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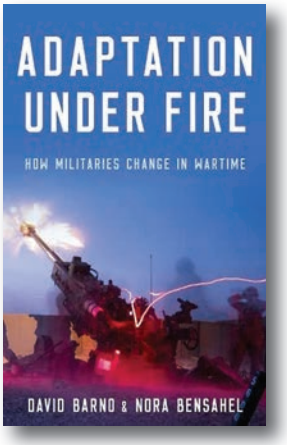
46 Cover Article
An multi-disciplinary infantryman employs the M320 40mm Grenade Launcher. (Photo DVIDS.)

DEPARTMENTS



84 Book Review

IDEAS AND ISSUES

Leadership

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2023 LtCol Earl "Pete" Ellis Essay Contest

In an essay of 2500 to 3000 words, answer the following question:

Logistics is identified as the pacing function for Force Design 2030 and Expeditionary Advanced Base Operations. The "tyranny of distance" and challenges to operational reach present limitations for the sustainment of the future force. What new capabilities, innovative methods, or novel organizations are required to extend operational reach and overcome the challenges of sustaining Marines as Stand-In Forces?

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Contest is open to all Marines and Friends of the Corps.
Participants associated with the *Gazette* editorial advisory panel may not compete.

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MARINE CORPS Gazette
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AUGUST 2023

Editorial: Change and Adaptation

This month, as the Corps continues to transit the uncertain waters of change, from new senior leadership to the annual "summer sillies" of reassignments and PCS moves across the Corps we present articles that observe and report on change in multiple areas of professional interest. As featured on our cover the mix of subjects includes articles focused on modernization and innovation in logistics, leadership, talent management, infantry training and force design.

In the "The Arms Room Concept" on page 46, Capt Devon Sanderfield provides insights into the Corps' training and organizational initiatives to produce more lethal, more capable "multi-disciplinary" infantry Marines. Our latest work of Useful Fiction, "Installations in Contested Environments" by MajGen David Maxwell on page 57, describes a vision for the future of installations in an age of competition and conflict with peer adversaries. Regarding talent management, Maj Brian M. Anderson presents the results of his analysis of one of the practical processes that defines talent management in the careers of Marines: "The Lieutenant Colonel Command Screening Board" on page 20.

Other standout features this month include continued exploration of the potential utility of AI/machine learning in military operations. In "Using AI to SAW Through OODA Loops" on page 64, CAPT John Konrad looks at how AI can revolutionize operational planning and decision making and to support the training and education of operational planners at the School of Advanced Warfighting. Three more noteworthy articles present somewhat uncomfortable facts and potentially controversial opinions to prompt critical thinking and further the fact-based exchange of ideas in the areas of talent management, force design and leadership. I encourage close reading and invite commentary on "We Are Failing to Set Our Young Marines Up for Success" by 1stSgt Adam Zurn, "We Don't Want You, Uncle Sam" by 2ndLt Matthew Weiss, and "Getting Serious About Training for Urban Operations" by Maj Robert Malcolm. For those readers and MCA members who want to join in the professional discussion of articles from this month's *Gazette* and other issues of importance to the Corps join the *Gazette* LinkedIn® network here: https://www.linkedin.com/showcase/marine-corps-gazette.

Lastly, a reading of our masthead reveals a change in my role and responsibilities. Starting this month, I have added *Leatherneck* Magazine of the Marines to my "portfolio" and so in addition to my role with the *Gazette*, and as the MCA's Vice President of Professional Development, I assume the duties of Publisher and Editor-in-Chief for both of our flagship magazines. I am humbled by the trust our leadership places in me and remain committed to supporting independent professional discourse and to sharing the stories of all Marines.

Christopher Woodbridge

Deckplate C2

Training for a peer adversary

by 1stLt Francis X. Cunniff

The roles and responsibilities of a second lieutenant in the Marines Corps include being a student of history, current events, and the current state of the Marine Corps as well as the world at large. We have our own metaphorical toolboxes that we load up to ensure we are ready for the mission, regardless of who we are fighting or where the events take us. Our next fight—whether it be a near-peer threat like Russia or China, or a non-state actor like ISIS and Al Qaeda—will have the new warfighting domain of cyber as a potential vulnerability. To prepare ourselves to face this threat, we must be aware of our own actions to ensure we are responsible in the signals domain and use every opportunity we can to exploit the enemy's use of this technology. We should evaluate our current command and control (C2) structure to ensure that it exists to support the Marines at the point of friction. We must allow Marines to attempt to exploit our own communications systems to develop tactics, techniques, and procedures to safeguard our own systems while we look to exploit the enemy's vulnerabilities to deny them the use of these operations.

On the topic of defense operations and countermeasures, our current C2 structure is the obvious target for enemy operations to deny or destroy. The use of encrypted radios, or *green gear comms* as they are commonly referred to, is an asset that Marines are introduced to early in their careers. These radios provide us with the ability to set up complex networks and allow for force tracking, reporting relevant information up and down the chain of command, and extending our ability to maintain control of our forces without being in shouting distance of them. They are not without their faults. *MCDP 6*, *Command and Control*, states, "Technology is not without its dangers, namely the overreliance on equipment on one hand and the failure to fully exploit the latest capabilities on the other."[1]

>1stLt Cunniff is a Naval Aviator currently learning to fly and fight the AH-1Z Viper at HMLAT-303.

Encrypted transmissions still represent a form of radio frequency emissions that can be intercepted. This does not require a sophisticated near-peer threat with its own battalions organized for signals intelligence collections or rooms full of hackers working tirelessly to try to grab a single radio transmission. Our current ultra-high/very-high/high-frequency assets are not unknown to the world. The Federal Communications Commission establishes frequencies that are restricted to military use and posts this information on its website. The enemy has the advantage of knowing this information, and with the use of commercial-off-the-shelf hardware, can exploit our transmissions, even assuming they cannot break out encryption to listen to the message. Software-defined radio allows individuals to purchase a twenty-dollar antenna from Amazon, plug it into a computer, and analyze the bulk of the radio-frequency spectrum, locating and isolating individual transmissions. With the aid of a highly directional antenna, which they can once again purchase commercially, they are now able to get a direction to the transmitting radio.

It is important to be mindful of these capabilities that the enemy may have, and I argue the best strategy to combat this threat is to conduct force-on-force exercises as this strategy of low-cost signals intelligence is probably closely related to the enemy's most likely course of action. Enable talented Marines to try to intercept our transmissions and locate our forces. At The Basic School, our enemy is likely just a few Marines in desert or woodland cammies firing blanks at us. While resources are limited, I argue that in order for Marines at all levels to appreciate the ability of the enemy to fix our position using the electromagnetic spectrum, we must have a red cell that is actively trying to do so. Our training should be realistic and challenging, and having an opposing force in our training that is trying to locate us based on our radio traffic is a way to do that.

... our current C2 structure is the obvious target for enemy operations to deny or destroy.

Ready Player One by Ernest Cline describes a world that is ultimately best described as connected. Both business and pleasure take place in a virtual environment known as the Oasis. The world is depicted as dystopian, as the access that the corporations in the novel have to the Oasis allows them to interfere with the actions of individuals as well as the ability to influence individuals in the system. This fictional world parallels our own in enough ways that it becomes an effective study for maintaining personal emissions control and security.

The last ten years have shown an enormous increase in the use of smartphones and smart devices, most of which support GPS and connection to the internet. Marines with cell phones in their pockets likely have their permissions set in such a manner to allow any number of apps to have access to their data in the forms of GPS, contact lists, and photos. This represents a great threat. Security of this information is now a concern at the level of the individual Marine, who is also relying on these companies that run the apps ensuring that they are taking adequate steps to protect the data.

In the article "Back to the Future?" by Col Gray Anderson (Ret), the author compares the current state of battle tracking in many ways as reflecting the Vietnam era's *great fire-team leader in the sky*. This approach had majors and colonels directing individual squads from helicopters above the battlefield. He argues that it was the antithesis of decentralized C2: individuals who should have been fighting battalions or companies were instead fighting squads. *MCDP1*, *Warfighting,* states, "In order to generate the tempo of operations we desire and best cope with the uncertainty, disorder, and fluidity of combat, command and control must be decentralized."[2] It is tempting to use tools such as a blue force tracker to monitor the state and movement of our forces. Force tracking decreases uncertainty on the part of commanders and takes some of the responsibility for constant position reports off of Marines in the fight, but it also has its disadvantages. It becomes easy to second guess the decisions of subordinate leaders as their location on the tracker does not match the unit commander's expectations. It also means that, for the entirety of their operations, they will be generating a nearly constant electromagnetic signature that can be exploited by the enemy.

A decrease in reliance on these systems would therefore better prepare Marines in two ways. The Marines on the deck, at the point of friction, will have to make a decision based on what will most effectively complete the task at hand. In Karl Marlantes' book, *What It Is Like to Go to War*, he identifies the unique situation of being a Marine in contact with the enemy, knowing that only those there at the moment will understand the full magnitude and gravity of the situation. We should look to embrace this point as an aspect of decentralized C2.[3] Have training involve Marines losing communications with higher and adjacent units. Cover up the blue force tracker board for periods of field operations to allow all parties involved to adapt to a threat. Training is where we will see what modifications to our equipment and procedures will best equip us to be successful when the enemy attempts to deny us communications.

... practicing for a fight in a contested environment is the only way to ensure our success when it is time to execute.

All officers that leave The Basic School are capable of receiving and writing orders without the use of any equipment other than a notepad and a pen. Maj Brendan B. McBreen, in his article "All Stations, this is Kodiak Actual," goes a step further and submits that we as a force should be capable of receiving and issuing orders verbally, "Five sentences, in fifty seconds, while under fire."[4] We are capable of adjusting to a thinking enemy if we make good considerations, limit the amount of information passed to the essential, and execute.

In addition to increasing our effectiveness as warfighters in a contested domain, adopting strategies that decrease our reliance on radio communications will increase survivability. We see this approach today executed in our ballistic-missile submarines. While there is a Navy captain in command, he is given a task and purpose and permitted to make decisions without constant communications. I am not suggesting that we as a Marine Corps should do away with all of our communications and battle tracking. We must, however, be deliberate in our use of these systems and ensure that they exist to aid in the individual Marine rifleman closing with and destroying the enemy.

The considerations for the next fight are complex and varied. This article does certainly not cover all aspects of what we may face in the next fight as a warfighting organization. For the considerations provided, however, I argue that practicing for a fight in a contested environment is the only way to ensure our success when it is time to execute. Allow leaders to take charge of their troops as a force that is supported by their combat operations center and rely on them to provide information back to higher when it is most effective to do so.

Notes

1. Headquarters Marine Corps, *MCDP 6, Command and Control,* (Washington, DC: 1993).

2. Headquarters Marine Corps, *MCDP 1, Warfighting,* (Washington, DC: 1997).

3. Karl Marlantes, *What It Is Like to Go to War* (London: Corvus, 2012).

4. Brendan B. McBreen, "All Stations, This Is Kodiak Actual ..." *2ndBn5th Mar*, n.d., www.2ndbn5thmar.com/orders.

Marines Are People

The humanistic approach to leading Marines

by LtCol Joseph Goodrich

>LtCol Goodrich is a KC-130J Pilot currently serving as the Deputy Director of the Marine Corps War College. His previous assignment included the Director of Safety and Standardization for MAG-14 and the Executive Officer of VMGR-252. He earned his EdD in Organizational Leadership Studies from Northeastern University in 2018.

In the July 2019 edition of the *Marine Corps Gazette*, I had the privilege of sharing "The LEADERSHIP Approach to Marine Corps Leadership" as an alternative perspective on the principle and trait-based leadership literature found in *MCWP 6-10*, *Leading Marines*.[1] LEADERSHIP is an acronym that stands for: **L**isten With a Purpose, **E**ncourage to Succeed, **A**ccountable to Self and Others, **D**ecisive in Nature, **E**mpower Others to Lead, **R**ecognize Faults and Learn from Mistakes, **S**et the Example, **H**arvest Trust and Respect, **I**nspire and Influence, and **P**reparation Leads to Resiliency.

Much of the literature on leadership stressed the importance of refreshing one's approach to leading—placing significance on other perspectives—as people, culture, and the environments change. This article offers a refreshed perspective on leadership by taking a critical look at the challenges Marine Corps leaders face in a constantly changing world. This *humanistic* approach begins with a critical analysis of *MCWP 6-10,* followed by a brief discussion of the key leadership terms, behaviors, and practices that Marine Corps leaders should consider, and then concludes with two alternative practices that focus on a humanistic approach to leadership.

Every Marine is familiar with *MCWP 6-10*, *Leading Marines*. This foundational leadership doctrine describes fundamental and battle-tested traits and principles of leadership. *Leading Marines* is presented in three sections: (1) Our Ethos, (2) Foundations, and (3) Challenges. According to the Electronic Library, *Leading Marines* "is not designed as a reference manual; it is meant to be read from cover to cover." An important theme that one can infer from reading *Leading Marines* from cover to cover is "winning means victory in daily life as well as in combat."[2] If this foundational doctrine on leadership was meant to help our leaders achieve victory in daily life, then why does it severely lack many of the key terms, behaviors, and practices that would best "provide the education of the heart and mind to win on the battlefield and in the barracks?"

Every Marine is familiar with* MCWP 6-10, Leading Marines. *This foundational leadership doctrine describes fundamental and battle-tested traits and principles of leadership.

For example, some of the most widely referenced humanistic leadership literature is included in the chart (located on the next page) and then cross-referenced with the number of times it is discussed in *MCWP 6-10.*

This list is not all-inclusive, and readers may find additional practices to be just as useful; however, they are the most relevant to this discussion. Leading Marines and leading people are no different. Marines are people. (There, I said it!) People require a level of care and energy that rivals a father and mother to their children or a professor to his student. Leading is a human endeavor that requires a basic understanding of love, compassion, and emotions. Leadership also considers how shame and ego prevent people from leading to their full potential. Despite the mixed messages associated with defunding military organizations designed to help military personnel navigate the complexities of leading diverse teams (the University of Foreign Military and Cultural Studies and the Center for Advanced Operational Culture Learning), Marine leaders must take it upon themselves to become educated in working in the people business that is the Marine Corps.[3]

Two alternative practices to Marine Corps leadership will now be presented that focus on the humanistic approach. The following recommendations are not meant to replace the lessons included in *MCWP 6-10* but complement the doctrine.

Leaders are Comfortable with the Uncomfortable

Leadership takes courage and is not for the faint of heart.[4] Leaders must

Term	Definition	# of Times Referenced in *MCWP 6-10*
Love	Knowing and caring about what inspires and empowers people.	4; "love of the Corps and Country."
Inspire, Inspires, Inspired	The ability to positively influence those around you and motivate others towards success.	2; in the Epilogue
Humanism	An outlook or system of thought stressing the potential value and goodness of human beings and seeking solely rational ways of solving human problems.	0
Compassion	Having positive intentions and genuine concern for others.	1; in the Epilogue
Emotion/Emotional	A natural instinctive state of mind deriving from one's circumstances, mood, or relationships with others.	3; "emotional shock absorbers," "emotional greeting," "emotional reaction."
Shame	A painful feeling of humiliation or distress caused by the consciousness of wrong or foolish behavior.	0
Ego	A person's sense of self-esteem or self-importance.	0
Followership	The capacity or willingness to follow a leader.	0
Enthusiasm	Intense and eager enjoyment, interest, or approval.	2; MCWP does not define, or give examples of enthusiasm
Cooperation	The process of working together to the same end.	0

Chart 1. *The definitions included in this chart were referenced from Google.com.

deal with many complex challenges that will affect individual, team, and organizational mission accomplishment. Patience, understanding, love, passion, and an understanding of the role shame plays in human behavior are all traits one must possess to earn the cooperation and followership of their people. Let us look at a hypothetical situation.

Sgt Goodrich recently found out that another Marine in his squadron is having an affair with his long-time girlfriend of three years. When presented evidence of the affair by his roommate, he responded by punching a hole in the wall and screaming, "I am going to kill him!" Sgt Goodrich's roommate tried to stop him from confronting the Marine but was shoved into the wall injuring his shoulder in the process. Sgt Goodrich immediately attended to his injured roommate, who was sent to base medical to have his shoulder put back in place. It did not take long for Sgt Goodrich's sergeant major to order him to the squadron command deck to explain himself. Unfortunately for Sgt Goodrich, the sergeant major was more focused on what Sgt Goodrich did than why. Sgt Goodrich was read his rights, and then the sergeant major presented him with an Article 31(b) form charging him with assault and destruction of government property. The CO was briefed on the events that occurred, but he too was not told why Sgt Goodrich acted in the manner that caused injury to another Marine and destruction of property.

The above example illustrates the importance of holding Marines accountable for their actions, but it does so in a manner that lacks a humanistic approach to leadership. Marine Corps leaders are comfortable compartmentalizing and following doctrine to help guide their response to situations, but they are not comfortable doing so using love, patience, understanding, and passion; I argue this is the wrong approach. The more effective approach would take the time to ask tough questions and put the needs of others first. The sergeant major and CO should have allowed Sgt Goodrich time to process the recent shocking news about his relationship and follow up with tough questions about why he acted out and what they can do to help Sgt Goodrich move forward in a more positive direction that refrains from harming himself or others in the process. Talking about feelings, thoughts, and behaviors can be an incredibly uncomfortable process, but ignoring them can result in a loss of productivity, motivation, and mission accomplishment. The following behaviors can help leaders become more comfortable being uncomfortable:

1. *Listen with a purpose:* listen and take notes, try to understand what the Marine is saying from their perspective on the situation; be deliberate about how you listen in a way that makes others want to speak and speak in a way that makes others want to listen.
2. *Follow up with tough questions:* Ask follow-on questions that attempt to identify the *why*.
3. *Be prepared to receive tough answers:* Leaders may not know how to respond to certain situations or information, so listen more and talk less.
4. *Embrace not knowing the answers:* Leaders do not always have the answers; be willing to help find solutions using critical thinking skills.
5. *Put the needs of others first:* It is not about the leader; it is about the follower.

Marine Corps leaders are comfortable compartmentalizing ...

What sets leaders apart from their peers is the willingness to admit they do not know. Part of being comfortable with the uncomfortable is a willingness to try new approaches. Leaders are often surprised by the impact of a statement such as, "I am sorry you are experienc-

ing _____, let me know if there is anything I can do for you." This level of emotional intelligence requires leaders to discard their ego and need for control and focus on practicing openness, gratitude, and being uncomfortable. It is important to remember that with uncertainty comes opportunity. Being uncertain as a leader is an opportunity to learn and grow while supporting those in need. Research in the field of culture and leadership suggests highly successful teams solve hard problems together, incorporating humanistic leadership practices and diversity of thought.[5]

Leaders Understand the Role of Shame and Ego

The award-winning author, researcher, and professional speaker Brené Brown studied the role shame plays in leadership, and she found shame to be "the most powerful master emotion."[6] Shame is "the fear that we're not good enough," and it can lead to "blame, disrespect, betrayal, and the withholding of affection." It takes courage, empathy, understanding, and vulnerability to overcome shame. Examples of shame in Marines include: not sharing one's thoughts or ideas for fear of being wrong or making a mistake; not asking questions (especially tough questions); not admitting fault after making a bad decision; or ruminating about past failures or rejections. Leaders should educate Marines on "the master emotion," and they should practice overcoming shame to help build trust and esprit de corps. The following behaviors can help leaders overcome shame.

1. *Recognize shameful behaviors:* People who are experiencing shame feel sensitive, unappreciated, rejected, used, embarrassed, worried, and angry.
2. *Be courageous:* Use empathy, understanding, and vulnerability to help share the burden of shame and show that people can learn and grow from shame.
3. *Be forgiving:* Leaders help their people learn to separate what they do from who they are; leaders should practice forgiveness and cultivate a culture of self-compassion.

A powerful feeling that is directly related to shame is loneliness. Every Marine, at one point or another, will experience loneliness. Loneliness is a complex emotion because it can leave people feeling isolated or disconnected. The term implies weakness; thus, it does not get much attention from Marine Corps leaders. It often manifests itself in our Marines as depression, anxiety, anger, or low self-esteem. One of the best ways to combat loneliness is to call it what it is. Leaders should have the courage to ask tough questions such as *are you lonely* or *does your situation make you feel lonely?* This helps identify and respond to loneliness before it results in more severe consequences. Loneliness and shame are often seen together, so it is safe to assume that loneliness may result in shameful behaviors.

Leaders should have the courage to ask tough questions such as are you lonely? This helps identify and respond to loneliness before it results in more severe consequences.

Another partner in crime with shame is ego. Ego is the practice of caring for oneself. By nature, ego, like shame, interferes with a leader's ability to practice humility. The good thing about ego is that one easy-to-remember tool can help keep egos in check; *shift focus from the self to others*. Leaders that focus on others and show compassion, love, tolerance, and humanism can help them overcome shame and remain focused in the workplace. It is a little late for the bottom line up front, but here it goes anyway; there is no room for shame or ego in leading Marines.

If you made it this far into the article, I have good news for you! You have taken a moment to consider an alternative approach to leadership that does not align directly with *MCWP 6-10*, *Leading Marines*. You have just exercised an example of *leaders never stop learning* section from earlier in the article. *Leading Marines* is a great foundational doctrine from which to practice leadership in the Marine Corps, but it does not consider many other key terms, behaviors, or practices often found in leadership publications of today. The complex challenges presented to Marine Corps leaders require them to be comfortable with the uncomfortable and have an understanding of the roles shame and ego have in leading to achieving full followership of their Marines and sailors.

Notes

1. J.E. Goodrich, "The LEADERSHIP Approach to Marine Corps Leadership, *Marine Corps Gazette* 103, No. 7 (2019).

2. Headquarters Marine Corps, *MCWP 6-10, Leading Marines,* (Washington, DC: June 2016).

3. Feedback provided by Dr. Lauren McKenzie, Marine Corps University Command and Staff College.

4. Information available at https://www.thecompleteleader.org.

5. Daniel Coyle, T*he Culture Code: The Secrets of Highly Successful Groups* (New York: Bantam Books, 2018).

6. Brene Brown, *Dare to Lead: Brave Work. Tough Conversations, Whole Hearts* (London: Ebury Publishing, 2018).

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The Courage to Encourage

Fostering courageous leadership in the Marine Corps of the 21st century

by LtCol Matthew J. Schultz

>LtCol Schultz is a Logistics Officer in the Marine Corps. He served as a Platoon Commander with Combat Logistics Battalion 4 in Iraq; a Staff Platoon Commander at The Basic School; and a Company Commander, with Marine Wing Support Squadron 172. He holds a bachelor's degree in Biology from York College of Pennsylvania and a master's degree in Management, Strategy, and Leadership from Michigan State University. He also possesses graduate degrees from the U.S. Army's Command and General Staff College Art of War Scholar's Program as well as the School of Advanced Military Studies. He is currently a Planner with the 3d MarDiv and is slated to take command of Marine Wing Support Squadron 174.

The American profession of arms universally embraces courage as an essential virtue. The Army, Navy, and Marine Corps all incorporate courage into the list of core values that each soldier, sailor, and Marine are expected to live by. Similarly, the Air Force integrates courage, integrity, and conviction into its preeminent core value—integrity first.[1] The explicit inclusion of courage in the fundamental values underpinning the culture and ethos of each of the Nation's armed Services should not come as a surprise. After all, the historical record suggests that defending national interests and defeating adversaries in war requires an abundance of courage. Yet, as many Marine Corps leaders can attest, there is a big difference between reciting the Corps values—honor, courage, commitment—from memory and living by them. Embodying those values requires action, not words.

MCWP 6-10, Leading Marines, describes courage as the "mental, moral, and physical strength the Corps ingrains in Marines to carry them through the challenges of combat and the mastery of fear, to do what is right in every situation, to adhere to a higher standard of personal conduct, to lead by example, and to make tough decisions under pressure."[2] While this definition clearly illustrates the Marine Corps' position on courage, it does not adequately address the paradoxical nature of courage which often requires a catalyst, particularly in situations that are novel, ambiguous, or deceptively benign. Additionally, warfighting organizations cannot afford to assume that every member possesses it in all of its forms and under all conditions, regardless of how much emphasis is placed upon it. Courage is simply not enough on its own, and just as a fire requires a spark applies to oxygen and fuel—courageous thoughts, words, and actions often require encouragement. This is particularly true given the complexity of the current operating environment.

...courageous thoughts, words, and actions often require encouragement.

The principal challenge that leaders must confront in terms of courage as a character trait is that Marines cannot be reasonably expected to have fully or holistically internalized what it means to be courageous upon graduation from boot camp or the acceptance of a commission. While they will have by that point demonstrated the ability to act with courage in some instances, the fact of the matter is that service in the operating forces, which must be balanced with the competing priorities of life, is a far different experience than participating in a tightly controlled and scripted period of instruction in a formal school. Additionally, despite the fact that many of the Corps' most important and timeless charters—promotion warrants, for example—capture the expectations of professional conduct, leadership is ultimately a human endeavor riddled with complexity and nuance. Individual life experience and genetic predisposition will always vary from person to person, and those factors will always influence peoples' thoughts, words, and behaviors which will in turn differ from situation to situation. As Viktor Frankl pointed out after spending years of his life imprisoned in a series of Nazi concentration camps, people have an innate responsibility to choose how they will confront every situation in life and are, as a result, ultimately self-determining.[3] Therefore, leaders must appreciate the fact that humans are imperfect and often governed, at least in part, by continuous, dynamic series of emotions spurred by their surroundings. It is for this reason that

courage—in all of its forms—must be taught, modeled, learned, practiced, and reinforced.

Courage is complex, multifaceted, and at times elusive. To make matters worse, courage can be deceptive to those who assume that displays of great courage in one facet translate into equal portions across the spectrum. This could not be any further from the truth though, and many leaders have witnessed examples of Marines with exemplary physical courage who lack the requisite moral courage to lead anyone but themselves—if that. Courage, like any character trait, is not perfectly imbued in anyone. Ultimately, it must be encouraged.

In contrast to the virtue of courage, the concept of encouragement—an important catalyst to courageous behavior—is commonly overlooked in American military culture and literature. For example, the word *encourage* only appears a handful of times—four to be exact—in the main text of *Leading Marines*—a stark contrast to the 45 instances of the word *courage*. While this general omission is likely, not intentional, the disparity may indicate a lack of appreciation for the potential energy that the concept can deliver to a warfighting organization. For example, one need look no further than the most impactful utterance of encouragement in context on pages one-seventeen of *Leading Marines*, directly above an iconic photograph from the battle of Fallujah. That caption reads: "Despite his grievous wounds, 1stSgt Kasal continued to shout words of encouragement to his Marines while he engaged the enemy."[4] Though some misconstrue the practice of encouragement as weak and accommodating, that couldn't be any further from the truth. Encouraging others is not synonymous with coddling, pampering, or overindulging others. Instead, it is a vital component of empowering and inspiring others to have a bias for courageous action.

Merriam-Webster describes the term encourage, a transitive verb, as "to inspire with courage, spirit, or hope."[5] It follows on to say that the concept of encouragement also includes acts to "spur on" or "to give help or patronage to." Thus, the concept of encouragement provides leaders with a useful tool to address situations wherein the behavior of others is misguided or courage is waning if not entirely absent.

Marine leaders at all levels have a moral obligation to foster sustained physical, mental, and moral courage within their formations. While there are many ways to fulfill this requirement, courage cannot simply be instilled through brute force, check-list memorization, or coercion. These approaches, while useful in some endeavors, can stifle initiative, promote avoidance behaviors, and accommodate indecision. Instead, courage must be cultivated. It must be modeled. It must be experienced. And perhaps more importantly, it must be actively encouraged—acknowledging Marines when they have displayed courage and placing Marines into situations where they can rehearse it. As such, encouragement is a fundamental aspect of effectively influencing the thoughts and behaviors of others, making it foundational to establishing trust, confidence, and a positive command climate. It is also critical to leading in today's complex operating environment.

The *Marine Corps Manual* states, "The objective of Marine Corps leadership is to develop the leadership qualities of Marines to enable them to assume progressively greater responsibilities in the Marine Corps and society."[6] It also includes three Marine Corps leadership qualities—inspiration, technical proficiency, and moral responsibility. All of this of course must be achieved in a operating environment that differs extremely from that of the turn of the century. Today's leaders face a number of unique challenges: increased access and reliance on information technology; a dwindling pool of young Americans qualified for military service; a growing divide between societal and organizational values and norms; and an increasingly emboldened and capable pacing threat. Additionally, given the competition for talent in the labor market, Marine Corps leaders must be increasingly adept at leading across generational divides. While the Corps' youngest Marines were spared the wars in Iraq and Afghanistan, they are not strangers to adversity, having grown up in an era of school shootings, social media, and COVID. The Marine Corps' ability to navigate these obstacles and use skills such as encouragement to foster courage across an unbelievably diverse collection of Marines, experiences, and perspectives in our ongoing preparations for future conflict. After all, the quality of the individual Marine is one of our primary value propositions to the Joint Force.

Capstone Concept for Joint Operations: Joint Force 2020 states that success in globally integrated operations will require forces that can leverage the benefits of the "human element in joint operations, emphasizing trust, force of will, intuitive judgement, and creativity, among other traits."[7] Courage underwrites all of the aforementioned traits, and encouragement is the means by which the Corps can deliver that force. Encouragement is free of charge, and it is an inexhaustible resource. Similarly, there is no such thing as a Marine or a unit with too much courage. Leaders must, therefore, display the courage to encourage others in every clime and place—from the barracks room to the barroom and the motor pool to the battlefield. The coming fight will require all of the courage we can muster.

Notes

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4. *MCWP 6-11.*

5. Merriam-Webster, s.v., "encourage," https://www.merriam-webster.com/dictionary/encourage.

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Warfighting Without Warfighters

In machines we must trust

by Capt Joe Work

Following the publication of *Force Design 2030,* Marine Corps leaders have continued to call for increased attention and investment into artificial intelligence, machine learning, and autonomous capabilities to increase survivability within the weapons engagement zone of the future fight. The Commandant recognizes that the Service needs to make significant changes in these modernization efforts, "but one of the biggest hurdles ... is a lack of trust in the new unmanned and artificial intelligence systems he wants to invest in."[1]

How can Service leaders expect the ranks to trust artificial intelligence and autonomous systems when the foundational documents of the Marine Corps do not acknowledge the growing role of machine cognition in the future fight? To a larger degree than any other modern technological revolution, artificial intelligence could change the nature of war and render current Marine Corps doctrine inadequate in future conflicts. While fundamentalists will likely view this premise as an overstatement, changing the nature of warfare would significantly alter *MCDP 1* and each of the other foundational works since "our approach to the conduct of war derives from our understanding of the nature of war."[2] At the onset of the seminal document, *MCDP 1* positions the "dynamic interplay between opposing human wills"[3] as a chief principle in understanding the fundamental nature of war. Previous defense experts have held that the nature of war is a constant, citing the character of war as the culprit of change.[4] However, in the context of machine-on-machine warfare, what happens to the nature of war when the fundamental human element is reduced? The words put forth in *MCDP 1* "are not merely guidance for action in combat but a way of thinking,"[5] and thus, our thinking provides no avenue for understanding, much less trusting, the machine aspects of war. Artificial intelligence will not be an immediate panacea for human cognition, but Marines' lack of trust in machines is borne from an underlying technophobia in our doctrine.

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MCDP 1 calls war a "human enterprise" and claims that the "human dimension" is central to warfare.[6] The publication uses Clausewitz's insights from two centuries ago when he described war as the means to a political object, "and means can never be considered in isolation from their purpose."[7] Marine Corps training relies heavily on the "intangible moral factors" and "extreme trial of moral and physical strength and stamina,"[8] which are central to the human experience during war. At their essence, artificial intelligence and autonomous weaponry can remove the human dimension from the activity, either partially or entirely. While our current defense strategy includes an emphasis on the human-machine team approach, "the size, weight, and power constraints that currently limit advanced autonomy will eventually be overcome," leading to a massive surge in machine learning that "decrease[s] the number of humans needed to perform a specified task."[9] Human-machine teams will allow a slow introduction of artificial intellects into military actions, but the human element will be significantly decreased over time.

Autonomous weaponry can be broadly categorized by three levels of human interaction. On one side of the spectrum, autonomous weapons can be mostly directed, where human programmers develop a specific set of responses with little to no deviance. A cyber capability could be programmed to perform a list of steps if it detects an adversarial intrusion. Many networks today already use automated network intrusion detection because the sheer volume of data would be near impossible for a human to monitor. The second capacity of human interaction consists of a machine that can learn and deviate on its own while humans retain the ultimate ability to conduct lethal or crucial decisions. A UAS could identify, locate, and track targets over several hundred miles on its own while submitting requests for lethal actions to a human controller. The final type of human-machine interaction removes humans from the equation with a fully autonomous machine that can make critical decisions on its own, such as if and when to strike a target.

Western countries will likely try to keep humans in control of lethal actions; however, our peer competitors may not be as reserved in their approach. There is a pronounced concern

that the United States may soon lose its competitive edge in artificial intelligence. China is pursuing the concept of a battlefield singularity—the point at which normal human cognition is no longer able to make accurate decisions because of the speed that artificial intellect can operate. China's efforts to outpace artificial intelligence research in the United States show a commitment to gaining the advantage that may cause them to disregard the doubts of controllability when removing a human from the system.[10] Although we are likely several years from machine cognition operating at the same capacity as humans, "some observers have been leery of increased combat speed and complexity that could challenge human control through pervasive automation."[11] Notably, in Russia, the Military Industrial Committee has approved plans to have "30% of Russian combat power consist of entirely remote-controlled and autonomous robotic platforms by 2030."[12] While a portion of that will include autonomous weaponry that is guided by humans, our adversaries will be driving to outpace us on the battlefield and will certainly pursue weaponry that takes humans out of the equation for the sake of speed. The Commandant cites that the Marine Corps currently has "capabilities right now that allow for fully automatic processing of sensor-to-shooter targeting, but we don't trust the data."[13]

The nature of war will inherently change when it is fought between two autonomous sources; the relative speed of war will reach a pace that could not have been anticipated by Clausewitz. If our adversaries were to gain such an advantage, would we continue to show restraint in retaining control of our artificial intellects? Do the Chinese and Russian governments already perceive our tendency toward ethical behavior as a critical vulnerability in the artificial war?

It is necessary to begin considering both the human and technical dimensions of warfare as fundamental to future conflict. While we attempt to modernize initial infantry training, "our understanding of the nature of the theory of war ... must be the guiding force behind our preparation."[14] Our current training primarily treats war as a "political, chaotic, violent, uncertain and human activity."[15] *MCDP 1* will need to be rewritten to adapt to the technical aspects of war if the Marine Corps hopes to stay relevant through the Information Age. Our adversaries are quickly building weapons to dominate the age of artificial intellects, and while our doctrine reflects the success of the 20th-century Marine Corps, we need to adapt our way of thinking to include an enemy that has no political ends and possibly no "intangible moral factors."[16] If our warfighters continue to be trained that war is conducted only by humans, we will set ourselves back in

the age when Marines will need to trust machines to fight as equals. Marines will need to trust autonomous systems with critical life support, medical evacuations, and re-supply. They will need to trust machines' determinations on targeting and center of gravity analysis. They will need to trust artificial intelligence because our adversaries will not hesitate to remove humans from the loop to gain a competitive advantage through faster decision making.

While many of the principles set forth in *MCDP 1* will likely endure time, the Marine Corps requires a new understanding of how the non-human dimension will affect warfare. *MCDP 1* sets forth an absolute statement that "no degree of technological development or scientific calculation will diminish the human dimension in war,"[17] but machine-on-machine warfare will significantly decrease the human factors that previous generations knew. The Marine Corps' research dollars, training development, and all policies and procedures are based on our understanding of warfare. Indeed, each of the other doctrinal publications takes the lead from *Warfighting*. *MCDP 2* says that intelligence collection and production "may involve the use of high-technology sensors ... [but] good intelligence is primarily the result of solid headwork and legwork, not the output of some secret process or compartmented database."[18] *MCDP 4* says that "technology does not provide the understanding and judgment required to operate an effective logistics system."[19] Finally, according to *MCDP 6,* "As long as war remained a human clash of wills ... no matter how much technology you had, it still boiled down in the end to intuition and judgment."[20] Each of these doctrinal publications shows a reservation to trusting machines and reinforces the superiority of human cognition.

Artificial intelligence will not be a capability that a few cyber or communications Marines know how to support; its impacts will rewrite every technical publication and manual that exists today. *MCDP 1* should be rewritten urgently to get ahead of this fundamental shift in warfare. The Marine Corps should embrace Gen Krulak's words in the introduction to *MCDP 1*, "I believe *Warfighting* can and should be improved. Military doctrine cannot be allowed to stagnate, especially an adaptive doctrine like maneuver warfare. Doctrine must continue to evolve based on growing experience, advancements in theory, and the changing face of war itself."[21] I recognize the words of Sir Michael Howard that it is tempting "to declare dogmatically that whatever doctrine the Armed Forces are working on now, they have got it wrong." However, in the years of peace that approach, our task is to ensure that we are not "too wrong."[22]

Artificial intelligence will not be a capability that a few cyber or communications Marines know how to support; its impacts will rewrite every technical publication and manual that exists today.

Notes

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3. Ibid.

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13. "Berger."

14. *MCDP 1, Warfighting.*

15. Ibid.

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17. Ibid.

18. Headquarters Marine Corps, *MCDP 2, Intelligence,* (Washington, DC: 1997).

19. Headquarters Marine Corps, *MCDP 4, Logistics,* (Washington, DC: 2023).

20. Headquarters Marine Corps, *MCDP 6, Command and Control,* (Washington, DC: 1996).

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We Are Failing to Set Our Young Marines Up for Success

The what, how, and why

by 1stSgt Adam Zurn

The Marine Corps' future successes or failures will be determined by the actions of our junior enlisted Marines. Due to increasing military technologies, worldwide media influence, and the popularity of social media, the ease and speed of sharing information in the technological environment make our Marines' actions more important than ever. Their actions will influence the strategic, operational, and tactical levels, whether positive or negative. Today's Marines are *absolutely* far more capable than ever, but they may have some leadership skill and trait deficiencies. Our Marines are more capable because they grew up with better technologies than we had, had more educational opportunities, and their entire environment moved faster than ours. Any deficiencies in their leadership skills and traits are because we as leaders did not teach our Marines what right looks like or because we let them deviate from the standard. Over the last sixteen years, three specific circumstances contributed to today's issues.

1. During the 202K plus up, we retained a large population of Tier 3 and 4 Marines who are staff non-commissioned officers (SNCO) today. Some of those SNCOs became Tier 1 and 2 while many remained Tier 3 and 4.
2. The Tier 3 and 4 SNCOs failed to develop their younger Marines, which resulted in their Marines getting promoted into leadership positions with deficits in leadership skills.
3. The most significant current issue is Tier 1 Marines depart the Corps because they are led by Tier 3 and 4 leadership.

To overcome our challenges, we need the fitness report (FITREP) and unit leadership to ensure all tangible job-related tasks and intangible character development activities are being conducted. Turning intangible implied tasks into actual specified tasks increases the exposure of critical leadership skills to young Marines by creating a system of accountability for those that lead. These actions will allow us to develop and retain more Tier 1 and 2 Marines and mature them into exceptional leaders.

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The fitness report is the Corps' tool for performance evaluation, and Marines need to be educated about the system and their responsibilities. *(Photo by SSgt Dengrier M. Baez.)*

The Past and The Present

During the 202K plus up, we retained a large population of Tier 3 and 4 Marines who are SNCOs today. Some

of those SNCOs became Tier 1 and 2, and many remained Tier 3 and 4. As we were promoted into our leadership roles, our challenges grew significantly. This happened because our adversaries became more capable, technologies were developing at an improved rate, systems like Marine Online, Global Combat Support System, Marine Corps Training Information System, and others required more user input daily, and by the way, we needed to overcome our challenges more quickly. Our failure was an inability to anticipate the upcoming challenges. Therefore, we did not always focus on the right things. Many Tier 3 and 4 Marines focused on completing job-related tasks instead of developing their Marines.

Over time, the junior Marines mentored by the Tier 3 and 4 Marines were promoted into leadership roles without exposure to critical leadership skills. Without those essential leadership skills, the requirements to overcome their challenges eventually outgrew their abilities. We essentially created more Tier 3 and 4 Marines that did not have the capabilities to perform to the standard we needed them to. Today, we have a larger population of Tier 3 and 4 Marines in the rank of sergeant and above, creating difficulties retaining Tier 1 and 2 Marines from the lower ranks.

The most significant current issue is that Tier 1 and 2 Marines depart the Corps because they are being led by Tier 3 and 4 leadership. Over the last several years, there have been many changes in developing our young Marines. Many of them have to perform to a specific physical fitness level before they can even sign certain contracts; a new phase in boot camp was developed to start maturing our Marines as early as possible; MOS schools have been changing curricula to enhance the Marines' skills before they ever hit the fleet; and we send our young Marines to professional military education at an earlier stage of their careers. These changes and more are why our young Tier 1 and 2 Marines are more capable than ever. These Marines know they are competent and know which of their sergeants and above are Tier 3 and 4. We as leaders are not giving them hope that their leaders will either become Tier 1 and 2 or that they will get forced out of the Corps. They are smart enough to know there is a lack of accountability. So we see the problem, but do we know the solution?

Yes, we know the solution and even talk about it often; however, we just do not apply it. We need to invest more time in developing our Marines and hold Marines accountable that do not want to adhere to the standards. It is easy to say, *develop our Marines*, but there is no system that forces the preponderance of Marines to do precisely that. Our Tier 1 Marines will always do the right things; that is just who they are. The problem is we assume Tier 2, 3, and 4 Marines will do the right things as well. Assumptions are a recipe for failure. Some Marines get too busy and forget, some fail to prioritize what is essential to the mission, and some only work for their personal gains.

The next thing is to hold Marines accountable that do not follow the standards. We are great at holding junior Marines accountable through counseling, Pg 11, 6105, and other administrative tools, but we need to do better when it comes to accountability for those who lead. I have rarely seen a sergeant or above get written counseling, or even a non-punitive letter of caution. If we use some of these tools with the lower ranks, why are we not actually using them with the higher ranks? As already stated, we need the FITREP and unit leadership to ensure all job-related tasks and character development activities are being conducted.

Service-Level Solution

Currently, one of the Service-level systems we use is the FITREP. The FITREP is a great tool, but it needs to evolve. *Talent Management 2030* states, "At present, the FITREP captures only the positive views of two supervisors." We need the FITREP to capture the positive, negative, and unique attributes through all job-related tasks and character development activities that leaders are required to accomplish. The FITREP needs to be used as a counseling tool and forcing function.

As a counseling tool, the job-related tasks and character development activities would be assigned inside the FITREP. They should still be set by the reporting senior (RS), but the RS should also be required to have input from the senior enlisted or officer of that Marine's chain of command (i.e. the Marine with the experience to know what the RS Marine should be doing). This will help because, currently, the old paper-style initial counseling does not sufficiently spell out the requirements of the Marine reported on; it gets filed away and then forgotten about.

As a forcing function and to help give our Marines a little reminder, the Marines will be required to get counseled by their RS using the system every quarter. This will create dialogue for further conversation and ensure they stay on track with all of their duties. They would acknowledge that they either completed or failed to complete their their tasks to which the RS can concur or not concur and write a short statement. These tasks would be marked as completed or not completed instead of a graded event to reduce administrative burden. Marines would still be evaluated on how well they performed at the end of the period. This is because we need Marines to complete all of their assigned tasks, not just the noticeable ones, to ensure their subordinates get exposure to critical skills and traits. For example, a task assigned could be conducting a guided discussion on critical thinking with subordinate Marines. A substandard guided discussion on critical thinking is still better than no discussion. As great as this new FITREP may sound, a system used as a counseling tool and forcing function would only be successful if it were built with flexibility. Additionally, it would need to account for all the tasks we are assigned to accomplish according to our rank, MOS, billet, additional MOSs, and functional areas.

Flexibility is required because, as we know, gunnery sergeants are different than sergeants, aviation Marines are different than ground Marines, staff billets are different than operating force billets, and instructors are different than students. A new system could clearly

identify all of these differences. Additionally, adding MOS duties would increase the rate of return for the Marine Corps. Right now, we send Marines to MOS-producing schools in hopes that they will apply their new skills once they return, but this does not always happen. Adding the functional areas is like operator-level preventative maintenance checks and services. Some units currently only care about the functional areas critical to their success, and others when they fail or when an inspection comes up. Combined, these actions either help remind our Marines of their responsibilities when they become overtasked or are a forcing function on those who only work for their personal gains.

The truth is that we still have some Marines that only run, do crunches and pull-ups, and never conduct swim qualifications because one matters for promotion and one does not. A forcing function for the Tier 2, 3, and 4 Marines frees up space for the Tier 1 Marines to take on more responsibility. Most Tier 1 Marines are usually trying to pick up the slack where their peers fail to perform. Turning intangible implied tasks into tangible specified tasks through a system that improves the counseling process, requires frequent interaction to remind Marines of their duties, and creates visual accountability of tasks will increase young Marines' critical leadership skills and traits. These actions will develop good habits within our Marines as they mature. Good habits will free up mental and physical capacity enabling Marines to take on more responsibility, which increases individual and, ultimately, unit capability. The problem with a new FITREP system is that it takes time and lots of money to create. Fortunately, the solution for the Service level also applies to the unit level. We need to invest more time in developing our Marines and hold Marines accountable that do not want to adhere to the standards.

Unit-Level Solution

In 2030, our end strength will be roughly 174,000 Marines. We currently do not know if we will be in conflict then, but we can assume our threats and challenges will be more complicated than they are now, and we must always be prepared. We need to take more responsibility for our problems and take more actions to correct them. *SMMC Memo 2-22* states, "We must actively work to improve our warfighting organization if we want to remain preeminent on the battlefield of tomorrow." If we continue to do the same things we do today, will we get the results we want in the future? The steps toward unit improvement are self-evaluation of our actions, proper planning, and then accomplishing those actions which move us in the right direction. A tactical pause to ask, "Is this the right thing to do, or is this just the thing closest to my boat?" is an invaluable action to perform.

The problem with a new FITREP system is that it takes time and lots of money to create.

First, we need to evaluate and plan. In the book, *The 7 Habits of Highly Effective People,* Stephen R. Covey talks about "Put first things first." This is not a new catchphrase for Marines, but its application is. This process talks about quadrant thinking and splits it into four parts, as seen below:

"Quadrant I. Urgent and important (Doing)." Sometimes, these things must be handled at certain levels. These are our last-minute deadlines, unforeseen events, and crises. For example, an incident within the unit that results in an eight-day brief requires the attention of the unit commander.

"Quadrant II. Not urgent but important (Planning)." This is where we build long-term success. We need to plan, build relationships, learn, and be creative thinkers. This is how we invest time to create time in the future. This could be a guided discussion at the unit level to evaluate an issue and find the right solution to overcome that issue, thus improving the unit and building creative thinkers.

"Quadrant III. Urgent but not important (Delegation)." Minor issues, unimportant tasks, needless interruptions. These are usually the things we think we have to handle when most of them could be delegated in reality. These could be some of the administrative tasks we busy ourselves with. We feel like we must be the ones to complete these tasks, but many of them can be delegated to lower levels.

"Quadrant IV. Not urgent and not important (Eliminate)." These things waste time: playing on the phone, excessive smoke breaks, internet cruising.

We can never entirely avoid Quadrant I, but investment in Quadrant II reduces how much time we have to spend in Quadrant I. More time allows for more reflection, creating more success through better planning and action. Leaders need to think of creative solutions to manage time better. There needs to be something, whether a process, a specific focused group, or any other tool. Something that evaluates issues and creates practical solutions. Once we have effective solutions to our issues, we must enforce them properly.

In keeping with the *38th Commandant's Planning Guidance*, "Everything starts and ends with the individual Marine. ... Demanding superior performance and enforcing high standards should not be viewed as draconian, but rather, should be expected by professionals."[1] Once we develop better plans, we have to be disciplined in our actions to execute them and demand the same from all of those around us. A great plan will not succeed if we lack the discipline to follow it.

Conclusion

I know there will be critics of the above ideas, which is okay. Some will inevitably take the defeatist approach and say they do not have the influence to change the system or that a new system will be too administratively burdensome. Others will make excuses saying they do not have the influence to get a whole unit to do the right things, or they do not have enough time to overcome the challenges above. *MCDP 1* says, "We must not tolerate the avoidance of responsibility."[2] It also states,

"We should deal severely with errors of inaction or timidity."[3] It is our Marine Corps, and it is our responsibility to take action! Our Marines' successes and failures are a reflection of us. I challenge everyone who reads this to question my ideas and submit their own. Having more perspectives will only create better outcomes.

We know our young Marines will shape the future, and we know that some of them may have deficiencies in their leadership skills and traits. Any deficiencies were created because we did not anticipate our future challenges, did not always do the right things to develop our Marines, and did not correctly hold Marines accountable. One day we will all take off the uniform, and when we do, we will sleep easy knowing we left the Corps in a better place than we found it. To overcome our challenges, we need the FITREP and unit leadership to ensure all job-related tasks and character development activities are being conducted. Turning intangible implied tasks into specified tangible tasks increases the exposure of critical leadership skills to young Marines by creating an accountability system for those who lead. These actions will allow us to develop and retain more Tier 1 and 2 Marines and mature them into exceptional leaders. It will be the small actions that lead to enormous success. If we plan and have a disciplined effort to take care of the little things now, we will not have to worry about big problems in the future. I would say we need to be the leaders we wish we had, but that is a lie; we need to be more.

The past has taught us that well-disciplined units prevail while undisciplined units fail. It is the responsibility of the unit leadership to control the unit's discipline, and as leaders, we need to discipline ourselves. Everything we do is to prepare our Marines for combat. *MCDP 1* states, "Combat power is the total destructive force we can bring to bear on our enemy at a given time ... Some factors may be wholly intangible such as ... the effects of leadership.[4]" Our Marines will win in combat, no matter what clime or place, if they are given the tools we as leaders owe them. Many resources will be unnecessarily expended if they do not get the leadership they deserve. The resources leaders will expend are human lives.

Notes

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The Lieutenant Colonel Command Screening Board

Quantitative analysis of career paths and selection results

by Maj Brian M. Anderson

> ***"There is required for the composition of a great commander not only massive common sense and reasoning power, not only imagination but also an element of legerdemain, an original and sinister touch, which leaves the enemy puzzled as well as beaten. It is because military leaders are credited with gifts of this order which enable them to ensure victory and save slaughter that their profession is held in such high honor."[1]***
>
> ***—Winston Churchill***

The Marine Corps is a commander-centric military institution whose philosophy of warfighting requires its commanders to possess high levels of personal and professional attributes. Within the midst of a Service-level transformation, the Commandant, in his planning guidance identified "Command and Leadership" as one of his five priorities.[2] The lieutenant colonel command billet is especially important due to its authorities and exerted influence at the tactical level. Because of the significance of the lieutenant colonel command billet, the Marine Corps convenes an annual board to screen and select these commanders. The lieutenant colonel command billet is the second board-selected command since the recruiting station CO is the first level of command requiring board selection. For these reasons, I was interested in identifying the quantifiable metrics associated with selection for lieutenant colonel command as well as identifying which career paths are associated with lieutenant colonel command selection for infantry, artillery, tank, and amphibious assault vehicle officers. This article presents my research contained within my master's thesis from the Naval Postgraduate School.[3]

I analyzed the fiscal year 2015 and fiscal years 2017–2022 Lieutenant Colonel Command Screening Boards with a total of 4,225 observations. To determine the predictive variables for lieutenant colonel command selection, I used some traditional operations research analytical techniques by building two binary, multivariate regression models and included variables based on demographics, MOS, physical fitness, training, and awards as well as B-billets and completion of resident career-level school (CLS) and intermediate-level school (ILS) to determine predictive career paths for lieutenant colonel command selection.

Variables Correlated with Command Selection

In my study, I found the metrics of fitness report evaluations, physical fitness, and attendance at resident CLS and ILS have the strongest predictive value regarding lieutenant colonel command selection.[4] For fitness report evaluations, I used the reporting senior (RS) and reviewing officer (RO) total cumulative values contained within an officer's Official Military Personnel File as the variables in my model.

An individual officer's RS total cumulative value is three percentages spread across the upper, middle, and

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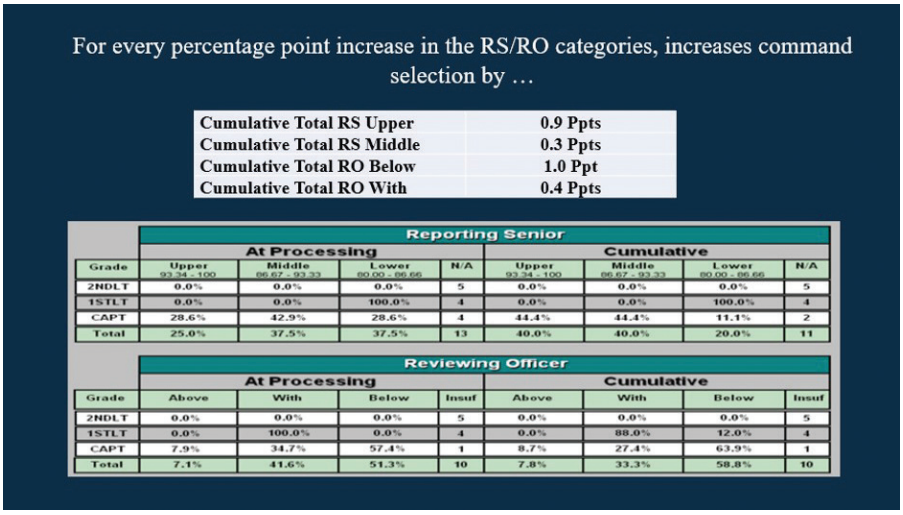
lower ranges adding up to 100 percent. Having a higher percentage of your fitness reports marked by the RS in the upper range is qualitatively better than the middle and lower ranges. The RO total cumulative values are broken into *above*, *with*, and *below*. These values are referencing where the RO marks an officer on the comparative assessment pyramid compared to officers of the same grade. These three percentages sum to 100 percent, and it is qualitatively better to have a higher percentage in the RO total cumulative below.

Every percentage point (PPT) increase in the *Cumulative Total RS Upper* and *Cumulative Total RS Middle* increases the probability of lieutenant colonel command selection by 0.9 PPTs and 0.3 PPTs, respectively. Regarding the RO evaluations, every PPT increase in the *Cumulative Total RO Below* and *Cumulative Total RO With* increases the probability of lieutenant colonel command selection by 1.0 PPT and 0.4 PPTs, respectively. Additionally, if an officer receives an adverse fitness report, it reduces the probability of command selection by 11.2 PPTs while every combat fitness report increases command selection by 1.1 PPTs. Regarding physical fitness, if an officer achieved a 285 or greater on the PFT, he increases the probability of command selection by 3 PPTs while a 285 or greater on the CFT increases command selection by 4 PPTs. However, an officer who achieved a score of 235 or less decreases the probability for command selection by 11 PPTs. Officers who attend resident CLS increase their chances to get command by 4.5 PPTs while those that attend resident ILS increase command selection by 4.3 PPTs.

Other statistically significant metrics include MOS, Bronze Stars, and rank. Combat arms and combat service support MOSs are less likely to get selected for lieutenant colonel command than aviation MOSs by 7.6 PPTs and 4.3 PPTs respectively. Each Bronze Star awarded increases selection by 3 PPTs while majors are 3.3 PPTs more likely to get selected than lieutenant colonels.

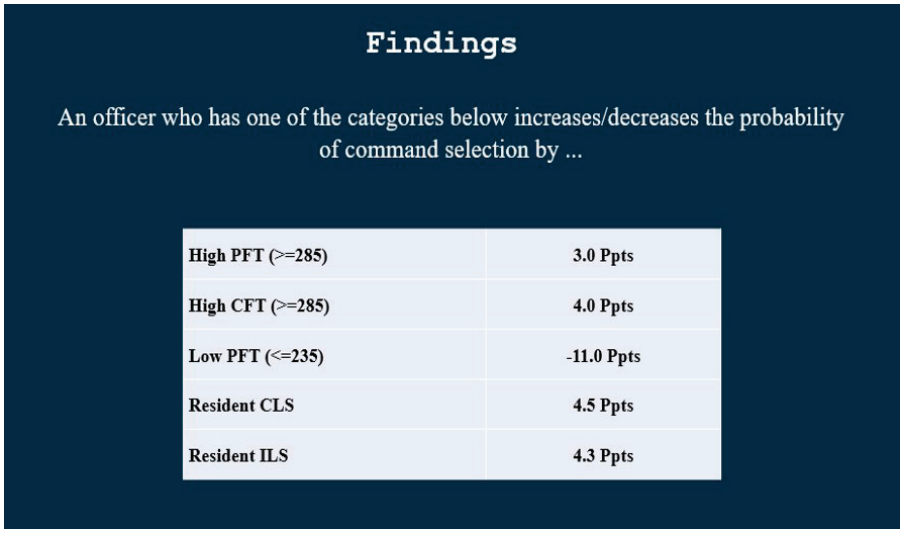
Within my model, I found the following variables to be statistically insignificant in predicting selection for lieutenant colonel command: TBS leadership grade, sex, race, a <=235 or below CFT, valor awards, Meritorious Service Medals, and possessing the AMOS of 0505.[5]



Fitness report findings. *(Figure provided by author.)*

… findings indicate that captains who fill a B-billet associated with their primary MOS have an increased probability of selection …

Regarding predictive career paths for infantry, artillery, tank, and amphibious assault vehicle officers, I built a model with the following variable categories: captain B-billet, major B-billet, additional MOS of 0505 or 88XX, attendance of resident CLS, and attendance of resident ILS.[6] My findings indicate that captains who fill a B-billet associated with their primary MOS have an increased probability of selection for lieutenant colonel command by 10.5 PPTs. Individual B-billets positively correlated with command selection include Tactical Training Exercise Control Group as a captain (32 PPTs), Expeditionary Warfare School instructor as a major (22.2 PPTs and recruiting station CO (38.7 PPTs). Additionally,



Physical fitness and resident PME findings. *(Figure provided by author.)*

possessing the additional MOS of Operational Planner is positively correlated with lieutenant colonel command selection and increases command selection by 14.1 PPTs. Lastly, within the career path model, attendance of resident ILS increases command selection by 14.7 PPTs.

Conclusion

Based on my findings, the Marine Corps selects its lieutenant colonel commanders primarily based on performance as measured by an officer's fitness reports and physical fitness tests. My findings also indicate that there are "better" career paths for officers who desire command. Regardless of MOS, resident ILS is positively associated with command selection. For most combat arms MOSs, captains who fill a B-billet associated with their primary MOS have an increased probability of selection for command. This does not indicate a causal relationship but could possibly be explained by an increase in technical and tactical proficiency that could improve performance as a battery or company commander and then have a subsequent impact on their career until the lieutenant colonel command screening board. The Marine Corps, even in the midst of Service-level change to meet the demands of the future operating environment, will continue to need, probably more so, high-performing, capable officers to serve as lieutenant colonel commanders. My hope is that this article provides some useful information for those with command aspirations by shedding light on the actions of previous lieutenant colonel command boards.

Notes

1. Winston Churchill, *The World Crisis, 1911–1918* (Washington, DC: Free Press, 2005).

2. Gen David H. Berger, *38th Commandants' Planning Guidance* (Washington, DC: July 2019).

3. Brian Anderson, *Predictive Variables and Career Paths for Selection to Lieutenant Colonel Command within the Marine Corps* (master's thesis, Naval Postgraduate School, September 2022), https://dair.nps.edu/handle/123456789/4795.

4. I used four physical fitness variables: High PFT (>=285), High CFT (>=285), Low PFT (<=235), Low CFT (<=235).

5. The AMOS of 0505, Operational Planner, is given to graduates of advanced intermediate-level school.

6. 88XX AMOSs are given to graduates of certain programs at the Naval Postgraduate School. For this model, the variables included 24 captain B-billets and 27 major B-billets in addition to the AMOS and resident PME variables.

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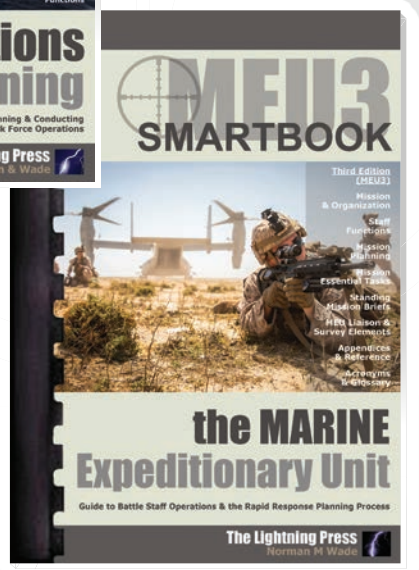

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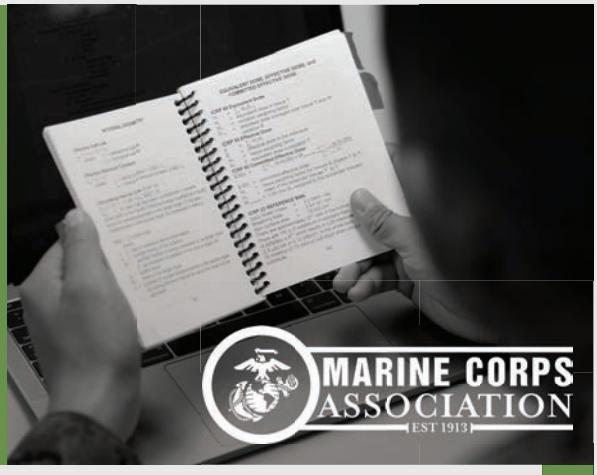

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Individual Ready Reserve Talent Management

Improving the process

by Maj Ronald Torgeson & LtCol Joshua Phares

"Talent Management is a Total Force Effort" presented some interesting and innovative concepts regarding optimizing our Individual Ready Reserve (IRR) force to align efforts with *Talent Management 2030* and *38th Commandant's Planning Guidance*.[1] Further discussion of IRR management issues is warranted along with the greater alignment of IRR management efforts and improved communications for the IRR force to support this greater issue of talent management and our ability to recall our strategic reserve forces in MARFORRES.

The authors identified two major and typical touchpoints for an IRR Marine that happen whenhe is placed in the IRR at the end of an active-duty contract and then again at the end of his IRR obligations.[2] In addition to these two points, there are other units that provide touchpoints for IRR Marines. The IRR is often a temporary home for Reserve Marines transitioning between billets, attending PME, or undergoing other life transitions—such as graduate school. Entering IRR Marines are assigned to their nearest reporting unit code based upon their last address on file. Prior service recruiters (PSR) actively scour assigned Marines and try to connect them with opportunities to drill within the Reserves—whether through a Selected Marine Corps Reserve unit or as an individual mobilization augmentee (IMA)—and track any interest and prospects in continuing to actively serve through the Marine Corps Recruiting Information Support System II. This provides not only an additional touchpoint but a continuous, open line of communication for the duration of the Marine's time in the IRR. A point of contention exists within Marine Corps Recruiting Command (MCRC), however, as active-duty accessions remain a priority of effort, drawing resources (e.g. advertising) from the PSR mission. Additionally, fewer lines of communication and mission adjustment exist between the supported Selected Marine Corps Reserve and IMA units and the PSR, which, if addressed, could more closely align efforts with manpower needs. The void is currently filled by PSR operations within MCRC, which coordinates with Reserve Affairs Manpower when assigning missions.

The Readiness Support Program (RSP) is an IMA program that provides additional touchpoints for IRR Marines. The program is part of the Marine Corps Individual Reserve Support Activity (MCIRSA), Force Headquarters Group, MARFORRES. The RSP utilizes IMA Marines to ensure accountability, readiness, effectiveness, participation opportunities, and assistance for IRR Marines with benefits and entitlements.[3] They accomplish this mission through IRR screening, training, post-activation support, and mobilization in support of national emergencies.[4] Monthly screening operations by RSP staff are intended to ensure IRR Marines' contact information (e.g. mailing address, phone numbers, and next of kin information) is up-to-date in the Individual Reserve Management Application (IRMA) to ensure the strategic IRR can be recalled efficiently. The IRMA database, much like the Marine Corps Recruiting Information Support System II, is a standalone system that only MCIRSA has access to and does not feed data into any other system. This task is redundant, as PSRs have a mission to ensure contact with the same exact population. A secondary effect, though no less worthy, is keeping the faith with fellow Marines-PSR and RSP Marines checking in on Marines. In fiscal year 2022, the RSP was able to contact and screen 20,002 of the approximately 60,000 Marines in the IRR. The RSP also conducts, in conjunction with MCIRSA, 25 IRR musters annually across the country which again allows MCIRSA to gauge and exercise the ability to recall the IRR force in the event of a national emergency, providing an additional touchpoint. These musters provide a percentage estimate of the force that can be

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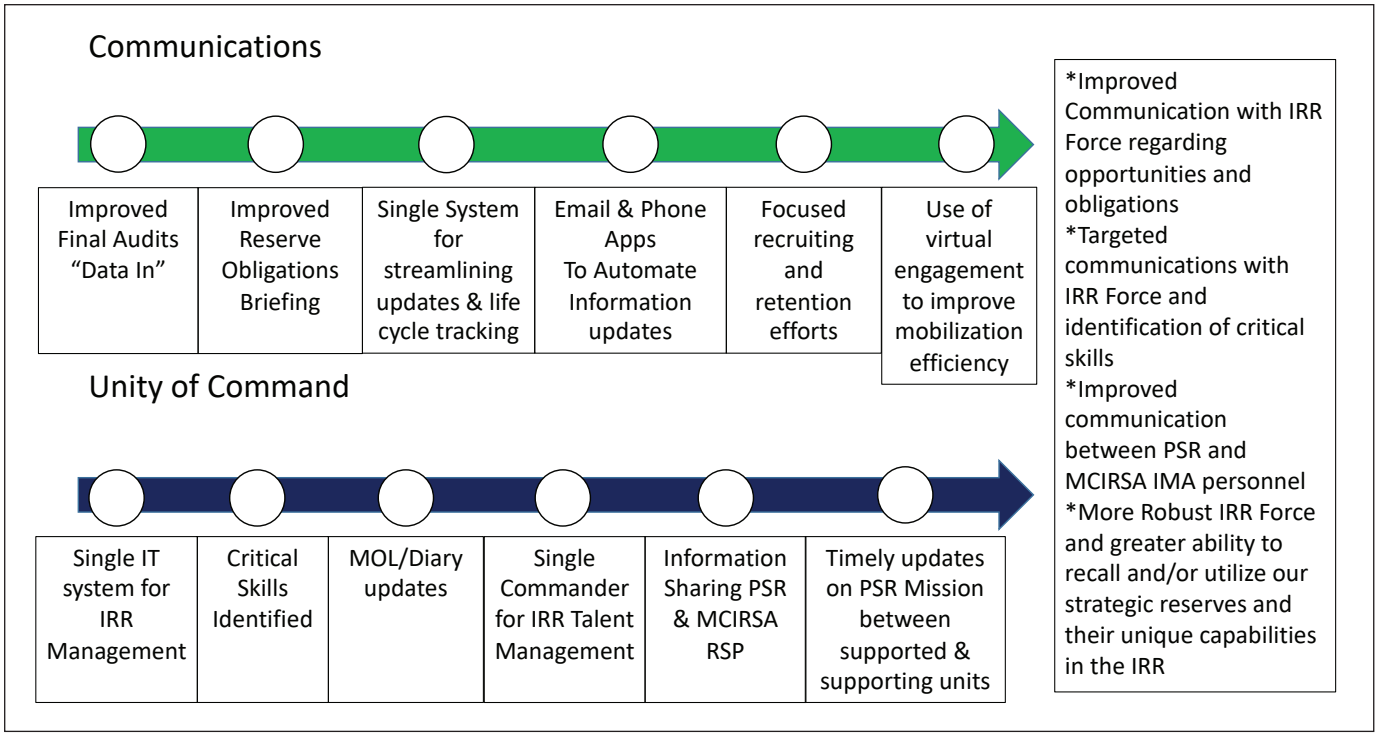
>>LtCol Phares is an Infantry Officer stationed at Camp Lejeune, NC, with the Inspector-General Staff at 2nd MLG, and previously served with Deployment Processing Command-East and as a Prior Service Recruiting Officer-in-Charge.



Recommended talent management methodology for the IRR. *(Photo by author.)*

mobilized within the congressionally mandated notification period and those that may need a delay or deferment. It also creates a ready pool of Marines that have been pre-screened for initial mobilization. Should a national emergency warrant a recall of the IRR Force, IRR Marines would be initially screened for suitability by the RSP before being sent home to await their mobilization to the Deployment Processing Command East or West.

A key component of this operation to maintain quality contact information is the input of quality data via a unit diary entry during the Marine's final audit and the maintenance of that data by the Marine. Marines, once discharged, often have very little interest in maintaining their contact information, as civilian life demands outpace any Marine Corps minutia, and Marine Online (MOL) becomes quite cumbersome with password changes and/or resets in order to effect changes. The time and effort expenditures greatly outweigh the requirement, and there is no enforcement action. Thus, touchpoints cannot be made due to poor data at discharge. Barracks duty phone numbers, unit or barracks addresses, or Marine Corps email addresses often get entered into the system during final audits, making it exponentially more challenging to make contact with a Marine. Additionally, during a poll of IRR Marines, the Reserve Opportunities and Obligations Brief, which is supposed to be a part of the transition readiness seminar for Marines coming off active duty into the IRR, does not effectively highlight the importance of keeping the information updated via MOL—nor does MOL make it intuitive for IRR Marines to know how to update contact and employment information.

Both MCRC PSRs and RSP Marines have a vested interest in the ability to effectively utilize the talent of the IRR population, albeit with different priorities: placing the right Marine in available billets for the former and IRR readiness and recall for the latter. PSRs are active-duty reservists with a distinct mission while the RSPs are IMA Marines operating with monthly screening goals. Both work, as many times as necessary, to contact the Marine using email, phone, and text methods, increasing the Marine's fatigue and wariness as they work to distinguish between legitimate Marine Corps efforts and clever phishing attempts while trying to advance their civilian lives. Marines have verbalized their confusion between multiple attempts to establish and verify contact information. Both units work independently utilizing different systems, with limited ability to annotate skills gained outside of the Marine Corps that may be critical in future fights, such as cyber certificates, IT training, languages, employment as a police officer or firefighter, additive manufacturing, finance, or business. Both may contact IRR Marines at various points during the Marine's time in the IRR, and efforts and information gained by one are not shared with the other. For example, updated addresses or phone numbers gained from a PSR are not shared via MCRISS to MOL or unit diary, so MCIRSA's ability to recall this Marine in a national emergency or for an IRR muster is degraded. Addresses and numbers updated by RSP personnel in IRMA require cumbersome additional system steps of data pull from IRMA and diary entry by the MARFORRES installation personnel administration center and are not always timely—thus degrading MCIRSA's ability to recall the Marine as

well as the PSR's ability to contact this Marine regarding Reserve opportunities. Finally, with the large-scale acceptance of virtual workspaces, advances in data security, telehealth, and electronic admin audits, the mobilization procedures for our IRR Force must be brought into the 21st century to accelerate the mobilization process and reduce travel and logistical costs.

Two major lines of effort to improve talent management and utilization of our IRR Force must be implemented: enhanced communication and unity of command. Improved communication at the point of IRR entry can occur via two methods: improving final contact audit information and improving access/ease of access to MOL. Final contact audit information entry can be done as a part of an enhanced IRR obligations briefing, which would also include more effective messaging focusing on why updated information is both necessary and required. A verification of final contact information would be required for each Marine as part of the successful completion of the Reserve Opportunities and Obligations Brief. Secondly, Marines should be required to sign up for phone-based applications or email updates as part of the Reserve Obligations briefing. Phone apps and email updates will allow improved communications and contact information mid-IRR contract by making it easier for Marines to update their addresses, phone numbers, critical skills, and employment information via a phone application and MOL, pinging them automatically via their chosen method(s) yearly to remind and allow them to update information. Better data infused into a single system will allow more focused recruiting efforts for both PSRs and RSPs, should critical skills be needed.

An interactive phone app would allow the Marine to reach out to either a PSR or RSP Marine (or other IRR engagement assets such as updating address, employment information, career planners, career counselors, Marine for Life, or mental health assets) depending on the Marine's needs absolutely anytime they want. This app would also eliminate the importance of the territory system and "normal business hours" currently in place. An RSP Marine in Alaska could assist an IRR member in Virginia if they were the first to work that Marine in a queue. The improved responsiveness would also continue to reinforce the customer service that is vital to maintaining continued communication when needed in the future.

One command and one system responsible for IRR force management will improve the unity of command, our second LOE, and synchronize the duplicitous efforts of both MCIRSA and MCRC as well as MCRISS and IRMA. A unified system will allow shared efforts by PSR and RSP Marines in order to reduce the number of times an IRR Marine is contacted and thereby reducing wariness by the IRR Marine. Inputs into a single, new IT system, with appropriate checks and balances, create diary entries and are reflected in MOL weekly. The new system allows for talents and skills gained outside of the Marine Corps to be annotated for future, focused opportunities to serve in MARFORRES, as well as create a better catchment feature should critical skills be needed in a future fight. The single system can also be a catalyst for greater information sharing between supported (Selected Marine Corps Reserve/IMA) and supporting (PSR) for greater alignment of recruiting efforts and manpower needs. The true power play of unity of command will be to align all IRR talent management efforts under a single IRR commander, including career planners, PSR, RSP, and not discussed Marine for Life IMA. The issue of PSR alignment with MARFORRES was broached in a previous *Gazette* article by Steve Wittle in July 2021 and warrants further review as part of a greater realignment of IRR management.

All of the above-described efforts would push the units engaging with the IRR toward optimal communication with the IRR force regarding opportunities and obligations, targeted communications, and better communication with adjacent units. All these efforts will result in a better-utilized IRR force and a greater ability to recall and/or utilize our strategic reserve and its unique capabilities. Marines gain amazing experiences and skills while in the IRR through college, work, and life experiences. At the same time, the Marine Corps can be better positioned to take advantage of this by improving its communications methodology and techniques and aligning its unity of command in its pursuit of talent management.

Marines gain amazing experiences and skills while in the IRR through college, work, and life experiences.

Notes

1. Maj Andrew R. Butler & Maj Jacob P. Pagragan, "Talent Management is a Total Force Effort," *Marine Corps Gazette* 106, No. 10 (2022).

2. Ibid.

3. Marines, "MCIRSA: Definitions," *Marines*, n.d., https://www.marforres.marines.mil/Units/Force-Headquarters-Group/Marine-Corps-Individual-Reserve-Support-Activity/Definitions/#:~:text=Readiness%20Support%20Program%20(RSP)%3A,Marines%20with%20benefits%20and%20entitlements.

4. Ibid.

Warrant Officer and Chief Warrant Officer MOSs

An imbalance in grade opportunities

by CWO2 Dane N. Schielke

As the Marine Corps begins to focus on force design and talent management, a key part of that is the retainment of well-qualified enlisted Marines to volunteer to be Marine officers, particularly warrant officers (WO) and chief warrant officers (CWO). The main point of this article is to not speak of discord about the overall current selection process for WO or CWO, it is meant to highlight the disproportionality of one MOS that is afforded selected grade opportunities: career recruiters.

Currently, there are four, separate, Marine Administrative Messages (MARADMIN) that provide results for the fiscal years (FY) WO/CWO selections. In no order of precedence, they are:

1.) FY 20XX ENLISTED TO CHIEF WARRANT OFFICER 2 RECRUITER SELECTION BOARD
2.) FY 20XX ENLISTED TO CHIEF WARRANT OFFICER 2 GUNNER SELECTION BOARD
3.) FY 20XX ENLISTED TO WARRANT OFFICER REGULAR SELECTION BOARD
4.) FY 20XX ENLISTED TO WARRANT OFFICER RESERVE SELECTION BOARD.

The two MARADMINs that will be referenced for this article are the recruiter and regular selection boards. The Reserve Component Selection Board and the Gunner Selection Board each have their own criteria and qualifications that are required but will not be the focus of this article.

>CWO2 Schielke is the Explosive Ordnance Disposal Officer with Marine Wing Support Squadron 171 aboard MCAS Iwakuni, Japan.

According to *MCO 1040.42B*, "Career recruiters, in the grade of gunnery sergeant, selected to WO (Recruiter) will be appointed by commission, by the President, to the grade of CWO2. Career recruiters, in the grade of staff sergeant, selected to WO (Recruiter) will be appointed to the grade of W-1. Recruiting WOs/CWOs will be assigned the PMOS 4810."[1]

... one MOS ... is afforded selected grade opportunities: career recruiters.

MARADMIN (FY23) for the regular selection board had 44 MOSs that encompassed the WO selection board. Not one of those MOSs is afforded the same opportunities that the career recruiter MOS is afforded. Why? Is it because the career recruiter is currently holding a special duty assignment/B-billet? Perhaps there are some Marines that are currently holding a special duty assignment/B-billet who have submitted a WO package for their primary MOS. For comparison, below are two excerpts from the FY23 recruiter and regular selection board MARADMINs regarding selection criteria.

MARADMIN 088/22 "FISCAL YEAR 2023 (FY23) ENLISTED TO CHIEF WARRANT OFFICER 2 RECRUITER SELECTION BOARD" dated 3/2/22:

"Must have shown extreme proficiency as a career recruiter; must have displayed exemplary leadership and organizational skills; must exhibit maturity, sound judgment, integrity, superior oral and written communication skills with a demonstrated ability to teach, coach and mentor; and must not have less than 8 or more than 20 years of active naval service."

(Keep in mind the "no less than 8 years of active naval service." This will be discussed later.)

MARADMIN 012/22 "FISCAL YEAR 2023 (FY23) ENLISTED TO WARRANT OFFICER REGULAR SELECTION BOARD" dated 1/19/22:

"The WO program is designed to provide the Marine Corps with technical specialists who perform duties that require extensive knowledge of a particular Military Occupational Specialty (MOS) ... MOS credibility is a key factor for selection."

Keywords from the recruiter selection board, that should be familiar to all staff non-commissioned officers and officers: *leadership, mentor, teach,* and *judgment*. In fact, they are, in small and large values, part of the fitness report (FITREP) attributes that all Marines, from sergeant to major general, are evaluated on. Now hold on. Criteria that a staff sergeant and gunnery sergeant have been evaluated on since they were a sergeant are the current characteristics that career recruiters must also display or exhibit? Are the required attributes highlighted in the career recruiter MARADMIN not encompassed within the regular MARADMIN's selection process? Are *maturity, sound judgment,* and *integrity* not involved with the extensive knowledge of the other 44 MOSs? Have the Marines in these 44 MOSs not shown, exhibited, or displayed the same attributes highlighted in the career recruiter MARADMIN?

There are Marines in the other 44 MOSs that can undoubtedly say that they have had to exhibit all the attributes that the career recruiter MARADMIN details during their current career. If they did not, they may not be in the positions or ranks they currently hold. There is a guarantee that many have displayed *superior oral and written communication skills* by the numerous U.S. and foreign field-grade officers, flag officers, and senior executive service personnel who had the privilege of receiving briefs or having discussions with these Marines. Are these communication skills and the other attributes not worthy of being afforded a commission to CWO2 if selected as an E7?

As alluded to earlier, there were keywords within the career recruiter MARADMIN selection board that correlate to the FITREP attributes. These attributes are *leadership, leading subordinates, developing subordinates, setting an example, communication skills, intellect, and wisdom.*

Excerpts from a FITREP are below for ease of understanding:

F. Leadership

1. Leading Subordinates "application of leadership principles."

2. Developing Subordinates' "mentorship ... ability to combine teaching and coaching."

3. Setting the Example, begins with "the most visible facet of leadership."

5. Communication Skills "equal importance given to listening, speaking, writing, and critical reading skills."

G. Intellect and Wisdom-3. Judgment "consistent, superior judgment."

While the attributes discussed are not detailing a specific letter grade it corresponds to, the details are in the main descriptive header of each attribute. The same traits that are highlighted in the recruiter MARADMIN selection board are used for FITREP markings from letters B to G.

While not advocating that any single MOS of the 44, on the regular selection board has more experience or is best suited for the same select grade opportunities; however, there are MOSs that require additional, and often extensive, skills progression to remain competitive. Some are required before being eligible for the warrant officer program in their MOS and some are required after appointment in their MOS. Of the 44 MOSs, 3 were chosen to highlight pre and post-appointment requirements. They are 0430–Mobility Officer, 2305–Explosive Ordnance Disposal (EOD) Officer, and 4130–Marine Corps Community Services (MCCS) Officer.

Are the required attributes highlighted in the career recruiter MARADMIN not encompassed within the regular MARADMIN's selection process?

After appointment, and throughout their career, a 0430–Mobility Officer has 17 required skills progression schools ranging from U.S. Army Transportation schools, Air Mobility Command's Integrated Development Environment/Global Transportation Network Convergence, to Hazardous Materials courses.[2]

For a 2305-EOD Officer, there is a substantial number of prerequisites that must be maintained and met to be eligible for the WO program. Eligibility for the warrant officer program requires "at least five years in MOS 2336 (EOD Technician) and have earned the Senior EOD breast insignia."[3] Furthermore, an EOD officer must maintain a Top-Secret clearance and meet all requirements for assignment to a critical position within the Nuclear Weapons Personnel Reliability Program an annual screening requirement.

Following a minimum base timeline for a Marine to go from an EOD technician to EOD officer would be:

1.) Lateral Move to EOD technician MOS during first re-enlistment

a. Time in Service (TIS) = ~four years.

2.) Eligible for the WO program as EOD officer, at least five years as EOD technician taken from the graduation date at the Naval School Explosive Ordnance Disposal School

a. TIS = nine years (initial four years + minimum five years as EOD technician).

The last MOS is a 4130-MCCS Officer that has sixteen required MCCS training courses ranging from Applied Financial Planning, Executive Skills Development, and Strategic Business Planning I. On top of the requirements *after* appointment, a prerequisite is "a degree from an accredited institution in a retailing related discipline such as human resource management or business management" and a "strong background in civilian retail management."[4] It is safe to say that a recruiter would be emersed in the civilian world and be required to engage with civilians. The same could be said about an MCCS officer and their prerequisites and requirements. Would the attributes of *maturity*, *sound judgment*, and *superior oral* and *written communication skills* not be required to attend, graduate, or maintain any of the previously mentioned courses or requirements for the 3

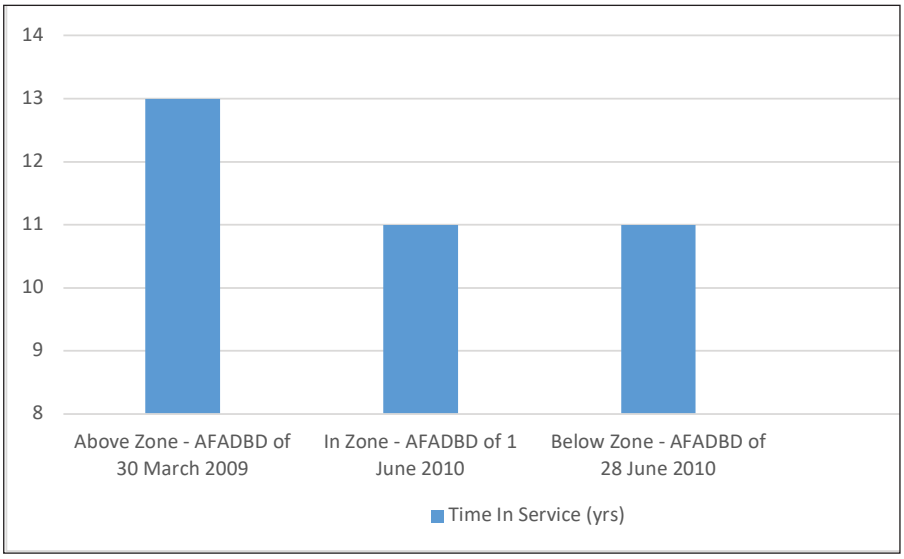


Figure 1. *(Figure provided by author.)*

MOSs or any of the other 41 remaining MOSs for that matter?

Coming back to the minimum 8-year TIS requirement, Figure 1 shows the FY23 gunnery sergeant selection-board zones for the 2336 EOD Technician MOS based on their armed forces active-duty base date, since this is the date that TIS is derived.[5]

From the graph in Figure 1, one can clearly see that each selection zone for the rank of gunnery sergeant already exceeds the minimum TIS of eight years based on the career recruiter MARADMIN. So, there are other MOSs that can meet the same TIS requirements that career recruiters must meet but are still not afforded the same select grade promotion opportunities. Why?

For external knowledge and insight into manpower management at this level, additional correspondence was sought by Manpower Plans and Policies, Officer Plans (MPP-30), Manpower and Reserve Affairs regarding this select grade disparity. With additional details from MPP-30, this type of change would be feasible if enacted. When asked if there were any specifics that would preclude all, or some, of the other 44 MOSs from the select grade opportunity, MPP-30 responded, "There is nothing written, in law, to say that the Marine Corps cannot follow this model for other MOSs."[6]

Another question specifically asked about the 4810–Career Recruiter MOS being below target inventory and therefore is being afforded this select grade opportunity as a type of incentive to maintain or bolster their manpower. MPP-30 responded, "The 4810 MOS is healthy and not below the 85 percent threshold."[7] This answer shows that the 4810 MOS is not below current manpower numbers. So, 4810s currently have a healthy manpower structure yet are afforded this selected grade opportunity. Why? How many of the 44 MOSs on the regular selection board are below their target inventory yet not afforded this select grade opportunity?

This option ... can increase our dynamic shift toward talent management ...

In conclusion, with the Total Force Structure Process and its myriad of concepts and estimates regarding operations, staffing, manpower, and affordability, to name a few, demanding or seeking to have all 44 MOSs on the regular warrant officer selection board be afforded select grade opportunities is not the intent. However, there is a wealth of knowledge and experience among those 44 MOSs that is impressive. This option, if afforded to other deserving MOSs, can increase our dynamic shift toward talent management, force design, human systems integration, and other known unknowns. By recognizing the superb leadership among the other MOSs, the Marine Corps' talent management can surpass expectations of manpower perspectives in the FMF with high-caliber Marines who choose to apply and further enhance their careers by continuing to evolve and make the Marine Corps a more intellectually determined and lethal fighting force. It should be discussed at higher levels within the Marine Corps and the DOD of which of the 44 MOSs *should* also have an E6 be selected to a WO and an E7 be selected to a CWO2.

Notes

1. Headquarters Marine Corps, *Marine Corps Order 1040.42B, Warrant Officer (WO) and Limited Duty Officer (LDO) Accession Programs,* (Washington, DC: 2019).

2. Department of the Navy, *NAVMC 1200.1G, Military Occupational Specialties Manual,* (Washington, DC: 2021).

3. Ibid.

4. Ibid.

5. Marine Administrative Message 080/22: *FY 2022 Gunnery Sergeant Selection Board,* (CMC Washington, DC: MRA MM, 2022).

6. Personal email correspondence between author and Manpower Plans and Policy Division in 2022.

7. Ibid.

Learning to Listen

Fighting toxic leadership

by Maj Ian S. Simpson

Marines deserve leaders who have the self-awareness and emotional intelligence to recognize their own shortcomings. For those leaders with the courage to hold the mirror up, honest subordinates will reflect an unblemished image. Alternatively, leaders who choose to deceive themselves by repeating a false narrative of perfect success will mute the voice of subordinates smart enough not to tell their boss the truth. In its opening pages, *MCDP 6 Command and Control* tells commanders that "feedback indicates the difference between [their] goals and the situation as it exists ... feedback is the mechanism that allows commanders to adapt to changing circumstances."[1] Though the OODA (observe-orient-decide-act) loop reigns king of maneuver warfare doctrine, the Marine Corps has no equivalent process for leaders to solicit leader-led personal feedback. Worse, by diminishing the voice of subordinates and by frequently measuring success by the number of tasks accomplished, toxic leaders have an opportunity to promote within the organization. Lastly, for those leaders who genuinely seek feedback, a lack of education or poor timing can make their efforts ineffective or counterproductive. To continue the Corps' long-standing tradition of healthy candor between the leader and followers, the Marine Corps must update its counseling directives, create a promotion system that roots out toxic leaders, and educate leaders to foster a command climate at all levels that incentivize honest subordinate feedback.

The most glaring problem with the current process is the lack of singular instruction on how to capture subordinates' feedback. While the Lejeune Leadership Institute's online database houses many documents that discuss leadership principles and coaching none clearly articulate a feedback loop process. In the best example, *RP0103: Principles of Marine Corps Leadership* outlines the eleven leadership principles known well by all Marines. Under the title, "be technically and tactically proficient," leaders are told to "seek feedback from superiors, peers and subordinates."[2] However, there is no further instruction on how a leader might accomplish this. The Marine Corps' *User's Guide to Counseling* is the principal document outlining the development of the subordinate, it offers no discussion on establishing a loop from followers to leader. Its content focuses on establishing growth goals for the subordinate in a one-way developmental approach "to help the junior achieve or maintain the highest possible level of performance."[3] While subordinate growth is valuable, the lack of attention to their responsive voice in the process is a massive opportunity loss for the leader's self-awareness and development.

This issue is paralleled in the fitness report process, which only captures the

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Leadership courses, like a First Sergeants Seminar, are one opportunity where Marines may learn how to seek out feedback from subordinates, but the Corps lacks formal instruction in this skill. *(Photo by LCpl Jocelyn Ontiveros.)*

perspective of the two direct supervisors in the evaluation. Fitness reports serve as the primary tool for promotion boards tasked with reviewing hundreds of reports to determine who is best qualified for promotion. The reports provide these boards with only a narrow perspective of the subordinate from their immediate supervisors as opposed to a much richer perspective of data possible if collected from seniors, peers, and subordinates. Because of this limited perspective, the fitness report system can reward yes-men who overwork their units at the expense of subordinates. Broadening the perspective to include the subordinates would capture many of the traits of toxic leadership—low morale, distrust, and poor organizational climate—often easily disguised to external evaluators. In recognition of this shortfall, the Commandant of the Marine Corps has begun testing MarineView360 to identify "traits of toxic leadership."[4] Like current reports, MarineView360's audience is the institution; however, leaders will gain critical insights into their subordinate's perspectives from its implementation. To marry with this initiative, leaders should seek to establish grassroots feedback loops that nurture more frequent data than a formalized process like MarineView360 or an annual en masse command climate survey.

A toxic leader's best tool is centralized control, conflicting directly with doctrinal guidance to minimize "the amount of command and control [needed] ... by replacing coercive command and control methods with spontaneous, self-disciplined cooperation based on low-level initiative."[5] For leaders who subscribe to the maneuver warfare model, every piece of feedback is critical information to improve the speed, efficiency, and lethality of the unit even if self-indicting. The author and research professor, Dr. Brene Brown, talks extensively on this topic in her book, *Daring Greatly*. She employs Theodore Roosevelt's well-known *Citizenship in a Republic* speech to contrast leaders who fight side-by-side with their subordinates versus those who sit on the sidelines and hurl critiques.[6] She writes of toxic leadership, "When shame becomes a management style engagement dies."[7] Toxic leadership suppresses subordinates' willingness to act boldly and centralizes decision-making preventing organizational growth. Subordinates in this cancerous environment become little more than robots following the direct orders of managers with no personal initiative, buy-in, or opinion.

While toxic leadership certainly exists, most leaders simply lack the knowledge to collect feedback effectively. These leaders often use formal counseling sessions as opportunities to gather feedback. Though this may seem appropriate, research shows formal counseling sessions are typically a terrible time to solicit leader-critical dialogue.[8] The formality and performance focus of counseling sessions cause attempts to gather critical feedback seem insincere. Following their performance review, subordinates may feel they cannot offer reciprocal feedback without the leader dismissing it as retaliatory. In her book *Insight,* organizational psychologist Dr. Tasha Eurich discusses how many supervisors assume they are receiving honest feedback during counseling sessions when instead the research shows subordinates frequently admit to lying to avoid damaging their bosses' ego.[9] This may come as an abrupt truth to many leaders who are seeking to do the right thing but have failed to consider the human dimension. In its chapter on ethical leadership, *MCTP 6-10B: Marine Corps Values: A User's Guide for Discussion Leaders* reminds all leaders that "there are few rewards for honesty in communication ... [there are] tendencies to alter facts and to withhold information."[10] The hard truth is leaders who ask for direct feedback one-on-one in a closed-door session with a subordinate have inadvertently established a barrier few subordinates are willing to cross.

The willingness to accept feedback starts at the top and cascades down. If unable to listen and change, leaders create an organizational culture where subordinates are equally distrustful. Brown writes, "When failure is not an option, we can forget about learning, creativity, and innovation."[11] In many organizations, dialogue is discouraged, and opposing ideas are ridiculed. An excellent litmus test for any leader assessing their culture is to consider whether subordinates find it easier to remain silent or propose new ideas.[12] Replacing a toxic organizational culture with one built on initiative and respectful feedback takes vulnerability and humility by the senior leader. In its guidance, *MCTP 6-10B* encourage small group leaders to "be secure enough to tolerate others having opinions different from [their] own."[13] The *User's Guide to Counseling* must include the same guidance to articulate a process where leaders learn to gather effective, respectful subordinate feedback without becoming defensive. Including a template for receiving feedback would support the guide's overall end state of "increased unit readiness and effectiveness."[14] Additional resources, hypothetical examples, and justification thoroughly outlining the process would provide a manual for all leaders.

The User's Guide to Counseling _must include the same guidance to articulate a process where leaders learn to gather effective, respectful subordinate feedbackwithout becoming defensive._

While the Commandant adapts policy and doctrine through changes like MarineView360, leaders can support internal dialogue by finding new ways to cultivate feedback. One way to do this is to establish informal group sessions that solicit perspective on specific topics from a targeted group of subordinates (e.g., all squad leaders).[15] Subordinates are primed for the discussion and given time to reflect, discuss with peers, and

prepare for healthy dialogue. Sessions must include multiple participants, so subordinates are not isolated one-on-one with a senior leader as during typical counseling. These sessions' specific intent and non-attributional nature allow juniors to speak hard truths. Further, if done with frequency, followers will build trust in the emotional maturity of their leader to receive feedback and gain confidence to discuss more sensitive topics.[16] Another excellent way to gather feedback is to visit subordinates in their workspaces. Leaving the safety and power of their office puts leaders in a position of vulnerability, thus making followers more willing to speak candidly. Changing the setting gives the leader a different perspective, allows them to observe and listen, and avoids distractions common around a busy leader's workspace. In short, leaders must make themselves vulnerable and earn the trust of their subordinates to demonstrate a willingness to receive feedback. Over time, subordinates will reflect on their supervisor's actions and seek to mirror them with their own Marines.

A leader looking to develop a purposeful feedback loop must choose who, what, when, and how they enhance their self-awareness. For a company commander, this may mean pulling in trusted staff non-commissioned officers on a routine basis to understand the impact of specific command decisions. For a maintenance chief, asking for feedback may come on the underside of an armored truck working alongside a few junior Marines. One example of a poor feedback loop is a platoon commander asking his formation of Marines if anyone has a problem with him or his decision. This feedback loop is unspecific, appears rhetorical, has too wide an audience, and any response will likely put the leader on the defensive. As GEN McChrystal describes in *Team of Teams*, soliciting appropriate feedback frequently encourages all team members to speak more openly, communicate more freely, and react more quickly to complex environments.[17] This requires a leader to highlight areas where they need to expand their awareness and then seek out feedback from the appropriate audience to address it. When soliciting feedback, leaders must always hold space for subordinates' opinions and fight the urge to offer an immediate defense or they will silence the response.

Some leaders feel their overall control is jeopardized when they open themselves up to questions or feedback. Ironically, the opposite of this is often true. Supervisors who fail to communicate openly or listen often create subordinates who are equally opaque. Subordinates wary of their boss's response withhold or limit information flow, which reduces the leader's ability to influence. Like many leadership challenges, there are no one-size fits all solutions, only wisdom passed on by others. In the *Harvard Business Review,* keynote speaker and author Dr. David Burkus relates how, Alfred Sloan, then president of General Motors, dismissed meetings when consensus happened too quickly. He surmised that time would give dissidents the courage to step up.[18] Instead of seeing silent consensus as a sign of unity, self-aware leaders should recognize this as a potentially dangerous symptom of organizational groupthink or worse the suppression of conflicting opinions by an overbearing leader.

Leaders stand at the center of their unit's command climate; from this position, they model appropriate behavior for good or bad. If leaders want to create subordinates with initiative, they must demonstrate candor and embrace feedback. Soliciting feedback builds mutual trust, shared vision, and increases buy-in. These tenants are central to maneuver warfare and senior leaders must have the emotional maturity to receive critique to promote them. Their vulnerability is the catalyst for building an environment where subordinates develop exponentially. The Commandant's initiative significantly alters how the Marine Corps will formally gather feedback, now leaders of all ranks must decide if they are willing to hold up the mirror.

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Courtesy of the Marine Corps History Division, Historical Reference Branch

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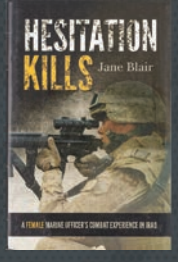

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We Don't Want You, Uncle Sam

Examining the military recruiting crisis with Generation Z

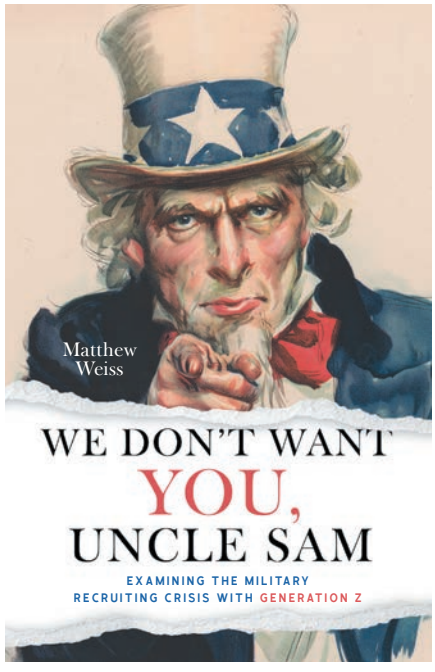
by 2ndLt Matthew Weiss

>2ndLt Weiss is a Signals Intelligence/Electronic Warfare Officer in the Marine Corps. He is currently deployed as the S-2 of the Coordination Element of Marine Rotational Force-Darwin in Australia. Previously, he worked in mergers and acquisitions at a cutting-edge defense technology company, Anduril Industries. He holds a Bachelor of Science and an Master of Business Administration from the Wharton School at the University of Pennsylvania. Most importantly, he is a member of Generation Z. He cares deeply about solving this issue of service and decided to write this book,* We Don't Want You, Uncle Sam*, to spread a crucial message.

I was born in 1998. As the very first members of our new generation took their initial breaths of life, the world was about to undergo a seismic economic shift. The babies born with me became Generation Z, or Gen Z, and together we are answering the question, *what do you do for a living*? very differently than in the past.

This statement is borne out by Gen Z's reaction to the time period we have developed in. We are too young to remember 9/11, and instead, we had our childhoods bookended with the Great Financial Crises and the COVID-19 pandemic. These large-scale, global events impacted nearly everyone in the world and shaped our fear today. McKinsey's American Opportunity Survey shows Gen Z's financial trepidation with nearly 23 percent of the ~25,000 respondents queried saying they do not expect ever to retire and only 41 percent ever hope to own a home.[1]

Recognizing that Gen Z views the world as being in an era of instability is of great importance to the uniformed Services because it greatly impacts how we should craft our recruiting. The delivered messaging must focus on putting control back into the hands of Gen Z'ers. Explaining that the military itself can be a way to make sense of this rapidly changing world is a start. The traditional barriers of the globe are now eviscerated with a generation that has been used to getting Wi-Fi and an iPhone at nearly the same time they grew out of diapers. These global moments combined with global technology make Gen Z desire for their work to be globally reaching. The Zoomer generation is one of *influencers* who can legitimately reach an audience of millions in seconds. They expect their work to do much the same. They care less about how their work betters themselves or helps them grow on the small or local level and much more about how their work is larger than any one individual.



We Don't Want You, Uncle Sam ***is a book written about the Generation Z recruiting crisis.*** ***(Photo provided by author.)***

This is significant for the Marine Corps because helping Gen Z'ers feel good about their answer to *what do you do for a living*? will have a dramatic effect on accessions. The way Americans respond to that question is very revealing of how they view their work. One seminal organizational behavior study on work categorizes people into three groups. Those that view what they do as a job, a career, or a calling.[2] Those who consider what they do to be a calling believe that their work is a crucial part of their identity.

With the onset of the COVID lockdowns and remote tasking, scores of employees quit their jobs and began questioning their relationship with work. Under the surface emerged a new trend that Harvard Professor Ranjay Gulati calls "the great rethink." Meaning trumps most other factors in determining how a Gen Z'er chooses a job. This generation feels it needs to have a calling that must be unique, more significant than the individual, and impactful.

Stanford Researcher Roberta Katz analyzed millions of snippets of Gen Z

online speech in a project called iGen Corpus. One of her main discoveries is that Gen Z emphasizes finding unique identities.[3] Verbiage is a crucial consideration here in defining a unique meaning. If someone is a doctor, while that is admirable and respectable in society, they are just one of the roughly million doctors in the United States.[4] One level above that is the neurosurgeon, an extremely rare and niche doctor, but still one of thousands. A calling, however, is usually a sentence, a string of words put together in a fundamentally differentiated way. Just like a mission statement in a military order, a calling usually has a why attached to it. An example would be, "I want to go into healthcare to protect the elderly from disease because my grandmother suffered tremendously from COVID." The generation cares less about the rigid doctor title and more about the destination, "I want to go into healthcare." Notably, they want to be able to say or post something to the larger society that scores them social standing.

To Gen Z, impactful work yields results that can be immediately observed. If someone wants to order a taxi, Uber has one within ten minutes. If someone wants to buy an item, Amazon will deliver it within two days. This "instant" economy makes the world seem like it is spinning faster. Interestingly, a study done during COVID captured this phenomenon.[5] Time expansion is that strange feeling many experienced but couldn't describe in lockdown where time either sped up or slowed down at abnormal rates. The study showed that younger participants were the most impacted by this perceived slowing down of time. Relating this to Gen Z's need for impactful work, they are not inclined to wait around to see results that may take ten years to mature. Gen Z wants their callings to produce immediate changes.

The challenge for the modern military is how to capitalize on Gen Z's desire to have a calling, not just a job. Unfortunately, an increasing gap is opening between military service and the perception of a calling. Recruiters are struggling to tap into innovative mental marketing to reunite what used to be obvious. Service used to be one of the highest-extolled virtues; arguably, nothing was more meaningful. Today, it is increasingly difficult to convince Zoomers that giving up rights and privileges to take on duties and responsibilities in uniform is the right path. Are Gen Z's new callings so out of touch with the traditional military? No, but the only people to enlighten future Gen Z recruits on how the military can help achieve their callings are those Gen Z'ers currently in the military. Only fellow Gen Z'ers actually understand this generation's deep quest for a calling.

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>Author's Note: The above was taken as an excerpt from the author's upcoming book this fall titled We Don't Want You, Uncle Sam: Examining The Military Recruiting Crisis With Generation Z.

USMC

Getting Serious About Training for Urban Operations

Focus on ranges and facilities

by Maj Robert Malcolm

"The battlefield will be highly complex and almost certainly decisive in urban areas ... In this world. Your world. You are going to have to optimize yourselves for urban combat, not rural combat. That has huge implications." [1]

—GEN Mark Milley, Chairman of the Joint Chiefs of Staff, 2022

Despite the quote and others like it from the U.S. military's most senior leaders asserting that the character of warfare in the near future is urban, there is little evidence that the Marine Corps or its sister Services are taking steps to optimize for urban combat. Preparations to meet the challenge of warfare in dense urban terrain must span doctrine, organization, training, material, leadership and education, personnel, and facilities, but this article will focus on training and facilities. It will use the Marine Corps' premier urban training venue, Range 220 at Marine Corps Air Ground Combat Center Twentynine Palms, to illustrate the problems, but make no mistake, urban training facilities Marine Corps-wide are inadequate to prepare Marines to survive and succeed in urban warfare.

At 300 acres (1.2 square kilometers) with over 1,500 structures, Range 220 is the largest and most impressive urban training facility in the United States. It may surprise readers, then, to assert that it is inadequate to prepare the Marine Corps for urban operations. In fact, Range 220 is not even truly urban.

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To understand these assertions, we need to first define the term urban. Doctrine provides us with one, as *MCTP 12-10B*, *Urban Operations*, defines the urban environment as comprising complex manmade physical terrain, a population of significant size and density, and supporting infrastructure.[2] This is often referred to as the urban triad.[3] Right away, we see that Range 220, as it exists in 2023, only replicates the manmade physical terrain. When resourced, such as during Service-level training exercises, it replicates a population, though not one of significant size and density. At present, the supporting infrastructure component is absent from Range 220. In the remainder of this article, we will examine Range 220 through the lens of the three components of the urban triad.

Uniquely Complex Terrain

When it comes to built-up manmade terrains such as buildings, streets, or bridges, Range 220 has a lot to offer that is not found almost anywhere else in the continental United States.[4] It was purpose-built to be large enough to be suitable for an MEB to train in.[5] It has a simulated, significant water feature. Different parts of the facility are meant to simulate different types of urban architecture both from a functional and a cultural aspect. It is composed mostly of converted shipping containers but does have several concrete buildings up to five stories tall, maintains a subterranean component, and is tied into the natural terrain, Hidalgo Mountain.

As impressive as the facility is, though, it does not present the challenge to battalion- and larger-sized maneuver that a real city does. To begin with, Range 220 is not nearly as dense or cluttered as real cities are. The streets are all made to be wide enough to allow

all our tactical ground vehicles to travel on them; real city streets are not. While there is debris in the facility, it is kept mostly out of the streets and does not impede movement; real debris in cities can be a significant obstacle on and off the streets. Real cities often have additional structures, temporary and permanent, in between buildings; these could be slums with makeshift shelters clogging the streets and alleyways or bazaar-like commercial structures in the streets. Oftentimes, these dense areas will be localized to distinct parts of a city, and planners will have to understand their effects on tempo, command and control (C2), and logistics. By contrast, the space in between buildings in Range 220 is almost uniformly open and devoid of obstacles to maneuver at the battalion and above echelons. The one part of the city that contains significant amounts of rubble—the district which is intentionally made to simulate a war-torn city—is the one that is least used.

Urban terrain is unique in that it consists of not just the surface but also sub-surface and super-surface man-made spaces. Every city has some sort of subterranean component (which may include habitable or inhabited space but may be merely part of the infrastructure) and buildings that rise above the surface. Both components present significant challenges to the maneuver, intelligence, fires, and C2 warfighting functions. Range 220 does have buildings with basements below the surface and even a few tunnels that connect parts of the city, but these are not sufficiently large and developed to give Marines a taste of what a challenge—and opportunity—the subterranean is in urban operations.[6] Likewise, Range 220 contains hundreds of buildings over two stories tall, but its tallest buildings are only five stories. These are insufficient to challenge the ground combat element to dominate much taller super-surface spaces, but it is also insufficient to challenge the aviation combat element. Clusters of tall buildings in real cities create what are referred to as urban canyons, as aircraft have to fly in between buildings and cannot simply stay above them at all times. Besides being extremely constrictive terrain for aircraft, these urban canyons frequently create micro-weather systems, with unpredictable wind patterns that affect aircraft handling.

Clutter and the three-dimensional aspects of terrain make the urban environment uniquely challenging, but what makes it truly complex is its constant reshaping and rearrangement by human activity. The entire Marine Corps could not move a mountain that was in its way, but it might only take a squad-sized element to topple a building, drop a bridge, or flood a city sector. During conflict, reshaping of the urban terrain may occur unintentionally as collateral damage but also intentionally as a means of attaining a military objective. Reshaping may be a result of the effects of munitions but can also be accomplished by mechanical means. For example, a time-tested technique of the Israeli Defense Force for urban operations is to avoid the streets and create movement corridors using their armored bulldozers. For obvious reasons, Range 220 is unable to recreate or even simulate these battlefield effects on urban terrain. Neither is any other urban training facility, but a way to do so needs to be found or else Marines are missing a key component of urban operations in their training.

Finally, as large as R220 is, it is still too small. Anthony King has recently outlined his argument that force size itself is a determining factor in the decisiveness of urban terrain in modern warfare.[7] Briefly, the army groups battling over Europe in World War II were so large that they could afford to isolate, bypass, or simply ignore cities. Modern states have only a fraction of the force size, and yet cities are larger and more numerous than in the last century. These forces lack the size and mass to be able to ignore cities. Range 220 is small enough that MAGTFs have the ability to encircle and isolate it; this is, unfortunately, not feasible with real cities.

The Urban Environment is Where the People Are

"Tasked with urban operations, soldiers think of buildings,"[8] wrote Ralph Peters. Understandably, we focus on the physical terrain of the urban environment. Yet, as we have seen, this is but one component of the urban triad. A group of buildings with no people is not urban. Range 220 alone is the former, but it has the potential to be the latter. At present, the only time Range 220 has a civilian presence is during Service Level Training Exer-

Range 220 aboard Marine Corps Air-Ground Combat Center Twentynine Palms, CA, creates a challenging, realistic training environment, but improvements are needed to better replicate the complexities of urban terrain. ***(Photo by LCpl Nathaniel Q. Hamilton.)***

cises, during which a combination of contracted civilians and military role players simulate the population of the town. However, with approximately 150 civilians, the town has a population density of only 125 people per km^2. A conservative estimate of a worldwide average population density in cities is 3000 people per km^2.[9] If only 10 percent of the population remains in the city during conflict (a very conservative estimate; 50 percent of Kyiv's population remained in the city during the initial phase of the 2022 Russian invasion), that still yields a population density of 300 people per km^2.

One thing is for certain—the FMF will not be able to avoid civilian populations in combat. Even in high-end peer conflict, there will be civilians present in cities. It is not as simple as evacuating cities prior to engaging in combat operations. No matter what the belligerents have done to try to get the civilian population out of a city, some will remain behind. Nor, as we have established, will conventional militaries be able to simply isolate and bypass cities to avoid civilian casualties. If a facility like Range 220 does not force Marines to understand how to operate in the urban environment with a civilian presence, then Marines will not be prepared for the realities of urban operations.

The City is an Organism

The final part of the urban triad is infrastructure. A city is not just buildings or even just buildings with people in them. It is also the means of movement throughout the city, the ways the people communicate with each other, and how they accommodate their basic needs. If a city is an organism, infrastructure is its nervous and circulatory systems. It includes transportation (public and private), utilities (electricity, fuel, water, sewer), and the portion of the electromagnetic spectrum which supports the functioning of the city.

Currently, Range 220 does not replicate the infrastructure of the city on a scale needed to support realistic training. Only a few buildings have electricity and none of them have plumbing, so the training audience is prevented from intentionally or unintentionally affecting them. There is no sewer system, a common part of the subterranean level of the city which can be exploited by the attacker or the defender. The flow of civilians from home to work to commercial areas and back in the course of a day is not replicated, and so unit staffs do not have to understand and account for it. In fact, there is no civilian vehicle traffic at all in Range 220 during Service Level Training Exercises. Recently, Tactical Training and Exercise Control Group's Signals Intelligence/Electronic Warfare shop has begun generating some civil electromagnetic noise, but not to the level of a real city, with radio, television, wireless internet, etc. This noise can be an obstacle but

also an opportunity; either way, it is a factor units will have to contend with in a real city that they are not currently forced to contend with in training.

Recommendations: What Should Our Urban Training Facilities Look Like?

Some of the fixes to the issues identified earlier are fairly simple. Installations can open contracts for role players to simulate civilian populations at their urban facilities. Those role players can be assigned specific dwelling places and workplaces and given vehicles to model the flow of traffic in the city. In lieu of making the facility as large as a real city, additional urban terrain could be represented virtually. Increasing the amount of electromagnetic noise can be accomplished with commercial off-the-shelf equipment. Additional rubble and debris can be acquired from construction sites and dropped off in between and around buildings. Additional openings can be made in the buildings and covered up with plywood to simulate dynamic breaches to allow ground forces to mousehole their way in between buildings.

Other fixes would require significant resources and effort to improve. Some streets can be narrowed so that they no longer easily accommodate larger tactical vehicles. Electricity and running water systems can be extended to more parts of the city so that training units can have a real impact on them. Where they already exist, subterranean levels can be expanded to include sewers, bomb shelters, or even public transportation systems in order to become significant terrain for the attacker and the defender.

The most difficult improvement to make is to give our urban training facilities the ability to replicate physical battlefield effects during training. Most urban training facilities that attempt to do this in realtime are restricted to remote-controlled systems that allow for a specific effect like a single wall collapsing or a mine or an improvised explosive device detonating on a road. These are suitable for lane training designed to replicate a very specific situation, but not for the free-play environment of force-on-force required to train commanders and staffs in the art of urban operations.[10] It is probably not feasible for every building in every urban training facility to be outfitted with a remote-controlled mechanical solution to replicate a variety of battlefield effects. The solution may lie in augmented reality systems that display battlefield effects on each individual Marine's heads-up display.

If that sounds far-fetched, think again. Augmented and virtual reality are already being leveraged by industry to make urban training more realistic and cost-effective. One United Kingdom-based company has already built multiple smart facilities for the British Army for urban training. These smart facilities are similar to the Infantry Immersion Trainers located on Camp Pendleton and Camp Lejeune in that they are contained in a warehouse, but inside, the walls can be rearranged to create an unlimited number of interior and exterior layouts. Soldiers training in the facility wear augmented reality headsets that allow the look of the urban terrain to be changed to resemble the architecture of different parts of the globe. Battlefield effects like cratering or holes in walls are also represented this way. Most impressively, enablers and supporting arms can be integrated into the training by networking simulators from multiple sites. For example, a scout sniper on a different installation can engage a target in the virtual world, and the infantry in the smart facility will be able to see the target go down through their headsets.

Making these improvements to our urban training venues and adopting augmented reality systems will no doubt take significant investments in time and money. Estimating the dollar amount is beyond the scope of this article, but the costs need to be kept in perspective. The initial construction of Range 220 cost approximately $50 million.[11] By contrast, a single F-35B costs approximately $130 million to procure and millions more in maintenance and upgrades over its life cycle.[12] Which one will have a greater impact on the Marine Corps' ability to fight and win the nation's war? The question should not be, *can the Marine Corps afford to make these improvements to its urban training facilities*, but *can the Marine Corps afford not to?*

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Back to the Future

How advance base Kwajalein may help INDOPACOM better compete with China

by LtCol Julian Tsukano

INDOPACOM has long sought to better compete with China through a range of military capabilities, with force posture a critical part of the overall INDOPACOM competition strategy. This article will first argue why the establishment of a new advanced base at Kwajalein Atoll using existing resources, in a location free from interference from host-nation challenges, is necessary. Secondly, though significant hurdles abound from China's grey-zone-basing strategy to bureaucratic processes, they can be overcome. Lastly, using Guam as a template, INDOPACOM can achieve meaningful support to the Joint Force through advanced bases. The threat from the People's Republic of China's (PRC) ballistic missile capabilities continues to limit options within the first island chain and requires INDOPACOM to approach Joint Force advance bases west of the International Date Line (IDL) from areas which the U.S. military can operate freely. Kwajalein Atoll is that location.

It is first important to define the advanced base for the purpose of this article. The DOD defines advance base within the *Tentative Manual on Expeditionary Advanced Base Operations* as "located in or near an operational area whose primary mission is to support military operations."[1] Within the context of the Indo-Pacific, advanced bases must be able to support combat operations over a great distance and have additional resources from which to generate combat power. Lastly, advanced bases outside of the Chinese missile's weapons engagement zone (WEZ) are ideal, as they permit U.S. forces greater freedom of maneuver.

China's Grey-Zone-Basing Strategy

China's aggressive approach presents challenging operational considerations and INDOPACOM must better compete with China. China's grey zone basing is focused on the local to national government, which directs military requirements into every construction project where applicable. According to the *2021 Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*, China went as far as "building military requirements into civilian infrastructure and leveraging civilian construction for military purposes."[2] The extent to which China has directed military requirements into domestic civilian infrastructure is unrivaled and includes all roads, ports, airports, rail lines, and communication networks. Additionally, China—through the One Belt One Road initiative—directed construction efforts in foreign countries to meet China's military design standards. China's military efforts within civilian infrastructure are known as the Military-Civil Fusion Development Strategy.

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... a new advanced base at Kwajalein Atoll ... is necessary.

The Military-Civil Fusion Development Strategy is most apparent in the pervasive Chinese construction efforts in the South China Sea. For example, China turned the once desolate shoal, Fiery Cross Reef, into a well-armed and defended military installation. According to a 2017 report from the Asia Maritime Transparency Initiative, "Fiery Cross saw the most construction over the course of 2017, with work on buildings covering 27 acres."[3] Construction at the Fiery Cross Reef includes a range of aviation, ground, naval, and defense facilities aimed at both force protection and projecting military power. China has long claimed that its efforts at Fiery Cross Reef are civilian in nature and not military. Regardless of Chinese claims, the focus on the Fiery Cross Reef and other islands demonstrates a determination to solidify its claims in the South China Sea.

China's grey-zone-basing efforts also include relationship-building with potential partners in the region. For example, China entered into an agreement with the Solomon Islands in 2021 to allow Chinese naval ships to dock and refit and briefly suspended all U.S.-flagged warships from the same right of access.[4] Chinese basing efforts have also included the Spratly Islands, where they have built installations across numerous features and reefs (see Appendix A). Concurrently, indications are that the U.S.-funded Ream Naval Base in Cambodia was demolished and U.S. assistance to rebuild was refused, leading observers to speculate that Cambodia may be working with China on redevelopment under the Belt and Road Initiative.[5]

Comparatively, INDOPACOM efforts have failed to compete with China's grey-zone-basing strategy, although good examples do exist. A majority of INDOPACOM basing efforts have been fractured, Service-specific, and

do not approach the comprehensive Joint Force strategy that the Chinese have embarked upon.

INDOPACOM'S String of Failures

INDOPACOM has made initial strides toward basing but has primarily focused on service and functional area requirements. For example, the ongoing runway improvements and aviation fuel storage construction at Tinian have received the bulk of INDOPACOM resources. Specifically, $109 million was allocated for principally Air Force requirements with no investment in strategic missile defense, naval port facilities, and critical logistics needs of the Joint Force concurrently, the Republic of Palau recently extended an invitation to the United States to build facilities for use by the U.S. military and the Republic of Palau.[6] The Palau airfield improvements promise to serve both the people of Palau and the U.S. military; however, joint requirements for force protection, logistics, and maneuver are missing. Compounding the lack of a Joint Force approach is Palau's location within China's WEZ, questioning the viability of such a location without adequate force protection. INDOPACOM has widely identified the need for additional advance bases throughout the region but is being pursued in a fragmented, Service-specific effort that has failed to keep pace with China's grey-zone-basing strategy and location within China's WEZ.

The commander of USINDOPACOM has acknowledged the importance of advanced bases in his prepared testimony before the Senate Armed Services Committee: "U.S. force posture is a warfighting advantage in USINDOPACOM's operational design. A force posture west of the IDL provides an in-depth defense that enables the Joint Force to decisively respond to contingencies across the region. More distributed combat power increases survivability, reduces risk, and enables the transition from defense to offense quickly should deterrence fail."[7] The need for advance bases west of the IDL has never been more acute and Guam is the prime example of a Joint Force advance base that accommodates most of the force protection, logistics, and maneuver requirements needed to support INDOPACOM.

Joint Base Guam

Guam has long served as an advanced base in support of the U.S. military in the Indo-Pacific. Guam's strategic location west of the IDL, standing as a U.S. territory, and Joint Force capabilities, reinforce its critical position within INDOPACOM. Most important to INDOPACOM are the unique force protection, logistics, and maneuver capabilities in Guam that serve as key considerations for which future advance bases should be considered. The comprehensive approach by INDOPACOM at Guam is an example that should be replicated at Kwajalein Atoll.

Force Protection

Guam currently is squarely within the range of China's conventional ballistic missile threat ranges from the DF-26 intermediate-range ballistic missiles, some anti-ship cruise missiles, and anti-ship ballistic missiles (see Appendix B) and requires immediate attention. The Pacific Deterrence Initiative, a congressionally directed DOD strategic funding policy, provided for survivability and infrastructure upgrades to Guam's force protection. The Pacific Deterrence Initiative initially set aside $118.3 million for cruise missile defense and later $892 million for a landbased Aegis ballistic missile defense system.[8] Guam's costly force protection requirements are necessary due to the lack of an existing comprehensive landbased ballistic/cruise missile defense system and location within China's WEZ. A future advanced base that is outside the range of most Chinese missile ranges and already possesses some form of missile defense capability will significantly lower costs and increase the survivability of the Joint Force.

Logistics

Guam is well poised to meet many of the Joint Force requirements within INDOPACOM, with a robust naval base able to handle a wide assortment of surface and subsurface naval vessels, a naval weapons magazine, sufficient fuel storage, and an airfield capable of supporting most of INDOPACOM aviation requirements. The advanced base at Guam possesses the type of logistics able to refuel, rearm, and provision maritime forces able to support INDOPACOM. Guam was recently tested during the initial period of the COVID-19 pandemic when the USS *Theodore Roosevelt* (CVN-71) conducted an unscheduled port visit in March 2020, sending thousands of sailors ashore in need of billeting, feeding, and medical care. Guam's robust logistical infrastructure is a decades-long investment effort to better support Joint Force operations. Advanced bases, like Kwajalein Atoll, that already possess robust logistical infrastructure like Guam will support INDOPACOM and better compete with China.

Maneuver

U.S. military presence in Guam is a model for how INDOPACOM can better approach advanced bases throughout the Indo-Pacific. Guam is home to Andersen Air Force Base, Naval Base Guam, and Marine Corps Base Camp Blaz all supporting critical Joint Force and unique Service requirements. Sufficient training and staging areas are found on the island that can support everything from amphibious exercises to aerial bombing. Additionally, as a U.S. territory, Guam is free from the type of diplomatic challenges that have frequently made operations in other combatant theaters difficult to stage. The selection of an advanced base, free from foreign interference, like Guam, will be critical to the basing of military capabilities in support of INDOPACOM.

Guam is host to unique capabilities such as B-2 strategic bombers, Submarine Squadron 15, and the Navy's only submarine tenders. Guam is also host to key command and control enabling capabilities such as Naval Communications Unit Guam and Helicopter Squadron Twenty-five. Importantly, the (Military Sealift Command) Ship Support Unit enables strategic pre-positioning of key equipment in support of contingency operations. The strategic resources garrisoned in Guam generate

significant combat power and support to INDOPACOM.

Guam is frequently declared the top defense priority and the former commander of INDOPACOM, ADM Richardson highlighted this by stating, "It is our most critical operating location west of the International Dateline."[9] The U.S military base in Guam serves as a prime example of how INDOPACOM can better approach advance bases, one that supports force protection, logistical support to forces, and serve within the operations area. There is wide acknowledgment of Guam's importance to national security, its unique capabilities make it a target of increasingly capable Chinese missile technology.[10] INDOPACOM must identify adjacent facilities from which the Joint Force can operate that possess existing force protection infrastructure, logistics capabilities, and the potential to host a range of maneuver units. Kwajalein Atoll should be the focus of INDOPACOM's future advanced base locations in the event Guam were to become untenable.

Kwajalein Atoll

Seven Hundred and 30 miles south of Wake Island, 1,590 miles east of Guam, and 3,400 miles from mainland China is the island of Kwajalein. Used by the U.S. military during World War II, Kwajalein is currently serving as a U.S. military ballistic missile defense site. In 1986, the United States entered the Compact of Free Association with the Federated States of Micronesia and the Republic of the Marshall Islands.[11] This agreement outlined the U.S. defense responsibilities and rights at Kwajalein Atoll, which provide the necessary legal structure to transition the facility from a purely ballistic missile defense site to an advanced base in support of INDOPACOM. Kwajalein maintains significant advantages in the form of force protection, logistics, and maneuver that make this location an ideal facility to expand INDOPACOM forward basing in the region.

Force Protection

Kwajalein Atoll sits outside of most of the Chinese anti-ship cruise missile and anti-ship ballistic missile threat rings (see Appendix B). This standoff distance will reduce the risk of hosting warships, like carrier groups and nuclear submarines, that need to rearm and resupply. The limitations presented by the greater distance give Kwajalein's missile defense systems a better chance of disrupting or neutralizing China's longer-range missile capabilities in the event of an attack. Kwajalein already serves as a test site for the U.S. Missile Defense Agency with most requirements in place. Transitioning to a live-ballistic missile defense system for the Kwajalein Atoll is possible as many of the support requirements are already in place.

Kwajalein is home to space-based surveillance capabilities and maintains a robust communications and detection architecture used by Missile Defense Agency to simulate ballistic and hypersonic missile attacks in and around its waters and airspace. Transitioning to a live-ballistic defense site is both feasible and practical as all the tracking and kill-vehicle assets are already in place. Lastly, Kwajalein's current population of 100 percent U.S. military and support personnel permits greater freedom of action in the event of hostilities with China given the lower risk to civilians and non-combatants.

Logistics

Kwajalein's integration with multiple defense agencies has fostered an efficient logistics capability at the facility that can support the Joint Force. Kwajalein Atoll maintains a 6,600-foot-long runway that can support strategic airlift platforms and a minor port facility with mooring that is sufficient to receive U.S. Navy logistics and surface combatant platforms. Kwajalein was the site of a $139-million-dollar construction project to improve runway lighting, waterways, taxiways, and navigation systems across the atoll.[12] Additionally, Kwajalein maintains laydown facilities with ramp space capable of storing military stores, fuel, and other logistical requirements at sufficient levels and quantities, which are necessary to resupply a naval and ground force. Kwajalein's facilities receive aircraft from across the U.S. military and frequently serve as a mid-Pacific refueling stop for forces in the region. Kwajalein's receipt of ongoing investment from the DOD and other civilian agencies has improved its standing as a viable logistics base and should be leveraged by INDOPACOM.

Kwajalein is under the control of U.S. Army Garrison Kwajalein Atoll and is known as a government-owned, contractor-managed installation. Many of the life support functions for the

Figure 1. Kwajalein Atoll, Republic of Marshall Islands. *(Photograph by* **WorldView-2 Satellite, DigitalGlobe, Inc., Maxar Technologies 2021 Inc.***)*

approximately 1,300 residents are run by contractors. This includes the vitally important hospital, billeting, water purification, and sanitation facilities. INDOPACOM must expand the hospital facilities to support trauma patients typical during wartime as well as billeting for a ground force. Further investment by INDOPACOM into port terminal facilities like cranes, roll-on/roll-off ramps ramp, and fuel terminals to support larger warships will significantly enhance the ability for Kwajalein to serve as an advanced base in support of the Joint Force.

Maneuver

Kwajalein's distance from most Chinese missile threats, the robust missile defense architecture in place, and the foundation for capable logistics infrastructure make Kwajalein uniquely suited to support a joint maneuver force. Critical to advance base operations is the ability to generate and maintain combat power. Kwajalein can accomplish this by safely hosting maintenance and support activities that can conduct limited repairs to ships and aircraft.

Additionally, Kwajalein can host key operational headquarters for various service components leveraging the robust communications, intelligence, and information architecture available on the atoll. This architecture will enable a Joint Force headquarters to reliably operate with sufficient battlespace awareness to command-and-control expeditionary advanced base sites beyond the advanced base at Kwajalein. Comparatively, Kwajalein Atoll can serve as a component headquarters in much the same way that Bahrain currently serves as the Navy's Fifth Fleet headquarters. The small footprint of the advance base at Naval Support Activity Bahrain, which sits at 145 acres compared to 760 acres for Kwajalein, hosts critical task force headquarters for surface and subsurface elements. Additionally, Naval Support Activity Bahrain also hosts a combined and joint maritime headquarters with representatives from numerous partners across the region. Kwajalein Atoll has the capability to serve as a critical headquarters for regional partners and allies within the INDOPACFIC without the challenging diplomatic hurdles that basing may require in other nations outside of the United States.

Kwajalein also has the capability of hosting a wide range of strategic assets to support Joint Force operations. Aircraft like the E-3 Airborne Warning and Control System, KC-10 aerial tanker, C-17 and C-5 cargo aircraft, and other strategic assets could easily operate from an advanced base at Kwajalein—safe from cruise and ballistic missile threats. Additionally, critical command-and-control ships like the Blue Ridge-class amphibious command ships could operate from Kwajalein, enabling maritime and amphibious operations in support of INDOPACOM.

As an adjacent facility to existing advance bases, particularly Guam, Kwajalein Atoll is the top choice amongst bases that possess force protection as well as logistical and maneuver force considerations. INDOPACOM requires alternatives to Guam and Okinawa, where they are within the Chinese WEZ. Though not without risk, Kwajalein is a top choice.

INDOPACOM requires alternatives to Guam and Okinawa, where they are within the Chinese WEZ. Though not without risk, Kwajalein is a top choice.

Risks

There are serious risks to such an effort that could spark the very conflict we desire to avoid, but they can be mitigated. In his article, "Military Build-up in the East China Sea and the Spark for Conflict," Maj Dylan Buck describes the ongoing risks of increasing U.S. presence in the INDOPACIFIC, describing how Navy ships have increasingly had to alter course to avoid collisions in the South China Sea due to increasing Chinese harassment.[13] Increased presence in the Indo-Pacific, Maj Buck argues, will only increase the risk of miscalculation. To mitigate this risk, INDOPACOM should establish a *hotline phone* between INDOPACOM and the Chinese equivalent. This hotline is not without precedent: in Syria, U.S. forces have a direct communications line with Russian forces to mitigate accidental contact between forces. The success of the Syrian hotline has now been expanded to include another hotline for the Russian and Ukraine conflict.[14] Such a hotline will do much to reduce the chances of miscalculation that repositioning U.S. forces to Kwajalein would create.

Time has played a significant role in improving installations and overall force posture. DOD has implemented a new system to manage installations that seeks to address priorities and threats in the two-five-year period and beyond.[15] A 30 November 2006 Secretary of Defense memorandum guided the establishment of a Global Posture Executive Council (GPEC). GPEC considers the whole-of-government approach to U.S. installations and includes notification/approval from Congress, budgetary support, and a range of legal reviews by multiple federal agencies and departments. The result has been an untenable delay to combatant commander initiative to move forces to new basing locations, such as Kwajalein. Under the best of circumstances, the GPEC process will turn the repositioning of forces into a multi-year effort. To counteract this process, a new Secretary of Defense policy relieves INDOPACOM of this bureaucratic process and establishes a separate funding, legal, and agency overview that speeds the process to a twelve-month timeline in concert with our national defense priorities. The suspension of the GPEC will support the rapid establishment of a new advanced base in support of INDOPACOM.

Conclusion

Integral to the national defense in INDOPACOM is a comprehensive ap-

proach to advance bases from a Joint Force perspective. INDOPACOM faces a difficult basing environment that is complicated by domestic fiscal restraints, significant distances between established advance bases, complex host-nation agreements, and complicated U.S. government policies. The establishment of a new advanced base at Kwajalein Atoll using existing resources while in a location free from significant interference from host-nation political environments is necessary. There are significant hurdles within the DOD ahead but they are mostly bureaucratic processes that can be overcome. Using the critically important base at Guam as a template, minor upgrades to the facilities at Kwajalein can rapidly achieve meaningful support to the Joint Force. Additionally, Kwajalein's transition from a Missile Defense Agency test site to an active missile defense site will prove to be challenging, but given the infrastructure currently in place, should be overcome. The threat from PRC ballistic missile capabilities continues to limit options within the first island chain and therefore requires INDOPACOM to approach Joint Force advance bases west of the IDL from areas in which the U.S. military can operate freely. Kwajalein Atoll is that location.

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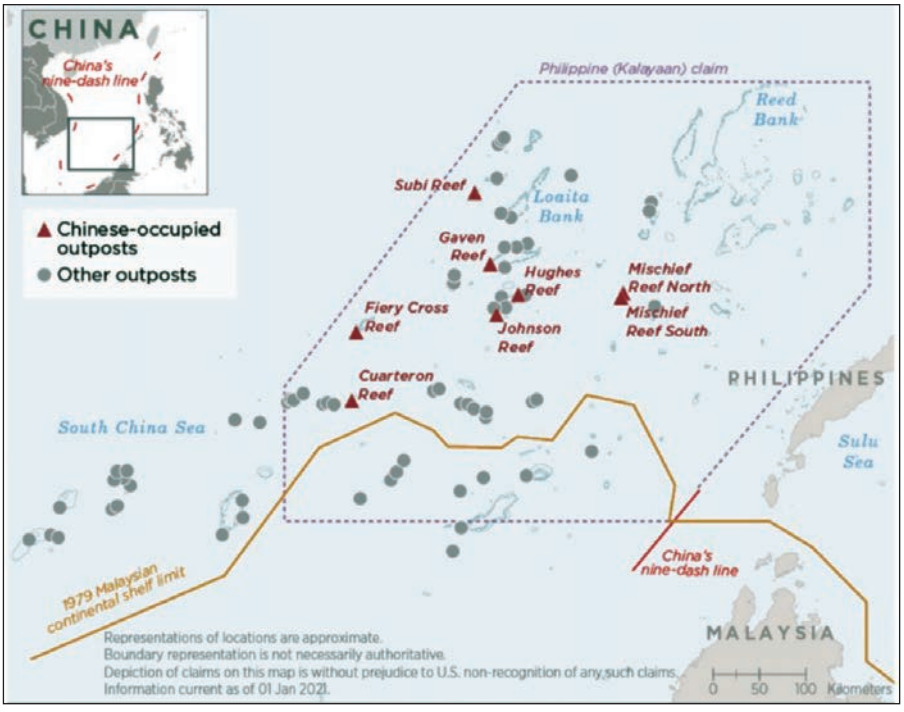
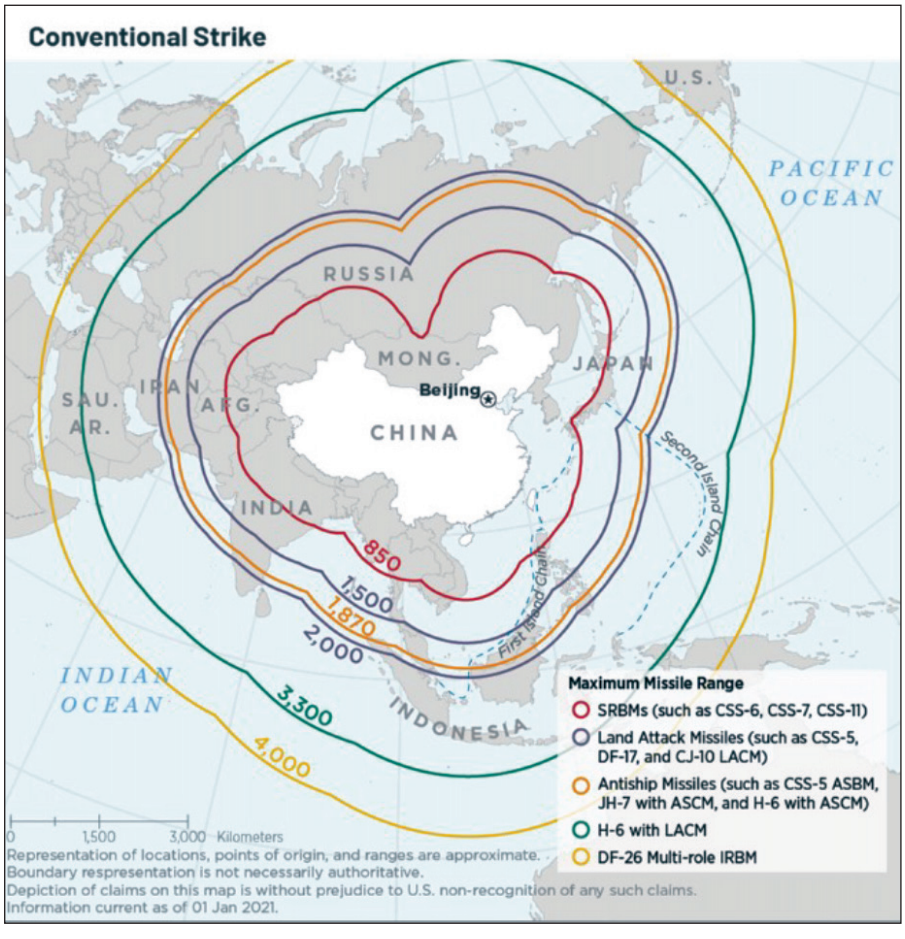


Appendix A. Spratly outpost. ***(Appendix provided by author.)***



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>Author's Note: The contents of this article reflect the author's own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

The Arms Room Concept

How multi-disciplinary Marines provide maximum flexibility to a distributed force

by Capt Devon Sanderfield

The character of war is changing, and the Commandant has taken ambitious steps to redesign the force to confront a capable adversary in the Pacific. One of the most contentious aspects of the Commandant's *Force Design* initiative is the Arms Room Concept. Under this concept, the Marine Corps infantry would transition away from some specifically defined MOSs to a force that leverages a multi-disciplinary Marine capable of employing a variety of different weapons systems on the battlefield. Responding to a question about the Arms Room Concept, BGen Watson, Commanding Gen Marine Corps Warfighting Lab said, "So the arms room means that you would have a sort of an armory of many different systems, and your Marines would be trained in all of them, and then you pick the weapons suited to the mission ... as opposed to having single-threat Marines who are only experts at one system."[1] As a company commander of Alpha Company 1/2 Mar, an experimental *Force Design 2030* rifle company, my team and I have been on the forefront of creating multi-disciplinary Marines utilizing the Arms Room Concept over the last eighteen months. This period has resulted in many lessons learned and recommendations on how infantry battalions can overcome systematic shortfalls and effectively implement the Arms Room Concept going forward. With additional investments of time, resources, and an adjusted approach to enlisted infantry schooling, infantry battalions can employ multi-disciplinary Marines to provide maximum flexibility on a chaotic and distributed battlefield.

The push towards the development of the multi-disciplinary Marine is not one of desire, but one of necessity. Static positions and massed formations are terribly easy to find and target, especially against an adversary like Russia and China who possess a robust suite of sensors and persistent ISR capabilities. However, as this technology continues to develop and spread, it is no longer just the major power players who possess the ability to leverage space-based ISR platforms and unmanned-aerial systems to hunt their adversaries. These systems, coupled with precision-guided missiles, long-range rockets, and cheap loitering over-the-horizon suicide drones will force military formations to become smaller and more dispersed to survive. Operating within this type of environment makes it no longer tenable to train Marines to become experts at one singular weapons system. As formations operate further away from their higher headquarters, small units will be required to possess a multitude of assets, weaponry, and capability sets.

The common question that comes up when discussing the creation of multi-disciplinary Marines is which weapons systems should encompass the arms room and which capabilities will require a Marine with a specific MOS. While training every Marine to become proficient and qualified in every weapons system is desirable, it is unrealistic in application. Within Alpha Company's *Force Design* structure, specialty-trained Marines and weapons traditionally held at the battalion level, such as Javelin missiles, heavy machine-guns, mortars, and loitering munitions, have been transferred from what was previously weapons company to the company's hunter killer platoon. These complex weapons systems require Marines with advanced-level training and were not included in our training to create multi-disciplinary Marines.

>Capt Sanderfield is currently serving as the Operations Officer for 1/2 Mar. He was the Company Commander for Alpha Company, the experimental* Force Design 2030 *company from July 2021 to April 2023.

What Does the Arms Room Concept Provide the Service?

Flexible/adaptive force

A leading benefit of the Arms Room Concept has been the flexibility it has provided the company. As the 2nd MarDiv Experimental Force Design rifle company within 1/2 Mar, the company had the privilege of executing a series of difficult experimental training exercises across the United States. These exercises were designed to push the limits of an infantry company, employing advanced sensors and weaponry within exercise scenarios for the company to distances exceeding 50 kilometers from the rest of the battalion. In each of these instances, the company's platoons and squads were distributed another five-ten kilometers to accomplish independent tasks assigned by the company commander. Upon insertion of the company into the exercise operational area frequently dominated by adversary sensors and anti-air missile systems, there was virtually no ability to adjust or reallocate key assets or crew-served weapons across formations. Doing so would require the use of already limited transportation platforms and would expose the force to the risk of detection and subsequent targeting.

Alpha Company's employment of multi-disciplinary Marines and access to previously held battalion-level assets at the company level were key components that enabled success in a

An 03XX employs his grenade launcher against enemy targets during a force design exercise. ***(Photo DVIDs.)***

distributed operating environment. By having medium machineguns, rockets, long-range precision rifles, and recoilless rifles within each platoon, platoon commanders and squad leaders have the unique ability to custom tailor their table of equipment to provide a mission-ready force to accomplish the task assigned. For the platoons and squads within Alpha Company, this has at times resulted in one squad carrying multiple medium machineguns and rocket systems while another is operating with a much lighter footprint carrying only their primary service rifle into the fight. Only by training Marines on every weapons system could these custom-tailored units have the flexibility required to be successful in a distributed fight against a capable adversary while simultaneously possessing the firepower required to mass when necessary.

Redundancy

Redundancy is another beneficial aspect of the Arms Room Concept. If the Marine who is typically responsible for employing the medium machinegun or Carl Gustav recoilless rifle is incapacitated, there is a squad's worth of Marines who can pick it up and employ it effectively in the fight. This occurred during several of our exercises and will undoubtedly happen in the next big conflict. While the most common example included a simulated casualty for the Marine carrying a specific weapons system, there were other instances where a Marine became ill or was simply needed to execute some other task. By having this redundancy, the unit never lost the capability that the weapons system provided because there was a ready bench of capable Marines who could pick up and employ that weapons system in the fight effectively.

Redundancy is another beneficial aspect of the Arms Room Concept.

Redundant capabilities have additional benefits beyond providing a company with a strong bench of utility players. It provides the option to weigh units in a way that was not previously possible. By having thirteen Marines who are trained to employ the medium machinegun or recoilless rifle within a squad, a company commander has the option to weigh that unit with additional weapons to allow for the accomplishment of a task such as an attack by fire or support by fire. The availability of these options has undoubtedly made the unit a more capable, flexible, and deadly force.

It is important to note that although redundancy means that a squad could theoretically hand a medium machinegun, grenade launcher, or recoilless rifle to any Marine within the squad to effectively employ, naturally the proficiency levels amongst the Marines will vary. We have addressed this by striving to train all Marines to be incidental operators with each of the weapons within the Arms Room. This means mandatory, across-the-board cross-training built into the training schedule to ensure every Marine can at least pick up a weapon, load it properly, conduct appropriate misfire procedures, and manipulate a machinegun's traversing and elevation mechanism or a recoilless rifle's sight system to engage various targets on the battlefield.

Enhances Integration

A point often used to argue against the Arms Room Concept is that there is no requirement to have these weapons capabilities organic to the rifle platoons and squads, for they can be attached by the company if required. While this argument is true on the surface, it overlooks the significant benefit of having Marines with those capabilities organic to each small unit. By platoons having access to the weapons and Marines during training, they will be best postured to accurately understand their capabilities, limitations, and how to best employ them on the battlefield. The valuable trust built through time and repetitions

cannot be replicated with an attachment that may or may not have worked with the unit before. Instead of receiving an attachment whose true physical capability and overall proficiency are unknown and largely assumed, the Marines are already an organic part of that small unit. Under the new construct that employs multi-disciplinary Marines, a single rifle platoon can serve as a heavy support-by-fire element complete with a full complement of machineguns while also providing organic internal security. Previously, this same task would require several attachments from outside the platoon to accomplish. Now, each platoon commander and squad leader have the capabilities required within their units with their multi-disciplinary Marines.

To continue to train multi-disciplinary Marines under this resource constraint, infantry companies will need to maximize the use of technology and simulators.

Recommendations

The implementation of the Arms Room Concept provides the Marine Corps infantry with a much more capable, lethal, and flexible force, but it does come at a significant cost. To create highly proficient multi-disciplinary Marines, the Marine Corps will have to adjust the way we man, train, and equip future infantry formations. Below are some recommendations for how infantry company commanders can approach this issue to support its implementation and future use across every infantry battalion.

Building Capabilities Incrementally

Training all Marines within an infantry rifle squad to effectively employ every weapons system available does take an extraordinary amount of time and energy. That said, it is achievable if you take an incremental approach to building capabilities over time. Those who typically push back on the concept will point out that it is impossible for every Marine to have the same level of proficiency as a current machine gunner who has years of fleet experience and advanced-level training. However, the goal of the Arms Room Concept is not to blindly hand weapons to any Marine in your formation and expect the same results. Instead, the goal is to create highly lethal teams made up of multi-disciplinary Marines who can perform a laundry list of tasks and employ a variety of weapons systems. With a future operating environment characterized by contested airspace and severe distribution of maneuvering forces, Marine Corps units cannot afford to fill a critical seat on any insert helicopter with someone who can only carry out one singular task or employ one specific weapon.

Critics of the Arms Room Concept express concern about losing a level of technical proficiency by moving away from designated Marines who employ some of these weapons in the previous, legacy construct. Although a valid concern, the argument tends to exaggerate the complexity of certain weapons while also ignoring that the Marine Corps has long trained Marines to employ multiple weapons systems. Combat engineers and artillerymen each cross-train Marines to employ machineguns for localized security. Even within the infantry, squads for decades trained traditional riflemen to employ the M249 squad automatic weapon, a light machinegun organic within each fire team. Marines carrying this machinegun achieved much success in combat operations in Iraq and Afghanistan before the Corps transitioned to the current service rifle.

To accomplish our goal of incrementally creating multi-functional Marines who can employ each weapons system in the Arms Room Concept, Alpha Company started by selecting the most common weapons systems the squad would likely use on the battlefield. These included the Infantry Automatic Rifle, the M320 grenade launcher, Carl Gustav recoilless rifle, and the M240 medium machinegun. With the agreed-upon understanding that it would take a large amount of time and ammunition for all Marines to become experts on each of these weapons, we started by qualifying every Marine on the basics, such as the ability to load, unload, and conduct misfire procedures for each weapon. As each Marine effectively demonstrated the ability to conduct these incidental-operator-level tasks, they were classified *as qualified* Marines capable of employing this weapons system if required. As each Marine trained to become qualified, small-unit leaders identified top performers who were evaluated in employing that weapon on a live-fire range. Those who were successful in this evaluation were designated as certified on that weapon and could now fire that weapon system in support of a maneuvering friendly element. Over the course of the predeployment workup, the company was able to *qualify* nearly every Marine in the rifle platoons on each weapon system while also building an impressive number of *certified* Marines who were the first ones within that unit to employ the weapon if the requirement was identified during planning.

Use of Simulators to Build Proficiency

Certifying every Marine on each weapon within the Arms Room Concept would require a massive increase in the amount of ammunition typically available to each infantry battalion. To continue to train multi-disciplinary Marines under this resource constraint, infantry companies will need to maximize the use of technology and simulators. The Marine Corps has made great strides over the years to ensure Marines have access to realistic simulators to train and build proficiency, and these systems will only get better as technology improves and becomes cheaper to replicate. Currently, every base installation has an Indoor Simulated Marksmanship Trainer (ISMT) available for units to schedule and use for training. Although Alpha Company did lever-

age these systems to a limited degree, this is admittedly a resource we should have used more. Company commanders should embrace the use of available simulators and incorporate them into their weekly training schedules to build individual weapons capabilities without expending the limited ammunition available.

Although the ISMT is a valuable resource for training Marines, there are currently several limitations associated with these systems. First, the limited number of simulators available on each installation will be insufficient to support every infantry battalion as they each transition to the Arms Room Concept. Either the current ISMTs will need to expand, or additional facilities will need to be constructed to meet the increasing demand. There will also need to be an expansion of weapon systems available within the current ISMTs to ensure they encompass the M320 and Carl Gustav, critical weapons within the arms room. Another option could be the investment in an ISMT type similar within each infantry battalion's office space. While this would require significant initial investment and continued attention to keep them working and operational, the benefits would be well worth the cost. 1/2 Mar has seen the benefit of having an in-house simulator first-hand. Within a battalion command post, there is a dedicated training room with multiple Javelin and TOW missile simulators. Utilizing these training aids does not require an extensive request process or deconflicting with dozens of other units across the base. As a result, the company and battalion have been able to sustain proficiency with these weapons systems while building an impressive number of incidental operators despite not receiving the necessary number of missiles to train effectively. With additional investment in the access and quality of simulators, infantry units can overcome the limited availability of live ammunition and develop a capable unit of multi-disciplinary Marines.

Leverage/Create Subject-Matter Experts

The Arms Room Concept and the creation of multi-disciplinary Marines within infantry battalions are only possible through the possession of unit internal instructors and subject-matter experts to train Marines on the technical proficiency necessary to employ various weapon systems. Alpha Company, 1/2 Mar has been fortunate in this area. To achieve the task organization in the company that included an increased rank requirement, the rifle squads were built from Marines from every infantry MOS. This was particularly important at the small-unit leader level. Each squad was comprised of staff sergeant squad leaders, sergeant team leaders, and several junior NCOs who were school-trained machine gunners, mortarmen, and anti-armor Marines. The presence of this diverse set of skill sets allowed the company to leverage these warriors to develop a team of multi-disciplinary Marines within each rifle platoon.

To meet the challenge of a future fight against a ... peer adversary, the Marine Corps infantry will need to transition ... to a more capable and flexible team of multi-disciplinary Marines ...

As infantry battalions adopt the Arms Room Concept and explore ways to replace the different specialty MOSs into a consolidated all-encompassing 03XX MOS, the Marine Corps must ensure units have access to a bullpen of school-trained instructors to fill this critical role. Until the Advanced School of Infantry redesigns its infantry school pipeline to meet this new challenge, infantry battalions must continue to leverage courses such as Advanced Machine Gunners Course, Advanced Anti-Tank Missile Gunner Course, and Infantry Unit Leaders Course. Marines returning from these courses will have the technical proficiency necessary to help develop and train the other Marines in their platoons. In addition to maximizing the use of these current advanced schools to train Marines and build a cadre of capable instructors, each infantry division needs to play a part by crafting division schools that help units achieve the goal of creating multi-disciplinary Marines across their formations.

Warfare is experiencing a technological revolution where precision-guided munitions and unmanned systems will continue to proliferate and dominate the future battlefield. To meet the challenge of a future fight against a smart and capable near-peer or peer adversary, the Marine Corps infantry will need to transition away from a force of single-threat Marines to a more capable and flexible team of multi-disciplinary Marines capable of employing a variety of different weapons available within the unit's armory. While Alpha Company 1/2 Mar has made a tremendous number of mistakes along the way and certainly does not have all the answers, our experience on the cutting edge of *Force Design 2030* experimentation for the past eighteen months has informed us of the benefits of Arms Room Concept and the necessity of multi-disciplinary Marines within the infantry. With additional investments of time, resources, and an adjusted approach to enlisted infantry schooling, infantry battalions can employ multi-disciplinary Marines to provide maximum flexibility on a chaotic and distributed battlefield.

Notes

1. Megan Eckstein, "Marines Update Force Design 2030 After a Year of Experimentation in the Field," *United States Naval Institute News*, April 26, 2021, https://news.usni.org/2021/04/26/marines-update-force-design-2030-after-a-year-of-experimentation-in-the-field.

Dirt Bike Reconnaissance

Considerations and concepts for employment

by Capt Michael Van Liew

The Marine Corps' *Force Design* effort renewed its focus on the Indo-Pacific. As the Service explores littoral reconnaissance and counterreconnaissance concepts, there is an opportunity to experiment with enhanced mobility support. Dirt bikes, an off-road subcategory of a motorcycle, serving in a mobile reconnaissance role are currently being employed with ongoing refinement. They provide an opportunity to gain an advantage in a complex operating environment that demands effective reconnaissance across the competition continuum and in environments with restricted mobility, such as the dense urban areas and jungles of the Indo-Pacific. Furthermore, dirt bikes add versatility to a family of reconnaissance platforms that can be task-organized and tailored to the situation. This article shares and explains dirt bike considerations and concepts for employment in support of reconnaissance operations.

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Historical Context

The application of motorcycles, and later dirt bikes, to support reconnaissance operations has been proven throughout history. Motorcycles have been used by militaries for over a hundred years, typically in a reconnaissance or courier role. Motorcycles were used to mount machineguns in 1916 during the Mexican Expedition to capture Pancho Villa.[1] During this expedition, the president of Harley-Davidson recommended shortened enlistments for competent motorcycle riders because of the difficulty in training and sustaining the skill level required for motorcycle employment.[2] World War I saw the widespread use of motorcycles for scouting and reconnaissance by the Army as they provided an effective alternative to horse cavalry. The Marine Corps acquired motorcycles in 1916 and used them for police, messenger, and convoy duties throughout the world until the beginning of World War II.[3]

During the interwar years, 1919–1939, the American, German, British, French, and Soviet militaries each integrated motorcycles into reconnaissance formations to various degrees as traditional horse cavalry was phased out. Motorcycles were often included in units composed of different vehicle types, such as the British Divisional Mechanized Cavalry Regiment, which contained 3 squadrons of 6 light tanks and 12 armored personnel carriers each, and a troop of 41 motorcycles within the headquarters.[4] These formations attempted to achieve *combined arms reconnaissance.* By employing task-organized, mixed-vehicle teams, the complementary capabilities ideally created a dilemma for the opposing force in concealing itself. During the early years of World War II, the Germans effectively integrated motorcycles into combined mechanized and motorized reconnaissance operations to create the tempo that led to their early success. For example, German motorcycle infantry battalions in France were used as division advance guards. However, German reconnaissance units began receiving heavy casualties during longer campaigns. Motorcycles were eventually phased out and replaced by armored personnel carriers that provided more survivability and firepower.[5] The U.S. and Soviet armies also maintained motorcycles as an integrated part of their reconnaissance formations during the war. However, by 1943, the more capable Jeep had superseded the motorcycle in the U.S. Army and Marine Corps, even though the Jeep was criticized for the lack of survivability it provided.[6]

From 1945–1992, the expansion of mechanized formations, improved communications, and the employment of helicopters greatly changed the way reconnaissance was achieved to support ground operations. Many militaries phased out motorcycles after World War II. The Soviet Army continued to retain motorcycles in reconnaissance companies alongside the BRDM scout vehicle due to their emphasis on these units being used exclusively for reconnaissance—only fighting when necessary or when there was a distinct advantage. However, motorcycles were eventually superseded by the BRDM for long-range reconnaissance and used for "courier-type duties."[7] The preference for armored reconnaissance vehicles over light-skinned reconnaissance vehicles was a trend observed throughout the Cold War, as militaries favored vehicles

The application of motorcycles, and later dirt bikes, to support reconnaissance operations has been proven throughout history.

with longer endurance, heavy weapons, and armor for increased survivability in conducting reconnaissance. This preference was driven by observations that saw light-skinned vehicles take heavy casualties and by the Cold War buildup of armor and mechanized units caused by the security dilemma.[8] During the Cold War, the dirt bike became the preferred motorcycle for employment due to its off-road driving capability. The Marine Corps got rid of all its motorcycles at the end of World War II, only to test and acquire dirt bikes in 1977 and 1985, respectively, for reconnaissance and courier duties.[9] As the Cold War neared its end, the Army began reintegrating motorcycle reconnaissance into cavalry-type formations. However, the reintegration was limited by the lack of a codified program to include formalized tactical training and maintenance plans.[10] The Army and Marine Corps operated with a small number of motorcycle scouts during the Persian Gulf War as a flexible reconnaissance and courier option; however, the bikes were never officially added to the Army's inventory and sustained only temporary fielding in the Marine Corps.[11]

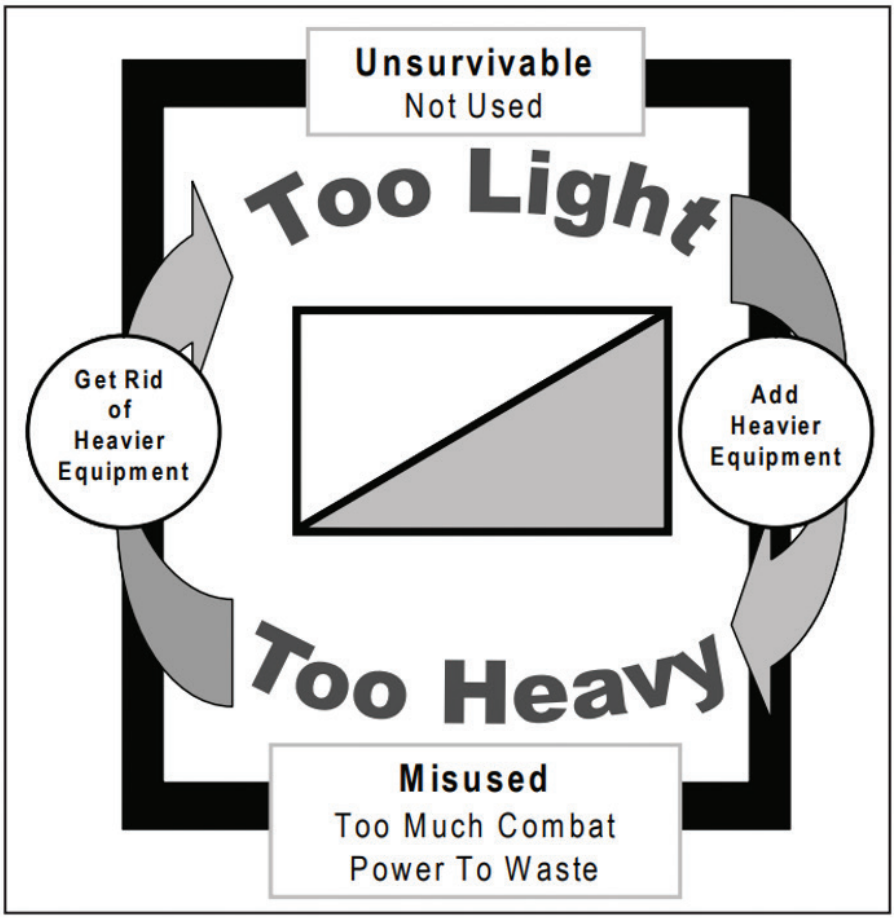
Dirt bike reconnaissance has proved effective in small wars as a light reconnaissance asset. This statement contradicts the 1940 *Small Wars Manual,* which states, "Motorcycles ... are of very little value in small wars."[12] Motorcycles in 1940 were not made for off-road travel and weighed two to three times more than modern dirt bikes. When faced with an adversary that had superior ground mobility in the Afghanistan and Iraq Wars, "The U.S. military strayed away from light tactical mobility and adopted heavier, slower, and less maneuverable vehicles; they traded mobility for a defensive capability and mind-set."[13] However, there are examples of dirt bikes being used effectively for reconnaissance in these small wars. In 2003, Marines used motorcycles to conduct hasty airfield surveys in Iraq. The motorcycles were so effective that the employing unit requested a table of equipment change. From 2009–2010 in Afghanistan, Regional Command-West employed dirt bikes to screen the periphery of the main body during movement and to conduct route reconnaissance/route clearance. These motorcycle teams were effective in infiltrating villages and gathering intelligence on improvised explosive device locations.[14] Of note, some dirt bikes remained on Marine Corps tables of equipment until at least 2009. Concurrently, insurgents and guerillas have and will continue to effectively employ motorcycles to conduct reconnaissance. For example, in 2010 in Helmand Province, Afghanistan, unarmed Taliban scouts on motorcycles attempted to quickly collect information on Marine activity.[15] Motorcycle-mounted Taliban created issues for U.S. forces by moving faster off-road and through canalizing terrain where other vehicles could not. In 2012, Marine special operations used dirt bikes in Afghanistan for a variety of functions, including reconnaissance, to diminish the Taliban's mobility advantage.[16] Small teams and special operations forces still employ dirt bikes today to conduct reconnaissance in militaries across the world. Recently, electric dirt bikes have been used by the Ukrainian military for reconnaissance missions to gain an advantage through their lightweight and small audible and heat signature against Russian drones.[17]

History demonstrates the considerations, advantages, and disadvantages of employing dirt bikes for reconnaissance. First, as the United States discovered in the expedition to capture Pancho Villa, instructing and sustaining the appropriate level of riding competency takes time and resources. In a 1975 article of *Armor* titled "Motorcycle Scouts," "about 100 hours" was determined to be the time it took to develop competent riders and mechanics for reconnaissance operations.[18] Recent observations have confirmed this training timeline. Second, armored vehicles are preferred over dirt bikes in conducting reconnaissance during large-scale mechanized warfare. Dirt bikes provide light reconnaissance with increased mobility and a smaller signature when compared to four-wheeled vehicles through rough terrain but are relatively fragile, lacking survivability and firepower, especially in long campaigns. Additionally, dirt bikes lack the endurance of larger vehicles for long-range reconnaissance but can move through smaller mobility corridors. The tradeoff between dirt bikes as a light reconnaissance asset and heavy options is an example of the reconnaissance paradox, where using light assets or heavier assets creates a dilemma in effective reconnaissance employment.[19] Third, the importance of a codified and formalized program should be the priority in establishing a dirt bike reconnaissance capability. The Army's attempted motorcycle integration from 1969–1993 faltered because of this deficiency. Last, dirt bikes proved effective in small wars and can be employed across the competition continuum. Dirt bike reconnaissance provides an asymmetric capability to exploit adversary gaps through mobility and speed, with a minimal signature. Ultimately, the operating environment determines what reconnaissance is most effective.

The Marine Corps got rid of all its motorcycles at the end of World War II, only to test and acquire dirt bikes in 1977 and 1985, respectively, for reconnaissance and courier duties.

Training and Logistics

Training and logistics must be integrated for dirt bike reconnaissance to be most effective. Riders must understand first-echelon operator maintenance due to the isolated nature of most reconnaissance missions and the lack of institutional knowledge on dirt bike maintenance. Furthermore,



Motorcycles have historically been categorized as "too light" in the reconnaissance paradox. The reconnaissance paradox is most prevalent during large-scale mechanized conflict. Employing dirt bikes in a combined arms reconnaissance formation with mixed vehicles or in small wars are ways to mitigate the disadvantages described in the paradox. ***(Diagram courtesy of the U.S. Army Combined Arms Center.)***

motor transportation sections must understand the required second-echelon maintenance for vehicles that are currently not a program of record. Lack of maintenance understanding will be compounded in expeditionary environments where logistics support may not be available. Planning for the acquisition of new parts must be proactive because parts are completed through open purchase, which can be a lengthy process. It is better to have parts before you need them so that training and readiness are not affected.

Gas and electric-powered dirt bikes each have respective advantages and disadvantages. When compared to electric dirt bikes, gas-powered bikes have an increased audible and thermal signature. Additionally, gas bikes typically take more time to learn to ride because of the clutch and the requirement to shift gears. Sustaining gas bikes is easier because they consume transportable fuel and will normally have a longer range. Electric bikes have a smaller audible signature and will take less time to learn to ride. Terrain and weather will dictate the endurance of an electric bike more than a gas-powered bike due to their impact on the battery's consumption rate. Sustaining electric bikes is more difficult because batteries must eventually be recharged and are relatively heavy to transport. Overall, electric dirt bikes are a more advantageous vehicle for tactical employment.

Dirt bikes require more training sustainment than any other tactical vehicle. Training must include a progressive plan to take riders through various terrain and visibility conditions. Riders should possess the ability to traverse obstacles, ride in close proximity, recover motorcycles, ride one-handed, ride with a passenger, and carry a combat load. The existing nationally recognized motorcycle safety foundation level-one riding certification can be used as a basic requirement for all follow-on given by a U.S. Motorcycle Coaching Association (USMCA) qualified instructor. Follow-on training is recommended to be a minimum of fifteen training days of individual riding skill development during the day and night before progressing to collective training. At a minimum, riders should sustain for at least 4 hours every 60 days. Sustainment training can be integrated into a schedule, such as moving to and from a range with dirt bikes or through a dedicated sustainment day. Third-generation night vision devices or better are recommended for nighttime riding. Less capable optics will degrade movement speed and employment effectiveness. To properly conduct progressive training, personal protective equipment (PPE) must be accessible because of the risk of injury. Issued elbow pads, knee pads, goggles, and boots suffice for riding. Full-face helmets and padded gloves need to be acquired to meet the recommended PPE level. All PPE should meet Department of Transportation standards and service life. Tactical PPE can be phased into training once riders have demonstrated competency. In addition to PPE, the following items have been identified as being necessary to have while riding: 25 foot of tubular nylon with a carabineer to be used as a tow strap, 12 zip ties to keep the tire in the rim bead in the case of a flat tire, a crescent wrench, a hex key, and a small air pump.[20] The end state for training and equipment is a reconnaissance rider capable of operating in blackout conditions with a combat load across various terrain.

Dirt bikes should be modified to maximize reconnaissance employment effectiveness. Chrome parts or the entire dirt bike should be painted camouflaged to reduce visible signature. Non-cosmetic modifications must be completed through the manufacturer to prevent voiding the warranty.

Marines on dirt bikes practice traveling through various terrain aboard Camp Pendleton, CA. ***(Photo provided by author.)***

Infrared headlights should be added to assist the riders in driving at night with a night-vision device. Bluetooth, horns, and other elements of the motorcycle that can create a signature or compromise a reconnaissance mission must be disabled. Elements that provide some functional use, such as white headlights, should be equipped with a kill switch to prevent accidental use. Other modifications to mask thermal and audible signatures, enable easier night operation, reduce maintenance, recharge faster, and reduce tire puncture should be experimented with.

Transporting dirt bikes provides an advantage over most reconnaissance platforms. Dirt bikes fit onto aircraft and small boats. Additionally, vehicles such as the Light Armored Vehicle, Joint Light Tactical Vehicle, and Medium Tactical Vehicle Replacement can transport them. Mounting dirt bikes onto the outside of vehicles, such as Utility Task Vehicles (UTV) and Light Armored Vehicles, is a potential solution to transportation. Furthermore, the ability to transport a load while riding a motorcycle is critical for mission accomplishment. A rack should be emplaced onto the rear of the motorcycle, without sacrificing handling, to enable the transportation of equipment.

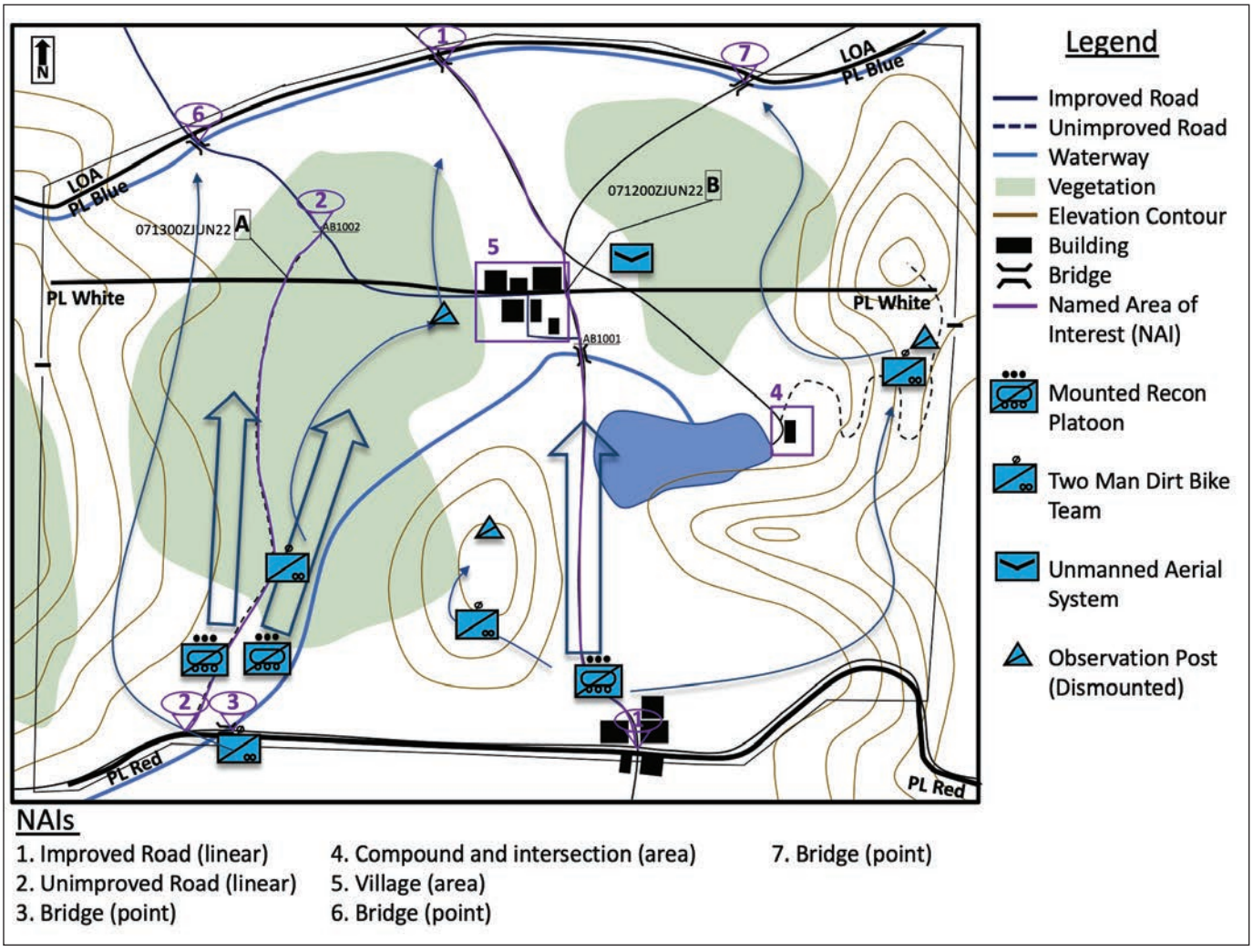
Concepts of Employment

Dirt bikes offer a variety of applications for conducting reconnaissance. Some applications include sensor emplacement and recovery, leader's reconnaissance, long-range infiltration and exfiltration, marking routes for future movement, manned-unmanned teaming, and augmenting mounted reconnaissance operations. Dirt bikes provide a time advantage in conducting reconnaissance, which increases operational tempo. They can enable the projection of unmanned aerial systems (UAS). For example, UAS with a limited range can be launched at a safe distance from the adversary. The operator team can then move closer to the adversary with the UAS so that a link is maintained. UAS control can even be transferred between dirt bike teams. Another technique of employing dirt bikes is the *hub and spoke* technique. The *hub and spoke* technique employs dirt bikes from a vehicle, such as a Light Armored Vehicle, Joint Light Tactical Vehicle, or a pair of UTVs as the *hub*. Dirt bikes serve as the *spokes*, expanding the range of the reconnaissance operation and mitigating gaps in observation. The *hub* provides sustainment for dirt bikes and riders. Two dirt bikes employed together is the optimal number. Dirt bike riders always operate in pairs and can be employed in a team of up to six. Employing more than six dirt bikes in one team will likely cause sustainment, coordination, and signature management issues that outweigh the benefits of employing them. In some cases, two riders can be transported on one bike. Concepts of employment continue to be exercised and refined. Employment techniques vary depending on which of the five types of reconnaissance are being conducted: route, area, zone, force-oriented, or special. Dirt bikes provide added mobility to every type of reconnaissance operation and contribute to security through speed.

Dirt bikes offer a variety of applications for conducting reconnaissance.

Route reconnaissance is a type of reconnaissance operation "to obtain detailed information of a specified route and all-terrain from which the enemy could influence movement along that route."[21] Dirt bikes can conduct route reconnaissance through bounding teams, quickly achieving the multiple observation posts necessary for a route reconnaissance. Additionally, they provide an added platform to reconnoiter the features of a route, including but not limited to, obstacles, choke points, bridges, crossing points, bypasses, lateral routes, built-up areas, potential landing zones and drop zones, civil considerations, and enemy activity. This added platform enables faster route reconnaissance. Dirt bikes can supplement a route reconnaissance mission by serving as an advance guard or as an overwatch.

Area reconnaissance "is a directed effort to obtain detailed information concerning the terrain or enemy activity within a prescribed area such as a town, ridgeline, woods, or other features critical to operations. The area may consist of a single point, such as a bridge or an installation."[22] The size of the area and the density of features within an area will affect dirt bike employment techniques. Larger sizes and densities will typically have dirt bikes supporting a mounted reconnaissance, while smaller and less dense areas may have dirt bikes employed to support dismounted forces. Regardless of the unit of action, dirt bikes provide a mobile capability to gather information about an area faster, building operational tempo. They are cached when conducting short-range observation or are used to quickly displace observation posts during long-range observation. Dirt bikes can be employed to move reconnaissance forces to and from areas—gather-



In this course-of-action graphic, a notional reconnaissance task force conducts an area reconnaissance with dirt bike support. A dirt bike team is attached to each platoon. The dirt bikes reconnoiter bridges, serve as a connecting file between platoons, establish hasty observation posts on the village (NAI 5) from the tree line and elevated terrain, and operate UAS. *(Photo provided by author.)*

ing information about features within an area, dominant terrain outside of the area that can influence operations, or a separate area that is within a few terrain features of a lead trace.

Zone reconnaissance "is a directed effort to obtain detailed information concerning all routes, obstacles (including existing, reinforcing, and CBRN [chemical, biological, radiological, and nuclear] contamination), terrain, and enemy forces within a zone defined by boundaries ... A zone reconnaissance may include several route or area reconnaissance missions assigned to subordinate units."[23] A zone reconnaissance compared to an area reconnaissance requires more resources, can begin from the line of departure, reconnoiters a larger zone, requires more detail, and typically is assigned to a task-organized force under a single commander. Dirt bikes provide an additive capability that increases speed in this most time and resource-intensive type of reconnaissance. They can be used to provide mobility in the various methods of zone reconnaissance, including fan, converging routes, and successive sectors. Similar to area reconnaissance, dirt bikes provide an added platform to reconnoiter the multiple features, which may be included in a zone or features that can influence a zone. Dirt bikes mitigate gaps through the zone between adjacent mobile ground reconnaissance platforms and can serve as a connecting file.

Force-oriented reconnaissance "is a directed effort to obtain detailed information concerning a specific enemy organization, wherever it may be or go. A force-oriented reconnaissance is normally assigned when commanders require additional, timely intelligence on a specific enemy or target unit."[24] Dirt bikes can be integrated into both stealthy and aggressive force-oriented reconnaissance missions, for static and mobile targets, respectively. Additionally, dirt bikes provide necessary mobility to a ground reconnaissance force whose mobility "should match or exceed that of the target."[25] Dirt bikes can be queued to gain and maintain observation of an adversary that has displaced from another element or is newly identified.

Special reconnaissance is defined as, "reconnaissance and surveillance actions normally conducted to collect or

verify information of strategic or operational significance, employing military capabilities not normally found in conventional forces."[26] Marine Raiders can employ dirt bikes to support strategic shaping and reconnaissance. In addition to dirt bikes supporting reconnaissance for Marine Special Operations Command, they can be employed by conventional Marine forces with special capabilities not normally found in other conventional forces to collect or verify information of operational significance. Some dirt bike applications include inserting using a joint precision air delivery system and emplacing and recovering sensors deep in an operational area.

Counterreconnaissance includes "all measures taken to prevent hostile observation of a force, area, or place."[27] Reconnaissance and counterreconnaissance activities are inseparable, however, units tasked with a reconnaissance mission are not given a supplementary counterreconnaissance mission.[28] Therefore, a dirt bike team should support either reconnaissance or counterreconnaissance at one time. Dirt bikes can support active counterreconnaissance operations, such as augmenting a screening mission. Dirt bikes are employed in similar ways during a counterreconnaissance mission as they are when conducting reconnaissance but for a different purpose.

Counter Arguments

First, personnel safety and musculoskeletal injury is a risk when operating dirt bikes. This risk is mitigated through the use of full traditional dirt bike PPE that transitions to tactical PPE through a progressive training plan under the supervision of qualified instructors. Traditional PPE includes elbow pads, knee pads, full-face helmets, eye protection that encloses the eye, full-finger padded gloves, and boots covering the ankle, whereas tactical PPE is normally used for conducting tactical operations with an addition of face protection. Sustainment training reduces risk because it enables riders to maintain proficiency. Second, the currently fielded UTVs provide similar capabilities to the dirt bike. One may argue that the advantage dirt bikes give over UTVs in conducting reconnaissance is minimal. When compared to UTVs, dirt bikes have a smaller signature (especially electric dirt bikes), can be more easily cached, can be transported by various vehicles and small boats, can be employed in the *hub and spoke* technique, and can move through more canalizing terrain and smaller trails. Dirt bikes provide an additional platform whose employment can be tailored to the situation. Further experimentation and exercise will highlight the advantages and disadvantages of employing dirt bikes compared to UTVs.

Training lessons learned must be further disseminated, exercised, and refined.

Conclusion

Dirt bikes provide a mobility option for reconnaissance operations across the competition continuum as the Marine Corps modernizes for the future. Motorcycles have supported reconnaissance operations across a range of military operations throughout history. Dirt bikes provide a light reconnaissance option, which can supplement reconnaissance formations to create a combined arms effect or be employed alone to enhance capability. They provide an asymmetric advantage to gain maneuverability and speed, thereby increasing operational tempo. Effective dirt bike reconnaissance starts with effective training and logistics. Training lessons learned must be further disseminated, exercised, and refined. A replicable maintenance plan, rider proficiency and safety standards, and proven transportation procedures need to be codified and disseminated. Initial dirt bike concepts of employment and tactics, techniques, and procedures across the reconnaissance and counterreconnaissance mission sets will continue to be exercised, refined, and ultimately proven in an operational environment.

Notes

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Installations in Contested Environments

The Taiwan crisis of 2027

by MajGen David Maxwell

Force Design 2030 and *Installations and Logistics 2030* describe evolving missions and new capability requirements driven by a changing operating environment. *Installations and Logistics 2030* is explicit about challenges associated with installations in contested environments and makes the following key points:

- To posture ourselves against the threat of peer and near-peer competitors, we need to rethink our view of Marine Corps installations.
- Our installations must be able to provide the full range of infrastructure and trained personnel required by the future force.
- Our installations must enable training, force readiness, experimentation, mobilization, and deployment while also improving quality of life for Marines, their families, and the civilian workforce.
- Smart, resilient, networked installations will provide stand-in forces with enhanced capabilities to recover quickly from attack, persist in contested spaces, and sustain distributed formations.
- We must ensure force protection efforts enable continuity of operations, protection, and safety of our families, and our forces to meet operational requirements.

The following vignette explores the contours of the changing operating environment and the associated implications for our installation through a fictional account of a security crisis occurring in 2027. While longer than most articles, a vignette is the most efficient way to animate the guidance in *Force Design 2030* and *Installations and Logistics 2030* while also illuminating the many challenges and opportunities associated with making our installations ready.

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The Taiwan Crisis of 2027 System Attack–Systemic Defeat

Cloudy, with late afternoon rain was the forecast as Col Kay Smith headed up the gentle rise skirting the Okinawa Expressway toward Taiyo Golf Course for an early morning tee time with Col John Harmon and Col Steve White. As on most Saturday mornings in Okinawa, the plan for Kay was to get her mind focused on having a good round of golf after a week of non-stop mini-crises in her job as the Deputy Commander of Marine Corps Installations Pacific, but today there was something else on her mind: the rising tensions between China and Taiwan had serious implications for the operations and safety of the bases and stations under her command. Eighteen holes with Harmon, the III MEF G-3, and White, the Commanding Officer of 12th Marine Littoral Regiment, offered an opportunity to discuss her concerns with respected friends and colleagues. She seldom saw White, but she looked forward to catching up since they had known each other since The Basic School.

Driving into the parking lot afforded a glimpse of the verdant dark green course, having benefited from the above-average rainfall of the past few months. Unsurprisingly, John and Steve were running a little late, so Kay signed in and started some warm-up swings. After some additional stretches and a brief chat with a friendly groundskeeper, John came hustling over with Steve in trail.

"Hey, sorry we're late. Let's get going or we'll miss our tee time," said John.

"Right," Kay said with a wry smile as she glanced at her watch. "Let's get to it."

By the 9th hole, the trio had settled into the flow of the game, and Kay ventured some shop talk.

"So, guys, the Chinese seem to be stepping up their Taiwan torment; more aircraft intrusions and more saber rattling. The G-6 says cyber intrusions are way above average. I think we should be stepping up preparations. I know we're reviewing our base and station readiness." John and Steve cocked their heads and looked at each other.

"There she goes again, always the professional," Steve quipped, having known Kay for 23 years.

Niceties dispensed with, John took on a serious tone and said, "Yes Kay, you're right to be concerned. Indications and Warnings are tipping into the red; we could be in for some unpleasantness in the coming months."

"We're ready," Steve added. "The regiment is in good shape, and we've got several elements doing reconnaissance/counter reconnaissance in the lower Ryukyus and northern Luzon. We've actually detected some atypical PLAN submarine activity well east of Taiwan. But I'm not sure I get it Kay, what're you worried about; our bases and stations aren't going anywhere."

"That's precisely why I'm so concerned," Kay responded. "It's much easier to target a fixed installation than a low-signature distributed force. Would the PLA be more inclined to use expensive missiles on large, fixed bases or a small, hard-to-target, mobile unit? We're sitting ducks."

Somehow that game flow had evaporated. "OK," John offered, "let's call it at nine and talk about this over some yakisoba and a Sakura."

At the table, John picked up where they left off. "OK, let's remember where we are, so keep it unclass, but let's think this through a bit. Kay, you started this, so what's bothering you most?"

"Well, starting at the top, strategically, it just doesn't make sense to me that we're treating our bases and stations like we did when we UDP'd here as lieutenants. The threat's very different now. We're in the same arc of fires as our deployed operational units. That's a big difference, right?"

"An attack here would be really escalatory, and might bring Japan in as an active combatant," Steve opined.

"Remember Putin?" John interjected. "That insanity was just five years ago. It's hard to predict an autocrat's decision calculus," he continued, looking ever more serious. "Kay, tell me what has been done to improve the posture of our installations as of late."

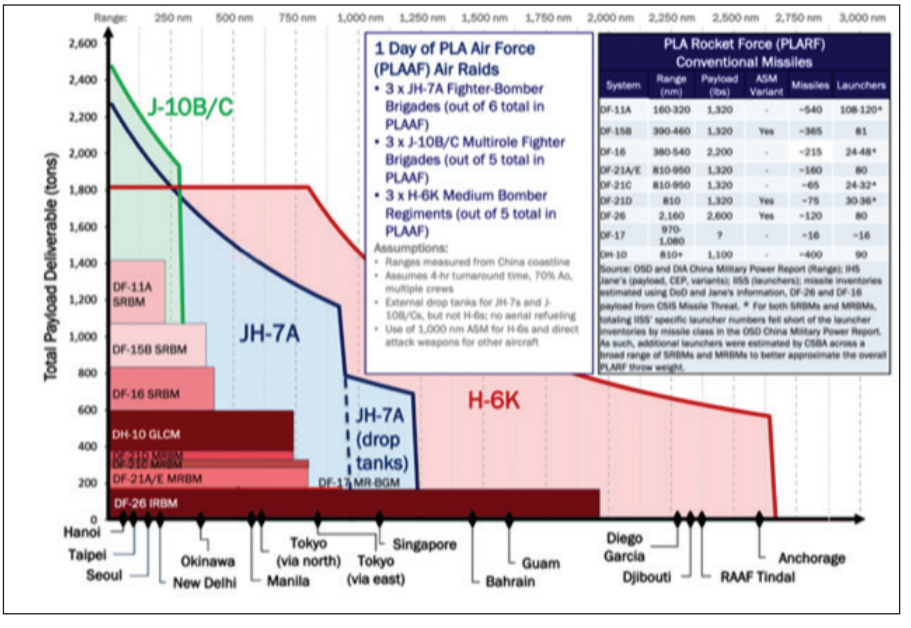
Looking askance, Steve muttered, "But look where that got Putin: six feet under. Maybe Xi learned something."

Kay had hoped the discussion would get to this point. "We've done a lot, but so much still needs to be done. We've barely moved the needle with Headquarters Marine Corps on resources. I think it's important that we're now tied into the theater missile defense early warning system and we can send warnings out to all smartphones if the threat dictates. That's critical for Marines, civilians, and their families. Unfortunately, we've still not gotten the mobile cell towers we requested, in part because we're still working on spectrum access with the Japanese. We need to keep pushing this. Steve, your folks might find them of use tactically, if we go Corregidor."

Steve chuckled while John's arched eyebrows conveyed some skepticism over the World War II analogy, but his demeanor was now quite serious.

"And to be fair," she continued, "there have been some other notable improvements over the last five years,

Marine Corps installations and forces in the first island chain as seen from the PRC perspective. *(Photo provided by author.)*



Range and capability analysis of People's Liberation Army Air and Rocket Forces. *(Photo provided by author.)*

and not just in IT upgrades. After pushing the issue for a couple of years, all our Installation Marines have a T/O [table of organization] weapon assigned and do annual FAM [familiarization] fire at a minimum. We have also developed healthy habitual relationships with elements of MARFORRES. Using reservists to fill holes created by our reduced reliance on FAP [Fleet Assistance Program] billets, and we now have the ability to fill vacancies with individual augments for the remaining FAP personnel when they get pulled during a crisis. Also, while there are IT and sensor elements associated with Global Logistics Awareness, hopefully, you're seeing a difference in the responsiveness of logistics to operational requirements. The biggest deal has been the change in mindset. Logisticians are no longer waiting to be told the requirement, they are anticipating and planning for future requirements by integrating logistics into operational planning. The old way just won't cut it given how distributed we are nowadays—and it also helps Installations by improving our situational awareness on LOGCOM [Logistics Command] and FMF logistics support requirements.

"OK," John said, "balanced argument noted Kay, but give us the wavetops of today's challenges," the golf game already a distant memory. "What else?"

"Let me do it in terms you guys might best understand: the seven warfighting functions—it's still seven right? We haven't added yet another one recently, have we?" Kay jested, trying to lighten the mood she had precipitated, if only just a tad.

Kay opened a firehose of pent-up frustration. "Let's start with command and control. John, whether you're in Guam or here in Okinawa, you obviously understand the importance of your operations center. It needs to work 24/7 regardless of weather or enemy action. You know that, but did you know the communications grid that underpins it is brittle and lacks adequate capacity? You know our computers are old and slow; you see them every day, and you might guess that routers and servers need to be upgraded, but you might not think about the cables running down the streets and in the walls of our facilities. They are from a different era."

"I've been told you might need to actually fight the MEF from your garrison facilities given the ranges of our latest missiles—and the PLA's. The bandwidth required to support the surveillance, tracking, and targeting of enemy assets is growing constantly. Our IT pipes are strained passing PowerPoint slide decks. So much for full-motion video and passing target data back to CONUS! And it gets better; the power grid that runs the communications grid is even less resilient. Much of our communications grid is buried, but most of our power grid is overhead. We lose power with every hurricane or typhoon. What will it be like if the PLA comes knocking? Steve, you've at least got your tactical communications. That'll work locally, but what if space is denied? A redundant underwater fiber line might be essential for off-island comms."

"Every Marine loves to shoot stuff—fires is a perennial investment favorite—so you'd think we'd be good to go, right? Well, not exactly. First, Steve, you understand the limitations we have with ranges. Individual and crew-served weapons aren't too bad, although we probably don't shoot enough, the big challenges are the limited areas we have to do live fire and maneuver and where we can shoot artillery and missiles. We're still waiting on funding to build virtual training ranges. Admittedly, a big part of the problem is a posture that mal-positions one-third of our operating forces for training, but we'll save that one for another day."

"We need to be able to simulate the entire kill chain for our anti-ship missiles, and we're just not there yet. The sim center is still just a POM30 unfunded deficiency," Steve chimed in. "Kay, don't forget ranges for our loitering munitions. We can do some training at Fuji and Tinian, but that's it, and since the smaller loitering munitions are integral to squad, platoon, and company operations, we need more reps and sets."

"Force protection—wow, where to begin?" Kay said. "Of all the priorities in my job jar, this one worries me the most. Talk about multi-domain; we've got threats coming from every direction: cyber, drones, SCADA attacks, ubiquitous sensing, insider threats, CBRNE—heck we even have space-based and sub-orbital challenges, plus the usual concerns for hypersonic cruise missile and ballistic missile attack. We just haven't adapted fast enough to have answers to these threats. From my time in P&R [Programs and Resources], I know there hasn't been the trade space given our constrained budget topline and we had to get the basic new warfighting capabilities fielded."

"Damn right," Steve interjected. "We wouldn't have been able to provide the sensing and fires to the Joint Force that we can now."

"I'm with you," Kay continued, "but now we need to think like the Chinese. This is a warfighting system we're talking about, a system that doesn't work without protection, sustainment, and installations that can operate in a contested environment. The PLA doesn't think in terms of our stovepipes, they see a system and look for the weak link in the chain, and yours truly is holding the weakest link. I feel a disturbance in the Force."

John had to say something at this point.

"Kay, come on. You SAW [School of Advanced Warfighting] Jedi always love those Star Wars references, but maybe you're being just a bit too dramatic. We can't afford to do everything."

"Maybe ... maybe," Kay replied, "but when a lone Chinese SOF operator drops his backpack and releases ten loitering munitions that put holes in six JSF on the flightline, we'll see how dramatic things can really get. Anyway, that's a good segue to information and intelligence challenges. Both of these functions have increased steady-state requirements far beyond what they were when we were lieutenants. In competition, especially here in the Pacific, we're in the fight every day. We need to have 24/7 intel on below-the-threshold threats, and we all read the CHINFO [Chief of Information] media summary every morning. There's a constant back and forth as we, and our allies and part-

ners, try to expose Chinese bad behavior and counter their disinformation campaign."

"From my standpoint, we've had to band-aid our communications grid, which wasn't built for the bandwidth and security requirements associated with these new demands. I mean, even battalions and regiments need PED [processing, exploitation, dissemination] facilities and these things often run 24/7, which means 24/7 chow hall hours and IT support. Security of these facilities is an issue as well."

"You're not being overdramatic in the least about this point, Kay," Steve said nodding. "We were running an MQ-9 mission last week and we had some comm problems. We had to call the Enterprise Help Desk, the same service an action officer gets sitting at a desk building slides. I couldn't believe it. We had to scrub the mission."

"OK, well my soliloquy is almost over; just two more functions," Kay said, picking up where she left off. John rolled his eyes.

"Maybe more of a diatribe than a soliloquy Kay," he said, "but I like your passion. I get where you're coming from. We need to have a conversation with the CG."

"So, logistics is still logistics, always key, but Steve you mentioned loitering munitions. We need some additional funding to get the ammo storage facilities up to speed to allow us to store the munitions and their batteries in adjacent facilities, and our NMESIS missile systems would benefit from humidity-controlled storage. But the bigger picture, I'm concerned we could actually be like Corregidor in World War II. We're at the end of a tenuous line of communications. The PLAN might decide to interfere with them with actions that drive up shipping insurance costs, and they could even get more aggressive and actively interdict shipping to Okinawa. We can't prepare for everything of course, but we should at least have some extra stores on hand to ensure we have enough fuel, food, and ammo to sustain us should the Chinese decide to cut us off. John, do you agree?"

"I do, as long as we don't get too crazy. I think I'm going to name the MEF CP Malinta," he said with a little less sarcasm than his previous quip about World War II analogies.

... we should at least have some extra stores on hand to ensure we have enough fuel, food, and ammo to sustain us should the Chinese decide to cut us off ...

Kay continued, "There's also the potential for huge expenditure rates of munitions and the possibility for substantial combat attrition. We need to have a distributed and resilient stockpile of munitions that our operating forces can access, both at home base and when deployed with allies and partners in their territory. Unfortunately, our PGMs [precision-guided munitions] are located in known Navy ammo supply points. We've just not been able to get the resources to do distributed prepositioning, which, ironically, is substantially less costly than the old maritime prepositioning approach. I guess ships are just more interesting than warehouses, which is unfortunate because the relevant combat power of our new missiles is on a par with previous configurations and doesn't require ships, connectors, escorts, and vehicles—all without the delay of RSO&I [reception, staging, onward movement, and integration]. Old paradigms die hard, I get it, but we've got to get folks to understand the increased power density of new weapons systems and their amazingly low cost per strike mile ... but I digress."

"Back to the need for reconstitution. We haven't had to worry about this for decades; it's just not in our psyche to increase planning factors to account for the kind of expenditure rates and attrition we're likely to face. We need to have more robust facilities to accommodate repair and refit. This will need to be a long-haul effort to change our cultural proclivities. Finally, I promise, we come to maneuver."

"Yup, got it," said Steve.

"Yea, me too, got it, maneuver is key," John reiterated.

"OK, sure but what about installations?" Kay replied.

"Good grief," said John. "You're not going to try and sell us on mobile installations are you?"

"Of course not," said Kay, "but have you considered that installations, at the very least, provide a base for maneuver? If we were not postured across the first and second island chains and you moved your regiment tactically to the same geography currently occupied by our bases and stations, would you say we have conducted operational maneuver in relation to our adversary? I would say yes!"

"Hmm, hadn't really thought about it in those terms," said Steve.

"As we increase our inventories of PGMs at all echelons and their ranges increase, we will increasingly maneuver not to assault, but to gain positional advantage for indirect and long-range precision fires. Our bases and stations occupy terrain in the mutual weapons engagement zone of our forces and those of our adversaries. So, it's not inconceivable we could be firebases for these weapon systems. It might not be our primary COA [course of action], but if we're cut off, it might be our only option to take the fight to the PLA. Of course, that moves us up the PLA's list of target priorities, which gets me to resilience."

"Obviously, we can't afford to harden everything, but we need to think deliberately about how to maintain continuity of operations for all of our critical infrastructure. Our critical infrastructure must be resilient and some assets may even need to be hardened for weapons effects vice just resilience."

"Like in a tunnel or underground," John winked. He was ready for this one. "The CG has been talking about this issue at nearly every weekly staff meeting. He understands it's an issue that needs attention. He gets it."

"Awesome," Kay said, "That's what we get for having a loggie as MEF commander. Only the second time, if I recall correctly!" She continued. "Resilience is a term of art in the installations community, but I like to keep things simple. The Air Force has a succinct definition: the capability of an installation to sustain the projection of combat power by protecting against, responding to, and recovering from deliberate, accidental, or naturally occurring events. I think that about covers it."

"The CG is really worried about fuel," John said.

"That makes sense; it's a critical vulnerability. Of course, it's the vulnerability of the storage tanks, but perhaps the most problematic is the fuel handling infrastructure, especially for aviation. It's a tough nut," Kay affirmed.

Two Months Later

Two months after their golf outing, and five years to the day since Xi Jinping was proclaimed "ruler for life," the onslaught began, not with a bang, but with an incremental, yet unmistakable escalation across multiple fronts.

It appears the Chinese paid as much attention to our doctrine, concepts, and force posture as we had. For over a month, they gathered an amphibious armada that tripped indications and warning systems, so we knew something was coming. We assumed it was a massive amphibious assault on Taiwan, a Chinese version of D-Day, but to our surprise, that did not happen. Instead, they began a graduated, slowly expanding interdiction of Taiwan's connections to the outside world. Undersea fiber optic cables stopped working, then space-based communications became unreliable, maritime militia significantly ramped up interference in commercial fishing operations throughout the South China Sea, and a northbound container ship sank suspiciously in moderately foul weather.

One month into China's campaign of intimidation, their playbook of malign activities appeared limitless. It was at this point that one of Kay's worst fears was realized. Through an intense information campaign, China made clear that any interference in their Taiwan campaign by the United States would result in devastating attacks upon U.S. bases and stations. They explicitly called out Camp Humphries in South Korea, Kadena AFB, Marine Corps installations on Okinawa, and Anderson AFB and Camp Blaz on Guam. The warnings were very precise and stated that any damage to property or personnel other than those named U.S. installations would be unintended collateral damage. China emphasized the attacks would be precision strikes, focused solely on U.S. property and personnel.

The Chinese thus presented our President with a dilemma—support Taiwan's defense or risk attacks on tens of thousands of military and civilian personnel and their dependents. The President was in a difficult place. If he took overt military action against the Chinese anaconda plan to constrict Taiwan's line of communications, the United States would be the first party to initiate combat, and at the same time, potentially thousands of U.S. citizens would lose their lives. Xi apparently was taking notes in 2022 when Putin catalyzed Western resolve with a massive, violent military assault on Ukraine. It was a black-and-white situation, whereas China's actions were all shades of gray.

Early on, when Chinese preparations were accelerating, Marine Stand-in Forces had been deployed from Okinawa and Guam to northern Luzon and Miyakojima, Kumejima, and Tokashiki Islands to the west and south of Okinawa. These distributed Stand-in Forces provided surveillance and sea denial fires options for the Luzon and Miyako Straits while providing enhanced situational awareness to the Joint Force. Given the gradualist approach adopted by China, having a thicker and more diverse range of sensors proved to be especially important to national command authorities given the large uncertainties associated with China's chosen approach—a massive all-out attack with missiles and an amphibious assault would have provided a more simplified, black and white decision calculus for U.S. response. The options for ISR, cyber ops, information ops, targeting, and strike that Stand-in Forces add to the Joint Force's expanded decision-maker options to allow for a measured and agile response, able to scale commensurate with China's incrementalism.

One Month Later

"BREAKING NEWS—CHINA REPEATS THREATS TO U.S. PACIFIC BASES," read the TV banner in Marine Corps Installations Pacific's crisis action center adjacent to the Joint Force Maritime Component Commander Forward/III MEF COC.

It did not help Kay's mood that she had been warning about such an eventuality. Told you so was not a helpful attitude, and she knew it. Now was the time to do the best with what was at hand.

"OpsO, I need to see our most recent SITREP," she requested.

Kay ran through a mental checklist of installation functions to ensure all necessary measures had been taken given China's demonstrated propensity to avoid surfaces and look for gaps that could be exploited. It looked like installations were truly a gap in PLA eyes.

Law enforcement personnel were working extra shifts and perimeter security was stepped up. Fortunately, the recently fielded AI-enabled drones substantially reduced the manpower required for conducting patrols, but there were still concerns over operatives able to deploy electronic warfare in support of cyber operations, as well as jamming and physical damage to communications infrastructure. The 2024 decision to issue installation Marines weapons was proving to be a wise move, enabling them to provide additional support to perimeter security. Hard to believe we had become so assured in our security we had forward-stationed Marines without weapons or weapons training.

Thankfully, the reservist rotational augments were fully incorporated into bases and stations—yet another manpower improvement over the last few years. Kay made a note to request a surge to get the next rotation in early and to

encourage as many currently assigned personnel as possible to extend.

Tenant commands were operating around the clock, so there was an increased demand for chow halls, IT support, and maintenance. Kay made a mental note to talk to John to see what MEF might be able to do to help with surveillance and security operations to allow Marines with specialized installation skills to support base surge ops.

Cpl Sanchez interrupted, "Ma'am, the MEF G-2 is on the phone."

"OK, I'll take it," said Kay with some apprehension, as she had a good idea what Joe wanted. "Joe, how can I help you?" she asked.

"Kay, we're getting crushed, we've got the majority of our tactical sensors deployed and we're getting fire hosed with data, but the network is clobbered, our PED'sters can't get their jobs done, and they say it's not processing capacity, it's a bandwidth problem."

As Kay suspected, installations communications grid upgrades had been an unfunded deficiency for four years running. Base comm grids were largely still copper and simply lacked the capacity. Back in Virginia, she recalled having fiber run to her house by a commercial vendor years ago, providing one gigabyte per second upload and download speeds. Her house had more bandwidth than the MEF-sensitive compartmented information facility, which is crazy but true and not to mention electromagnetic pulse attack was not a big consideration when she decided to shift to fiber for her home—so there was that vulnerability to think about as well.

"Joe, sorry, we understand the problem. Tell you what, I'll talk to our comms folks. Perhaps we can have them team with Comm Battalion to run some fiber to a tactical SATCOM link," Kay offered. "I've already asked engineers to disperse their generators to ensure we have backup tactical power generation if needed."

"Kay, OK I appreciate that, but you know space is going to be unreliable. Perhaps they could tie into a commercial fiber point of presence," said Joe.

"Right, we'll look into that as well," Kay agreed. "I'll let you know tomorrow where we are with the band-aid."

Kay looked up to see Sanchez back at the hatch looking serious.

"Ma'am, we just got a message saying the next UDP battalion won't deploy on time—some sketchy stuff going on in Pendleton, Twentynine Palms, and Lejeune."

"Need some specifics Sanchez, like what?" asked Kay.

"Well, in addition to the interruptions in the Global Logistics Awareness systems you're already aware of—like sensors dropping off and recurring network outages—there's been a number of intrusions into our range control systems stateside, and it's been affecting the training cycle. That ankle-biter stuff set the battalion back a few weeks, but now there's been major disruptions in contract air operations—but that's not the worst of it. Third Battalion 2d Marines was at Cherry Point forming up in the parking lot after the buses dropped them off and a quadcopter flew over; they're thinking it might have dispensed anthrax. They've got to all be tested, and it'll be a day or two before they can confirm what it was. I got a text from Sgt Mulvaney who's a grunt in 3/2 Mar. He was looking forward to escaping the Lejeune heat since his barracks A/C was broken again, but now they're back in barracks waiting on test results. Just lots extra friction regardless of whether it was an actual bio-attack or not."

Kay turned back to the situation report and the logistics support section. Two dry store ships had been delayed due to maritime militia activities in the South China Sea and Naha Port authorities were reporting other delays as well. The commissaries would be out of fresh produce in a week, and there was only a two-week supply of baby formula. Fortunately, the base had gained funding for an additional two-month supply of MREs that could feed all tenants and dependents, but good luck feeding MREs to infants. *Maybe we can frag a C-130 to make a run to the mainland for formula, putting a whole new meaning to the old term milk run*, thought Kay in disbelief. *How did we get to such a place?*

At least the training ranges were in pretty good shape, but ammo levels were not what they should be. The arms room concept placed an increased requirement for ammo to qualify a wider number of Marines, whereas before only specialized MOSs qualified on crew-served and shoulder-fired rockets. It was unquestionably critical to have more Marines trained in more weapons platforms, but ammo allowances had still not increased to levels necessary to get everyone trained to standard.

Virtual and constructive training helped with training on artillery and missile systems, but the facility envisioned by Project Tripoli just had its groundbreaking last month. Despite MCICOM's efforts, it was still taking five years to get new facility construction started and then there were the inevitable construction delays. At any rate, *no reason to dwell on this now; it is what it is,* she thought. There were more immediate concerns.

Two Weeks Later

There was now no question that China was all in on gaining control of Taiwan. Essential supplies were still arriving in Guam and Okinawa, but merchant ships were now organized into escorted convoys after the investigation of the lost container ship EVER GENTLE revealed ambiguous but highly suspicious indications that there had been a PLAN submarine in the area of the sinking.

Evacuation of dependents proceeded apace with charter flights leaving at regular intervals from Naha International Airport and Kadena Air Force Base. Once these flights were completed, the concerns over food and medical care for tenants would be substantially reduced, but it remained to be seen whether the departure of dependents would make the bases and stations more or less likely to be targeted. On the receiving end, Marine Corps Installations–West was busy with the influx of new families. It would have been good to have rehearsed this non-combatant evacuation operation beforehand to develop a playbook for how to secure quarters, guidelines for what could be taken, and more information to give the displaced about what to expect on the other end. Still unresolved was who would care for all the pets remaining behind.

Currently

To date, the Chinese have still not taken overt military operations and the United States has decided to work with the international community to impose economic sanctions on China while also increasing naval and air forces in between the first and second island chains.

Kay could only hope that sanctions worked. The evacuation of dependents from Japanese locations reduced the burden substantially, but that did not increase ammo levels or ensure that theater air and missile defenses would make much difference if China decided to go kinetic.

Maybe the installations would weather the storm. Kay could only hope because there was nothing else to be done; it would depend on the Chinese.

Epilogue

Can a *fait accompli* be slow and progressive? Does it have to be so sudden the opponent is unable to offer a timely response in hours or days?

With the benefit of hindsight, what appeared at the time to be a progressive ratcheting up of intimidating actions by the Chinese looks today more like a *fait accompli* given China's studied exploitation of our vulnerabilities and the recognition that they had tailored a long-term campaign to gain control of Taiwan and then executed it to near perfection. America and its allies and partners did respond to Chinese provocations quickly but in a measured series of economic, information, diplomatic, and military actions, with varying levels of effectiveness. Yet today, China controls Taiwan's apparatus of government and is working to consolidate total control over the island.

As an adversary with a mature Long-Range Precision Strike complex, the Chinese changed the battlespace in novel and unanticipated ways. The ability to create effects, without changing location, meant the Chinese could threaten to attack or conduct an attack at very low cost. By manipulating our Indications and Warnings, they were able to force us to react, executing flush plans, conducting a noncombatant evacuation operation, and focusing on internal housekeeping matters while they had none of the traditional logistical or temporal costs associated with moving into battle position.

Attack or threat of attack was fast and cheap for the Chinese, whereas we had to move large forces great distances, evacuate families, and implement ad hoc defensive measures to cover installation vulnerabilities. Also, their attack options had the benefit of being precise, thus allowing them to modulate collateral damage. Importantly, they could attack any target set within range of their munitions while we had perhaps overfocused on protecting tactical formations to the detriment of fixed installations.

The DOD rightly recognized the need to improve its abilities to target and attack PLA forces back in 2018 ...

The DOD rightly recognized the need to improve its abilities to target and attack PLA forces back in 2018, but this focus evolved into tunnel vision given resource constraints across the Department that forced budgets to focus only on the "top" priorities vice the Joint Force's system priorities. Underinvestment in system enablers opened a seam the Chinese drove their missiles through. The Chinese viewed all U.S. assets within their weapons engagement zone as valid targets, and without the baggage of our cultural propensities, they were clear-eyed as to where the U.S. was most vulnerable and what targets would best achieve their political objectives.

The Chinese knew our democracy demanded the President pay close attention to public sentiment, and Taiwan did not resonate with the American polity as had Putin's attack on Ukraine. This was not because Americans had a greater affinity for a European war. Rather, it was because of the way the Chinese had learned from Putin's mistakes and adopted a gradualist approach that avoided bloodshed until the very end of their campaign. By then, it was too late to walk back the chain of events they had orchestrated.

China's strategy leveraged American ambivalence by threatening to attack U.S. citizens and military personnel at U.S. bases and stations located within their desired sphere of influence, and the President decided to avoid escalation until U.S. non-combatants could be evacuated. Perhaps savvily, China chose not to interfere with the evacuation. They understood they were losing some of their leverage, but the vulnerability of U.S. installations left plenty of targets possessing both military and iconic value for them to threaten. In return, they gained more of their most valuable commodity: time.

It is clear now that posture matters greatly. Vulnerabilities are vulnerabilities, whether operating force or supporting establishment, especially in the eyes of an adversary who may understand political vulnerabilities better than the U.S. military, given they have the benefit of not being burdened by the U.S. military's inclination to focus primarily on military outcomes.

The Joint Force and the Nation's infrastructure and industrial base comprise a system that was perhaps better understood by previous generations. In World War I and World War II, key cities, bases, fortresses, and industries were early military objectives of both sides, but during the long interregnum of our military hegemony since then, we forgot. The Chinese had not.

USMC

Using AI to SAW Through OODA Loops

Enhancing Marine Corps training with AI and exploring the potential of ChatGPT in the OODA Loop

by CAPT John Konrad

ChatGPT boasts the fastest adoption rate of any software ever published, and nascent AI-generated code assistants have already infiltrated over 40 percent of code on the popular software database GitHub. In an age of rapid technological advancement and information exchange, it is crucial for the Marine Corps to continuously adapt and evolve its training methodologies. This now includes AI training, but where do we begin?

First, we must understand that ChatGPT is a neural net that has ingested billions of pages of text and is capable of performing the very human task of generating language. This text encompasses not only English but a full cacophony of foreign, programming, and other types of languages enabling it to view problems in the context of near-infinite perspectives and different schools of thought, eliminate (or highlight enemy) bias, and use computational tools like Wolfram|Alpha to go beyond what humans can do. It is also an adaptive learner.

The School of Advanced Warfighting (SAW) has long been instrumental in preparing Marines for the complex challenges of modern warfare. SAW students ingest enormous amounts of material and run scenarios with the guidance of expert instructors allowing them to understand complex scenarios and adapt to different warfare styles. Concurrently, artificial intelligence (AI) systems such as OpenAI's ChatGPT are trained on unfathomable amounts of information, emerging as powerful tools that demonstrate the potential of machine learning and adaptive algorithms. This article explores the parallels between the Marine Corps School of Advanced Warfighting and the AI language model ChatGPT, and how AI might augment the OODA Loop (observe, orient, decide, act) process—a decision-making framework developed by Col John Boyd to manage complexity in dynamic environments.

Both SAW and ChatGPT utilize adaptive learning approaches to improve their respective skills. SAW incorporates feedback and lessons learned from military exercises and real-world operations, while ChatGPT learns from vast amounts of text data and is fine-tuned based on user interactions and feedback. Additionally, they both provide training in simulated environments and scenarios, preparing personnel and AI for real-world challenges. Both emphasize continuous improvement and effective communication. SAW updates

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Students and leaders from SAW gather at FMF, Atlantic, Marine Forces Command headquarters, Norfolk, VA, July 2022. SAW is instrumental in preparing operational planners for the complex challenges of modern warfare. *(Photo by Casey Price.)*

its curriculum and training methods based on new technology and emerging threats, while ChatGPT is updated and fine-tuned using new data and feedback to improve its performance. Both entities recognize the importance of collaboration, with SAW training personnel to work together efficiently in complex and dynamic environments, and ChatGPT focusing on generating human-like text to enable effective communication with users.

The similarities between adaptive learning programs like SAW and adaptive learning algorithms like ChatGPT are striking, but AI is no replacement for schools like SAW or the expertise of experienced warfighters for reasons both simple (AI does not yet know what questions to ask itself) and complex (AI sometimes suggest very bad ideas). In fact, the opposite is true. AI works best in the hands of experienced and highly knowledgeable users who can ask pertinent questions and understand which AI answers should be expanded upon and which should be ignored.

AI does a really good job of looking at information from a wide range of observation points and orientations. For this reason, it is especially effective in running OODA loops.

Here is a brief overview of how the OODA Loop decision-making framework developed by Boyd can be integrated into AI bots.

Observe: AI could process and summarize vast amounts of data—both on the battlefield and in historical archives—streamlining the initial observation stage and providing decision makers with critical insights and trends but the real power comes when you unlock different perspectives.

By default, the AI could ingest language and communication data in the field and provide junior officers with tactical ideas and concerns in the style and process of *MCDP 1*. It could suggest ways to further confuse the enemy or maneuver around a stronghold. Junior officers could select among available ideas and then—this is where the tool becomes powerful—asking AI to reframe the idea from the perspective of Clausewitz, Sun Tzu, or Boyd himself. AI could even digest briefings, speeches, and writings of modern-day leaders the junior officer knows would do well in the situation before him.

Orient: By analyzing historical data, cultural factors, and other related information, ChatGPT could improve situational awareness and help decision-makers better understand their operating environment. If, for example, the junior officer is fighting against the Russian army with close air support from French forces the database of cultural information and fighting styles—including strengths and weaknesses—obtained from scanning volumes of foreign text could provide leaders in the field with ideas for leveraging allied strengths and enemy weaknesses.

Decide: As a decision-support tool, ChatGPT could generate various possible courses of action along with the pros and cons of each option, aiding decision makers in selecting the most appropriate action. Once a decision is made, AI is great at digesting statistics and data to provide information including likely ammunition expenditures and possible casualties allowing support units to prepare.

Act: ChatGPT could facilitate coordination and communication of decisions by generating clear instructions and guidelines for implementing the chosen course of action. It could translate using cultural cues to help foreign allies better understand and adapt to the maneuver.

Loop: Of course, OODA is not a linear tool, but neither is AI. When, for example, the junior officer makes a decision, missing observations and additional orientations could be suggested to refine the idea.

So, could this technology replace field experience or the adaptive learning methods taught at SAW? Absolutely not. AI does not replace expertise or mental models; it simply offers a multitude of ways to augment them. Marines could easily fall into rabbit holes of information and waste valuable time. AI is also not great at understanding when the information it has collected is wrong leading it, in the words of author Nassim Taleb, "to bull**** itself." Further, it does not have "gut instinct" to warn it when a plan looks good on paper but could be disastrous in the field. AI needs supervision—expert supervision.

For these reasons, the real value of using AI to saw through OODA loops is in training and wargaming exercised where AI can help students improve the speed and quality of loops while offering instructors—who will be monitoring the AI feeds—valuable insight on why certain mistakes were made or how new tactics were developed.

Once this is perfected in wargaming, the same tools could be applied in battle. A commanding officer monitoring both the battle and AI-induced OODA loops may be more willing to take a hands-off approach if he understands what prompt led a junior officer to act upon a certain idea. The AI may also help senior officers take corrective actions and communicate the commander's intent without frustrating the men under fire. AI could grade junior officers in realtime providing Joint Forces with opportunities to fill in any tactical gaps.

The similarities between the Marine Corps School of Advanced Warfighting and the AI language model ChatGPT and the potential to enhance the OODA Loop process highlight the importance of embracing AI's capabilities. By leveraging AI in military training and decision making, the Marine Corps can improve its ability to adapt and respond to rapidly changing environments and maintain an advantage in complex situations. However, it is essential to consider the ethical implications and potential vulnerabilities associated with AI systems, ensuring they are used responsibly and effectively to support national security objectives. It also must not be forgotten that AI is just a tool that can help offer ideas and guidance while officers observe, orient, decide, and act but, we cannot forget that AI is a technology that generates ideas and in no way undermines Boyd's maxim, "people, then ideas, then technology." In fact, this AI makes the human component more important than ever.

USMC

Automation for Future Conflicts

The requirement for infrastructure and processes to enable the software development lifecycle

by Maj David "Skip" McGee

>Maj McGee, is a Communications Officer currently assigned to the Marine Coders section, Innovation Laboratory Branch in the Marine Innovation Unit. Maj McGee previously deployed as the Officer in Charge of the Deployable Joint Command and Control Detachment 20.2. He has served with MARFORPAC as a C4 Operations Officer, as the Operations Officer for Marine Wing Communications Squadron-48 Det A Fwd, as the S-6 Director for Marine Corps Air Station Yuma, and held Platoon and Company Command at 8th Communication Battalion.

In *Force Design 2030*, Commandant Berger identifies an imperative requirement to modernize the force,[1] "[F]uture Marines will possess ... the intellectual and technical skills required to innovate, adapt, and succeed in the rapidly changing 21st century operating environment."[2] In a technology-dominated operating environment, automation is essential to mission success.[3] The Russian war with Ukraine produced software applications enabling decentralized targeting and automated alerting.[4] Innovation through automation provides a leaner, increasingly efficient, and effective fighting force. The requisite technical infrastructure and software lifecycle process do not currently exist to enable Marines across the force to effectively automate solutions to current and future problems. What infrastructure and processes should be developed to enable the development of automation within the Marine Corps?

Successful Application Development Example

While writing a deployment's worth of fitness reports over a satellite connection from a tent in Jordan, I was frustrated that the connection periodically failed. The first couple of times I was informed that the weather at the distant end was bad so there was not any point in troubleshooting. Marines are accustomed to adapting to marginal conditions. After a while, I started wondering why the weather in Lago, Italy, was so bad. Is this weather problem real a convenient answer for the satellite controllers to avoid messing with power or troubleshooting the connection? It was perpetually dry and sunny in Jordan, so at least half of the satellite shot seemed to be without weather impacts. I checked the weather after the connection was restored and quickly found that the weather issues the controllers reported did not in any way match the weather reporting. This problem became so frequent that I kept browser tabs dedicated to the weather at different locations. Eventually, I was tired of asking my Marines to get past the weather story. I wrote a short Python application to concurrently display the weather at two locations using data from a free weather Application Programming Interface (API). I turned this application into a Windows executable, and one of my Marines wrote a PowerShell script to sign the application with the domain certificates for use on our laptops.[5] Shared network storage enabled distribution of the application to any user who desired to run the executable. This application development, testing, and delivery lifecycle worked because the infrastructure (domain, servers, and workstations) was entirely maintained and administered by my unit. We possessed both the requisite infrastructure and the capability to develop a software lifecycle process. While five detachment rotations later this application may no longer be used, this experience demonstrates that small problems can be solved or reduced through automation.

External Federal Application Development Example

Looking outside the Marine Corps, here is an example of an existing software development lifecycle in a different federal agency. Developers who work on an application test and change their code locally and then commit their changes into a GitLab repository. As code is added/changed and committed to the code repository, the repository's continuous integration pipeline uses runners to build the code into a Red Hat Package Manager package and run applicable functional tests to ensure that the changes do not negatively affect the application's performance. The pipeline continues to execute other jobs, such as checking for dependency vulnerabilities and security concerns with Static Application Security Testing tools and potentially with dynamic testing tools. Assuming that problems are not detected, the continuous delivery portion of the pipeline then signs the Red Hat Package Manager and

deploys the package to a development environment yum server repository. When the hosts in that environment run a periodic update, they update to the latest application version. This process occurs seamlessly, without manual intervention, unless there is a need for developer attention to resolve a functional issue or security problem. Additional functional and dynamic tools are run against the new version of the application in the development environment up to and potentially even including user testing. At some point in this review process, another pipeline is triggered to push the application from the development environment to the production environment repository where the production hosts update to the new version. Is there a reason that we could not create a similar infrastructure and software development process within the Marine Corps Enterprise Network (MCEN)?

Failed Application Development Example

The MARFORPAC G-6 watch described their process for obtaining intelligence and awareness of cyber threats and threat actors in the INDOPACOM Area Of Responsibility. Commercially procured and tailored threat intel data was too expensive, so they maintained a list of over thirty uniform resource indicators or websites that they read daily in order to identify changes and relevant events in the area of responsibility. This task was time intensive, depended entirely on the analyst for its thoroughness, and did not scale well as websites or uniform resource indicators were added. I saw an opportunity for automation and wrote a Python web scraper to identify occurrences of the keywords that they were looking for within the website list and return the corresponding paragraphs, so the analysts only needed to review a relevant subset of websites instead of iterating over the whole list. This solution could enable the watch to increase its list of uniform resource indicators and improve its area of responsibility awareness while both reducing the time spent browsing the list and standardizing the review across watch officers. Yet, I could not find a path to integrate this script into the MCEN for the watch officers to use. Lack of hosting resources, proxy problems, and lack of shared authentication were the challenges. Since I could not identify the approval process or automate the distribution of a software product into the MCEN, the initial code was migrated from DevForce to GitHub.[6] However, this meant that all work had to be conducted outside of the MCEN due to the inability to access GitHub to make code changes and work on the app from inside the MCEN. Once the first conceptual version of the application was ready for testing, I could not find an effective solution for hosting it or identify the process for hosting such an application in the MCEN. I considered using a raspberry pi to host a web user interface based on the script on my home network but decided that the lifecycle maintenance of the application and user accounts would be too much to support on my own for free. This project failed due to the lack of hosting infrastructure and process for development, testing, approval, and delivery.

Is there a reason that we could not create a similar infrastructure and software development process within the Marine Corps Enterprise Network (MCEN)?

Sharing Solutions

Building infrastructure to enable automation is a shared joint problem. The other Services understand the 21st-century operating environment and the value of automation. The MCEN now makes VSCode, Anaconda, and RGui available to end workstation users in the software center—so the suite of user development tools is growing. The Defense Information Systems Agency's GitLab instance is a significant step toward a SecDevOps infrastructure that enables joint application development. This resource is accessible from inside the DOD Information Networks, freely available to users who desire to host a project or repository, and uses common access card authentication as well as personal access tokens for pushing/pulling code changes. GitLab runners (if unfamiliar, think computation and processing for continuous integration jobs) can be registered to this instance to enable building software from the code repositories using continuous integration/continuous delivery pipelines, enabling a developer or developer team to build an application entirely inside the DOD Information Networks.

From a knowledge and capability perspective, integration with the Reserve Component can provide expertise using the existing initiatives of the Marine Corps Software Factory and the Marine Coders.[7] The 06XX community possesses the 0673 MOS, which is developing the pipeline to train Marines.[8] Simultaneously, the coding and automation skills of the average Marine are advancing as programming courses increase in popularity in high schools and colleges.[9] Project this trend into the next ten to fifteen years and the ability of a Marine to automate a problem will be correspondingly higher. We must develop the infrastructure and processes to weaponize that ability.

Analyzing the Problem

While a case could be made for Service-specific GitLab/GitHub instance, we will assume here that the DISA infrastructure remains freely available to any service member. The remaining challenge, therefore, is integrating the continuous delivery portion of a pipeline into the MCEN. This process begins by registering runners inside the MCEN. Then we need to answer some organizational questions to determine the way forward, such as how do we authorize and deploy applications? What are the resource requirements and what is the secure delivery process? Web applications, applications signed

with DOD Certification Authority certificates, and corresponding web access firewall implementations could add a requirement for closer coordination and support from system administrators and potentially manual intervention into the deployment cycle. How does that application development cycle occur quickly and securely?

There are essentially two potential destinations for these applications, a test/development environment and a production environment. The infrastructure for these two potential destinations does not exist (to my knowledge) but would be relatively easy to create, potentially via defined network rules with access to create FedRAMP-approved Red Hat Enterprise Linux virtual machines in Azure or Amazon Web Services to use as runners and application hosts (with some additional security controls around the production environment).

There are three different distribution methods that should be considered, broken down by operating system package manager: a yum/dnf repository for Red Hat Enterprise Linux hosts (assuming an Aptitude repository is unnecessary), integration into System Center Configuration Manager for Windows, and container repository integration. For the moment, we can ignore the container distribution method.The knowledge base or infrastructure of containers, container runtimes, and container registries is currently not resident within the MCEN and FMF, and creating both that knowledge base and infrastructure is a much heavier lift than the solutions I propose.

There are two different application use cases that need to be considered, distinguishing whether that application is deployed to a server or a workstation. Server applications could be hosted in an environment with authentication, defined/limited network access rules, and Domain Name System integration, whereas workstation applications would need to be installed and tested on workstations, presumably requiring local administrative access to the workstation.

While each of these components of the application development cycle possesses unique characteristics and technical problem subsets, the overarching problems that the Marine Corps must solve are infrastructure ownership, defining the application lifecycle process, and funding the supporting infrastructure. The overall resources required to maintain the infrastructure described here are very minimal, not more than one full-time equivalent employee or military member, and some associated costs for virtual machine licensing in Amazon Web Services or Azure. The most critical problems are determining the ownership and application lifecycle process.

The Marine Corps must ... enable software development, testing, integration, and delivery.

Conclusion

Consider a logistician who develops an application or script to help automate a transportation problem and several users in combat operation centers worldwide want to install and use it. How would that Marine accomplish that task right now? Would they contact people at Information, Command, Control, Communications and Computers and Marine Corps Cyberspace Operations Group and try to work their way uphill to develop a development process and infrastructure? Quite possibly they would give up in frustration once someone mentions the most dreaded three letters in military information technology: the ATO (authority to operate). How should they tackle that problem? We need a defined process and infrastructure for completing that software development lifecycle at the pace and timeline of the warfighter. Commandant Berger ordered us to innovate, adapt, and succeed. The Marine Corps could lead the Services in developing secure coding practices and secure application delivery practices and processes because we have the capability to do better. We are growing the requisite knowledge base across the force. We do not currently possess the Service-level infrastructure to enable secure automation and application development. The Marine Corps must develop a resourced testing/development environment and define the approval process to enable software development, testing, integration, and delivery.

Notes

1. David H Berger, *Force Design 2030* (Washington, DC: May 2020).

2. Ibid.

3. Charlie S. Bahk, "Announcement of the Marine Corps Software Factory Pilot," *Marines.mil*, March 30, 2023, https://www.marines.mil/News/Messages/Messages-Display/Article/3325426/announcement-of-the-marine-corps-software-factory-pilot.

4. Drew Harwell, "Instead of Consumer Software, Ukraine's Tech Workers Build Apps of War," *Washington Post*, March 24, 2022, https://www.washingtonpost.com/technology/2022/03/24/ukraine-war-apps-russian-invasion.

5. David McGee, "WeatherScraper," *GitHub*, November 29, 2020, https://github.com/skipmcgee/weatherscraper.

6. This resource https://gitlab.devforce.disa.mil was last accessed in July of 2022 and appears to no longer be accessible, perhaps replaced by https://web.git.mil.

7. "Announcement of the Marine Corps Software Factory Pilot."

8. Ibid.

9. Additional information is available at https://advocacy.code.org/2022_state_of_cs.pdf.

Ground Logistics Vehicles in the Marine Corps

The future hinges on developing concepts of employment vice prototypes

by LtCol Douglas K. Peterson

The Marine Corps has a problem with the tactical ground vehicle fleet. Despite best efforts to design force protection for the next generation of vehicles, the enemy will continue to innovate and find new ways to destroy combat vehicles. This path of escalation is not sustainable. This chain needs to be broken. Introducing autonomous platforms to the ground fleet vice building larger, heavier vehicles is a more strategic alternative to break the chain. The Marine Corps must leverage autonomous technology in the future for a more capable ground vehicle fleet that is posed to compete on the battlefield at a sustainable cost.

As autonomous vehicle technology advances, it will be cheaper to design driverless vehicles than to design vehicles with the necessary level of force protection to protect their occupants from external threats. That day is not here yet, but the Marine Corps needs to be ready for when it is. Unmanned ground vehicles (UGVs) have been experimented with for over 90 years. The Soviets first started developing UGVs that were based on their T-18 and T-26 tanks in the 1930s and were first used in the 1940 Winter War against Finland.[1] The Defense Advanced Research Projects Agency (DARPA) has been at the forefront of UGV technology development in the United States. The book, *Autonomous Vehicles in Support of Naval Operations,* was published in 2005 by the National Research Council to review lessons learned with the implementation of autonomous vehicles in the military and identify capabilities needed to improve their utility as well as which technologies need to be further developed.[2] This research builds upon these findings but differs as it takes a deeper look into why the progress in adapting this technology has slowed. In the *2001 National Defense Authorization Act*, Congress set a mandate that one-third of the operational ground combat vehicles in the military was to be unmanned by the year 2015.[3] The ability of the military to meet mandates, goals, and estimates such as this continues to fall far short of expectations for numerous reasons.

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The Marine Corps Warfighting Laboratory executed a manned and unmanned teaming limited operational assessment to effectively combine robotics, sensors, manned/unmanned vehicles, and dismounted Marines. *(Photo by MCWL.)*

Background

The Marine Corps spends a great amount of money on designing force protection for Marine ground platforms. The Mine Resistant Ambush Protected (MRAP) vehicle program is rightly viewed as a success but came at a price tag of over $45 billion.[4] This force protection is needed to protect Marines and sailors that ride inside the vehicle and is demanded by an American public that does not want to see the unnecessary loss of life from its young patriots. It is a fact that armored vehicles save lives. In the beginning stages of Iraq and Afghanistan when IEDs became the weapon of choice by the insurgents, the Marines hardened their HMMWVs with whatever materials were available, from sandbags placed on the floorboards to additional steel plates attached on the outside. As a result, IEDs became more powerful to counter the additional protection. In an attempt to counter the enemy's more lethal IEDs, the Marine Corps introduced the MRAP, which was requested by the battlefield commanders as an urgent requirement due to high losses to Marines and soldiers in HMMWVs. The MRAP is an example of a success story and specifically demonstrates how the acquisition community responded quickly to an urgent requirement and introduced a life-saving capability. The increased ground clearance, added armor, and "V"-shaped hull of an MRAP provided drastically improved levels of protection for Marines.[5] As a countermeasure to the introduction of MRAPs, the enemy again adjusted tactics by emplacing even more destructive IEDs.

As the majority of these IEDs were initiated via pressure plate switches, the next solution was to attach mine rollers to the front of the MRAPs. This would cause the IED to be detonated when the mine roller went over the IED, causing the blast to occur twenty feet in front of the Marines in the cab of the MRAP and destroy the mine roller vice the MRAP. This was a good innovation by the Marines. In response, the enemy began emplacing the IED and the pressure plate initiator at an offset so that, if the mine roller triggered an IED, the blast would still be centered underneath the cab of the vehicle, not the mine roller. The Marines varied tactics so that not all MRAPs employed the mine roller and left the enemy to guess how to emplace their IEDs. This change in tactic continued to be somewhat effective but not entirely. The Marines could continue to increase ground clearance and add thicker, harder steel to the outside of vehicles to defeat the majority of IEDs emplaced in the ground, but as seen in the recent civil wars in Syria, the Azerbaijan-Armenia conflict, and the Russia-Ukraine conflict, the next threat to vehicles may not be something buried in the ground beneath them but loitering in the sky above them. Loitering munitions are cheap (less than $10,000 per copy) and plentiful.[6] These munitions can defeat a tank from above and require a whole new way of thinking to protect against. Design challenges make it more difficult to protect a vehicle from an overhead threat than it is to protect it from blasts coming from below the vehicle. New threats will continue to emerge and the cost to design and build vehicles to protect against any possible modern threat will become too great to field a vehicle in the necessary quantities. This chain needs to be broken somehow.

... the terms "unmanned" and "autonomous" will be used and it is important to understand the difference ...

One mitigation to counter IEDs that the Marine Corps has tried is to conduct "left-of-blast" countermeasures. Left-of-blast is a term commonly used to take actions and implement countermeasures that target the time before the IED is detonated, thereby causing the IED not to explode or to explode in a way that is harmless to the vehicle occupants. The DOD established the Joint Improvised Explosive Device Defeat Organization (JIEDDO) in 2006 to explore and identify ways to prevent, identify, and defeat IEDs.[7] The organization enjoyed some success in rapidly fielding capabilities that could detect and neutralize IEDs, such as electronic countermeasure systems like the Chameleon and Combined Vehicle Radio Jammer that jammed the signal of radio-controlled initiated IEDs. JIEDDO also created training to help service members identify IEDs preemptively.[8] Overall, the capabilities JIEDDO provided undoubtedly saved the lives of numerous Marines by preventing IED blasts from ever occurring.

Another method to respond to the threat of IEDs is to just accept a certain percentage of loss of life. If it is cost prohibitive to design against all known threats, but the mission can still be accomplished with existing equipment and an acceptable loss of life, the expectation that lives will be lost must be accepted to accomplish the mission. This is not the strategy that the Marine Corps should be pursuing in peacetime nor is it one that the American public would accept during war. Therefore, the only way to break this chain of improved measure versus countermeasure is to remove the object that is valued above all else: the individual Marine or sailor that is riding inside the vehicle. Taking the driver out of the equation requires one thing and enables another. First, removing the driver will also remove the intuitive mechanical operation that a driver possesses and thereby requires the vehicle to operate without the input of a driver in the cab. Secondly, removing the driver allows for a design that does not need to protect a fragile human occupant, which will have a cascading effect on the reduction in weight, complexity, and cost of the vehicle. Freedom of design to focus on capability vice protection and comfort is the key to achieving cheaper but more effective logistics ground vehicles.

Before further discussion of the technologies, it is necessary to define a few terms. In this article, the terms "unmanned" and "autonomous" will be used and it is important to understand the difference between these terms. Unmanned can be defined as "without the physical presence of people in control."[9]

Autonomous will be defined as "acting independently or having the freedom to do so."[10] The main difference is that unmanned may still have a human controlling the vehicle, just not physically present with the vehicle, while autonomous means that the vehicle is designed to operate without a human's input. The term driverless may also appear in this article when referencing other publications. Depending on its use, the term driverless can refer to a vehicle that is unmanned or autonomous. This will be clarified as it is used. There are also differences in the level of autonomy. Two types of autonomous technology are "leader-follower" and "point-to-point" navigation. Leader-follower is the type of navigation that enables one vehicle in a convoy to follow the vehicle in front of it. Leader-follower requires fewer sensors and autonomous features as that navigation type can assume that if the vehicle in front of it just went over a swath of terrain a few seconds prior, the following vehicle can also safely follow in trace. This type of technology is the easier form of navigation to achieve between the two types. Point-to-point navigation employs additional autonomous features and is more advanced than leader-follower technology. In point-to-point navigation, the vehicle formulates its path from the point of origin to the destination. To successfully navigate, the vehicle must employ a host of advanced sensors to sense the terrain around it and use a variety of algorithms to continuously make observations and decisions about the optimal path.

Military UGV Experimentation

Previous research conducted by DARPA and the National Research Council sheds light on the current state of UGVs. The Grand Challenge was issued industry by DARPA in 2004 and offered a one million dollar prize to the team that could successfully traverse a course from Barstow, CA, through the desert to Primm, NV. In the first year, none of the fifteen finalists were able to complete the course, and the award went unclaimed. Of the fifteen finalists, there were a host of challenges the UGVs experienced while navigating the course. Four vehicles became mired in the terrain, two vehicles encountered navigation or software issues and were removed from the course, two vehicles became entangled or confused by fences and could not continue, one vehicle overturned while negotiating a 90-degree turn, and six vehicles did not even make it out of the starting area without suffering a malfunction or contacting the starting chute. The UGV that traveled the farthest completed just 7.4 miles of the 142-mile course.[11] However, the challenge was still seen as a success because interest was generated; a year later, another challenge was held and five teams completed a different course.[12] Where the first Grand Challenge incentivized the research community, industry began to take a greater interest in developing autonomous technology. In 2005, the National Research Council concluded that UGVs have great potential to support the Marine Corps and recommended that the Navy and Marine Corps should accelerate the introduction of UGVs and specifically for the Assistant Secretary of the Navy for Research, Development, and Acquisition, the Chief of Naval Research, Marine Corps Systems Command and the Marine Corps Warfighting Laboratory to partner with the operational community to further develop critical technologies needed for UGVs to succeed.[13]

The Marine Corps has accelerated experimenting with UGVs over the last ten years. In 2012, the Marine Corps Warfighting Lab experimented with the Oshkosh Defense-built TerraMax UGV

This UGV is essentially the Medium Tactical Vehicle Replacement with a kit installed to provide autonomous capability. The TerraMax used in 2012 was a descendant of Oshkosh's entry into DARPA's Grand Challenge in 2004. In 2004 it only completed 1.2 miles of the course.[14]

The Marine Corps Warfighting Lab has also been experimenting with the Expeditionary Modular Autonomous Vehicle since 2017. This UGV was originally designed as a tracked vehicle with a 7,200-pound payload capacity that could transport ammunition and supplies at a range of 50 miles via preprogrammed GPS waypoints. However, within the first year of testing a remote-controlled .50 Cal was integrated into the platform along with the capability to launch lethal drones, essentially changing the platform from a logistics vehicle to an assault vehicle.[15]

Another UGV the Marine Corps has looked at is a 6x6 wheeled vehicle called the Hunter Wheeled Offload Logistics Follower (WOLF). This is a smaller UGV with a 2,200-pound payload capacity that uses a hybrid diesel and electric power plant with a 200-mile range. The autonomous features on the UGV fall more in line with leader-follower technology as it is designed to follow a dismounted Marine that carries a handheld wireless controller. The company, HDT Global, is working on designing additional autonomous capabilities. An experimental Marine Corps infantry battalion has used the Hunter WOLF in the mountains of West Virginia to conduct missions such as re-supply and casualty evacuation in February 2022. Mine-clearing, supporting direct and indirect fire support, and communications relay nodes are additional mission sets this vehicle could be configured for.[16]

More recently, the Marine Corps awarded a Small Business Innovation Research contract in September 2022 to a company based in Colorado to develop the Remote Expeditionary Autonomous Pioneer. The Small Business Innovation Research will fund a six-month effort by Stratom to develop a multi-use uncrewed platform that can be internally transported by a V-22. The Remote Expeditionary Autonomous Pioneer will be an off-road, remote-controlled vehicle that allows Marines the ability to conduct a variety of missions such as logistics resupply and mine-clearing from a distance.[17]

Perhaps the most high-visibility UGV the Marine Corps is experimenting with now is the ROGUE Fires, which leverages technology and design elements from the Joint Light Tactical Vehicle to create the cab-less chassis. The ROGUE Fires is being paired with a launcher that fires the Naval Strike Missile to form the Navy-Marine Expeditionary Ship Interdiction System. The Navy-Marine

Expeditionary Ship Interdiction System successfully launched a missile from land and hit a target at a range of over 100 miles at sea in August 2021.[18] This vehicle can be remotely operated by a Marine walking near the vehicle with a tethered controller or function in a leader-follower mode. Since the JLTV utility variant has a payload capacity of 5,100 pounds, and that payload could be doubled with the addition of its accompanying trailer, the potential to use this platform as a logistics delivery platform as part of a convoy in leader-follower mode is something the Marine Corps should be aggressively pursuing now.

Mission creep appears to be a common theme with UGV experimentation. The technology seems straightforward to develop a truck that must only follow the truck in front of it without the need for a driver. However, most of the efforts the Marine Corps begins experimenting with evolve into multi-use platforms that can do everything from hauling beans, bullets, and band-aids to mine clearing, casualty evacuation, firing a remotely operated .50 cal machinegun, and launching drones. This identity crisis for what the Marine Corps wants out of a simple UGV has unnecessarily complicated what should be a manageable goal.

Industrial Base UGV Capabilities

It is an understatement to say that the commercial industrial base is far ahead of the military in the development and testing of unmanned vehicles. Passenger car and heavy equipment companies such as Tesla and Caterpillar have developed, marketed, and delivered products with some level of autonomous capability. In the case of Tesla, the company has run into some challenges in achieving the level of autonomy it originally promised but is still able to provide cars with impressive capabilities. According to an outside source, a Tesla automobile in full self-driving mode can plan and navigate a route from origin to destination without a steering wheel or pedal input from a driver, obey traffic signs, and employ accident-avoidance features such as automatic braking and lane departure override. What it does not do is free the driver from responsibility should an accident occur. The driver of the Tesla remains required to stay alert and ready to respond in the case of errors the car may be about to make.[19] With advancements in autonomous technology on the road, off-road construction vehicles have also benefitted.

A simulated casualty is placed onto the back of the Ground Unmanned Support Surrogate, experimental technology being tested by Marine Corps Warfighting Lab. *(Photo by Sgt Sarah Dietz.)*

Caterpillar has developed unmanned capability in the form of remote-controlled large dozers and wheel loaders that enable an operator to fully control the machine from a remote command station they call "Cat Command." Keeping the operators in a controlled environment instead of in the cab of the dozer keeps them out of harm's way for potentially dangerous missions. Operators can switch between running numerous pieces of equipment from the same ground station.[20] These dozers can be ordered from the factory with the ability to be operated remotely, with a cost, depending on the capabilities needed, of approximaately $100,000 for a base kit.[21] The Caterpillar company's stated reason behind providing this capability is to protect operators, essentially the same goal that the Marine Corps has in pursuing this technology. As this is a remote-controlled kit, this would not be considered autonomous but is a transitionary step the Marine Corps could take now to keep logistics convoy truck drivers off the road. Similar to how Air Force pilots fly weaponized drones and release their payload over Afghanistan from Air Force bases in Nevada, motor transport Marines operating trucks remotely from their base in Camp Lejeune or Camp Pendleton could conduct resupply convoys on distant battlefields. Of note, Caterpillar is working on full-autonomous technology, essentially giving a piece of heavy equipment a mission and letting it conduct it without an operator actively controlling it.[22]

Academia is also involved in the research and development of autonomous technologies. College campuses all over the United States have teamed up with startup companies to conduct pilot projects that involve food delivery robots that travel from kitchens to dormitories along sidewalks. These robots utilize lidar radar, cameras, and GPS trackers to traverse college campuses in a geofenced environment. The goal of one of these pilot projects—a partnership between Ohio State University and Cartken, a robot-sidewalk delivery startup—is not so much to demonstrate that the technology works, the robots have already proven capable of performing their mission, but to demonstrate they

can do it for half the price and in half the time of other delivery services.[23] On some of these college campuses, the utilization of autonomous vehicles, has graduated from proving the technology to full implementation based on a business case analysis.

A more closely related case study from the civilian sector is the recent demonstration by Kodiak Robotics and U.S. Xpress. In March 2022, a driverless truck was used to make four round trips from Dallas to Atlanta.[24] This demonstration was conducted to show how a driverless truck could haul freight over the road safely at a pace humans could not keep up with due to their need for rest. A lone driver would have taken ten days to move the same amount of freight that the driverless truck moved in five days. The advantage highlighted by this demonstration focused on how this technology could provide a solution to current truck driver shortages. The computer does not need to take breaks for eating and sleeping so as long as fuel is in the tank. The demonstration successfully proved that cargo could be transported across miles of interstate and the truck, heavy with sensors, was able to navigate and negotiate traffic along the way. This demonstration was not a complete success though. According to the *New York Times* article, teams of safety drivers were regularly rotated to always include someone behind the wheel and these safety drivers had to take control of the steering wheel several times over the course of the 6,300-mile trip.[25] The article does not detail the causes for the interventions but does state that the technology has no problem staying on course, merging, and negotiating other cars changing lanes. The situations where the safety driver acted were in response to sudden occurrences, such as a traffic accident occurring right in front of it. This is an admission that their autonomous technology is not 100 percent safe yet, but it is important to keep in mind that these are heavy trucks operating at freeway speeds surrounded by much more agile smaller cars. In addition to safety drivers having to intervene, the demonstration did not include the truck driving into either city. A stop would be made outside the city to transfer its freight to a traditional truck for the "last mile."[26]

What is similar among the civilian companies reviewed previously is that each of these companies, Tesla, Caterpillar, Cartken, and Kodiak Robotics have developed the technology in response to demand. For Tesla, it is the demand of car enthusiasts that want to own a car with the most advanced technology of any car manufacturer. With Caterpillar, it is to market a product to the construction industry that will protect its operators conducting dull, dirty, and dangerous missions. Cartken strives to improve performance and cut costs to deliver food to hungry students on college campuses while Kodiak Robotics is looking to attract the interest of freight companies that want to move more freight efficiently during a truck driver shortage. The demand for autonomous trucks in the Marine Corps is to accomplish the mission with fewer lives lost.

Concepts of Employment for the Marine Corps

The Marine Corps would benefit from utilizing autonomous technology for long-haul resupply convoys, both on and off-road in semi-permissible environments. The Marine Corps may want to take an iterative approach to employ autonomous technology. A remote kit would allow drivers to operate the vehicle but not be physically present with the vehicle. Unmanned technology would allow the Marine to be out of harm's way but still able to observe the environment and monitor the truck from the safety of a remote command station, not unlike the CAT Command Station that Caterpillar offers. The unmanned capability would also reduce the manpower needed to drive trucks. The next step is implementing full leader-follower technology. These mixed convoys would consist of a minimal number of Marines in gun trucks at the lead and trail end of the convoy for protection and driverless is leader-follower logistics trucks forming the bulk of the logistics train. The last step in the implementation of autonomous technology would be to implement full convoys of driverless trucks moving logistics throughout the battlefield, manned only with drivers during motor pool operations and the last tactical mile if needed.

The most useful concept to experiment with now would be partnering unmanned aerial vehicles (UAVs) with UGVs during convoy operations ...

The most useful concept to experiment with now would be partnering unmanned aerial vehicles (UAVs) with UGVs during convoy operations using a loyal wingman concept that links UAVs to UGVs. An un-piloted UAV could travel with the convoy and maintain a bird's-eye view of the battlespace and would also be a visual deterrent to would-be attackers. For extended-duration logistics convoys, there could be two UAVs that could take turns in the air, with one in observation mode and one self-docked to a vehicle in the convoy while recharging. Another concept to experiment with would be continuous route surveillance. The Marine Corps attempted this with Aerostats (persistent surveillance via cameras mounted in balloons flying high above FOBs) in Afghanistan but even these were limited in their ability to maintain 100 percent situational awareness because of their static nature. In areas with a high IED threat, the Marine Corps could employ swarms of UAVs coupled with artificial intelligence capability that saturate a route and indicate when and where potential IED emplacement activities occur. There are drone platforms available in the civilian sector today that could be used to test this concept for mere thousands of dollars.[27] These drones could satu-

rate a 250 km route, roughly equal to the distance between COP Payne and Camp Leatherneck, Afghanistan, with overflights at two-minute intervals for the same cost as one JLTV. Yes, some of these UAVs may be lost to enemy action, but with continuous surveillance and immediate counterfire at the ready, the kill chain could be preserved and the enemy responsible could be identified and potentially neutralized immediately.

Another potential concept of employment is to use numerous swarms of small UAVs with UGVs with smaller payload capacities to deliver supplies to remote Marine Corps outposts. Some percent of asset loss would be expected, but they would be acceptable at thousands of dollars per copy vice hundreds of thousands of dollars per copy. A thorough assessment and business case analysis would need to be conducted to determine the viability of that concept of employment.

UGV Benefits

There are obvious advantages of expanded UGV use in Marine Corps operations. Getting Marines out of the driver's seats on dull, dirty, and dangerous missions would not only keep them from potentially being an IED casualty but would allow that Marine to be used in another capacity, an important force structure savings. Additionally, the reduction of armor and less complicated vehicle designs would make for a more reliable and sustainable fleet of vehicles that is cheaper to operate and maintain. The added weight of armor drives up vehicle costs in more ways than just the extra armor. The JLTV is a recent example. The JLTV needs a highly advanced suspension system to carry its 17,000-pound mass and has a payload capacity of 5,100 pounds. Due to its performance and complexity, the Marine Corps is paying a premium for the JLTV. Autonomous vehicles would not have to be hardened to the same extent as vehicles carrying human occupants. The weight reduction would allow the Marine Corps to utilize vehicles with less exquisite design solutions. This would have a cascading effect on the price, all in the good direction. An initial reaction to that statement would be that the cost savings would be countered by the increased expense of designing autonomy for the vehicle. However, the Marine Corps has the advantage of autonomous ground vehicles being a very popular research area in the commercial market right now and can leverage what the industry is already working on instead of conducting research on its own. Leveraging commercial-off-the-shelf technology with just minor modifications for military use could be a very real possibility.

The benefits of removing drivers would have a cascading effect on truck design. Without the need for heavy armor to protect the fragile occupants, cascading design effects would allow for changes to the truck's engine, transmission, and suspension system resulting in a less exquisite truck. This means less weight to support the hardening of the vehicle and more available payload capacity. Climate-controlled cabs and other creature comforts that must be designed into the truck to keep drivers comfortable would not be necessary. Anti-idle features could be implemented without the need to figure out how to keep the occupants warm or cool as there would be no occupants. The range of the trucks would thereby be increased. Producing a truck with a less exquisite drivetrain and comfort features would also require less maintenance on the trucks and fewer repair parts choking up the supply chain and competing with battlefield essentials such as food, water, and ammunition. The reduced maintenance on the drivetrain may be somewhat countered by increased maintenance of the sensors and other autonomous features that will undoubtedly require troubleshooting and maintenance as well. The Marine Corps is always looking for more tooth and less tail; embracing autonomous technology could achieve that as fewer motor transport Marines would be needed in the Marine Corps end-strength. The Marine Corps could invest more personnel into Marine Littoral Regiments, which will be necessary to win a potential war with China. The Marine Corps could contract civilian truck drivers based in the United States to conduct the remote operation of vehicles during stage one, and some could even be collocated with the Marines to conduct motor pool operations within the wire of forward operating bases.

Cost savings could be significant if the Marine Corps transitioned its strategy from designing for force protection to designing for autonomous capability. The price of an unarmored HMMWV was $37,000 in 1983.[28] The newly fielded JLTV that has the performance of the HMMWV with the protection of an MRAP has an average cost of $453,000 in 2023.[29] Assuming you could purchase a base model version of the HMMWV with a Cat Command-type autonomous kit you could theoretically save $241,000 per vehicle. Recognizing it is unfair to compare 40-year-old vehicle technology to today's technology, merely adjusting for inflation is not a fair comparison. However, if you designed the vehicle from the start to be unmanned, meaning no cab or other creature comforts, the comparison may be fairly close. Rough calculations are calculated below in Table 1.[30]

Vehicle Type	1983 cost	2023 cost (adjusted for inflation)	Autonomous kit	Total cost
HMMWV	$37,000	$112,000	$100,000	$212,000
JLTV		$453,000		$453,000

Table 1. Cost comparison of unarmored, autonomous HMMWV to JLTV.

UGV Challenges

Although some may look at the current state of UGVs in the civilian sector and bemoan the Marine Corps for not being further down the path of embracing autonomous vehicles, there are very good reasons that UGVs have not taken over the roles of motor transport Marines yet. The differences between an open desert or freeways in the United States and a foreign battlefield cannot be overstated. In the private sector, companies rely heavily on excellent maps and crowd-sourced data while the Marine Corps would not have that luxury on the battlefield. The worst operating environment the commercial industry might face is probably more permissive than the best scenario the DOD might face on a foreign battlefield. Tesla and Kodiak Robotics are having enough difficulty designing automobile accident-avoidance procedures without having to think about what to do if someone actively attacks their vehicle. UAVs have been implemented into military operations since the beginning of the War on Terror. One reason for that is there are enormous differences between the air, land, and sea domains. The air and sea domains are vast voids, with little to no adversary presence. Not so with the land domain. Many logistics convoys take trucks through the heart of villages, often passing by adversaries within meters and under the observation of the adversary during much of their transit time.

Numerous concerns from experienced motor transport officers in the Marine Corps will make it a challenge for UGVs to be a fully accepted part of the battlefield. No matter how many sensors you put on a UGV there are senses that current technology is not able to replicate. For example, the sense of smell, facial expressions of civilians, speech, distant sounds, behaviors of people and animals, and departure from baseline activity all together form a sixth sense or "Spidey sense" as sometimes referred to. An experienced Marine familiar with the area can sense when something is not right to a degree that a computer most likely will never be able to replicate. Cyber protection and operating in a degraded environment are other concerns as the UGV will receive commands remotely and use GPS for navigation. These concerns are amplified when considering our adversary in the next fight might be China. China has advanced cyber-attack capabilities that would introduce challenges to a ground fleet that depends on wireless communication and GPS. In leader-follower technology, maintaining line of sight with the lead vehicle is imperative to the rest of the convoy. In high dust environments or poor weather conditions, this line of sight would often be broken, stopping the convoy if using currently available sensors. This visibility issue could be mitigated by adding Bluetooth connectivity between trucks, but due to the cyber concerns already mentioned, this is not currently a viable option.

Autonomous vehicles will greatly enhance the capability of the Marine Corps.

Culture also plays a role in resistance to adopting UGVs. America has had a love affair with automobiles since they were first introduced over 100 years ago. The mating of man and machine and the driving experience will be something difficult to give up. Even as automatic transmissions have become more reliable and efficient than their manual transmissions counterparts, there is still a demand for manual transmissions, despite them being more difficult to operate.[31] In the military, some Services clung to the horse cavalry long after they proved unsuited to the modern battlefield. It is human nature to resist change, and the Marine Corps is no different. Marines love their trucks, and it will be difficult to remove drivers from seats until autonomous technology has overwhelmingly proven to be as reliable or more so on the battlefield as a Marine in the seat. Another concern some Marines have with removing Marines from driver's seats gets to the very heart of the Marine Corps' way of fighting. A Marine Corps logistics convoy is not just a collection of trucks and truck drivers moving supplies from one place to another. A convoy is a group of Marines and their weapons systems on a mounted patrol. If a convoy is attacked by small-arms fire the patrol will respond and gain fire superiority. This living, breathing threat serves as a deterrent to would-be attackers, and without that threat, small-arms and combined-arms attacks on convoys may increase. Looking back over the last twenty years, logistics convoys full of UGVs may have been ideal for an occupying force in Afghanistan and Iraq, but that does not mean it will translate well to the Marine Corps mission as an assault force against China.[32]

Conclusion

Despite millions of dollars and decades spent experimenting with ground-based UGVs, the civilian sector is significantly ahead of the military in the research, development, and production of autonomous technology in ground vehicles. Instead of competing against industry, the Marine Corps needs to acknowledge this new dynamic and rejoice that industry is ahead in technological advancement. In this way, the Marine Corps can be a fast follower of the civilian sector. The Marine Corps should immediately shift its experimental efforts on UGVs from developing and testing products to developing the concepts of employment highlighted throughout this literature.

This is an exciting time to be involved in ground vehicles in the Marine Corps. Autonomous vehicles will greatly enhance the capability of the Marine Corps. It is a waste of resources for the Marine Corps to try and assume the role of leading the technological advancements already made by industry in this area. The Marine Corps' best strategy is to focus on developing concepts of employment to apply future autonomous UGV technology while keeping a close eye on what the civilian sector is doing to position itself to be a fast follower as the technology advances.

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>Author's Note: The views expressed in this paper are those of the author and do not reflect the official policy or position of the National Defense University, the DOD, or the U.S. Government.

Fighter/Attack Aircraft in Support of Logistics

Resupplying and repairing with fighter jets in the weapons engagement zone

by Maj Timothy O. Warren Jr.

Conflict with a peer adversary will present challenges to the U.S. military that it has not experienced for decades—if ever. Specifically, the ability to project and sustain forces via traditional means will be contested at every step. As cargo aircraft and container vessels move deeper into the weapons engagement zone, their chances of being targeted by adversary anti-access and area denial (A2/AD) systems greatly increase and thus increasing the risk of forward-deployed units being isolated and starved into submission. These traditional means of logistical transportation are large, slow, and not very maneuverable with the additional problem of being limited in quantity. Tilt-rotor aircraft present a less risky means of force sustainment within the weapons engagement zone, but even these aircraft may be too limited in maneuverability and defensive capability to survive against a peer adversary. Additionally, we risk writing off 77- to 101-million-dollar aircraft and experienced aircrews that are stranded due to internal component failures or combat damage if aviation logistics assets cannot get to their location before being located and targeted by the adversary.[1]

The question arises then, how do we get supplies, personnel, and equipment into contested areas when traditionally transportation means are not viable options? An answer to this problem set is that we must establish the means of delivering supplies to units deep in weapons engagement zone with more versatile and harder-to-kill platforms. This is where fighter/attack aircraft can come into a new role as logisticians.

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Marines with Marine Fighter Attack Squadron 251 conduct maintenance on an F/A-18C Hornet. *(Photo by LCpl Koby I. Saunders.)*

With proper planning, development, and funding, Naval Aviation can equip its most maneuverable and defensible aircraft with the means of delivering critical logistical support to the units that need it the most. Fighter/attack sustainment is not an alternative to cargo aircraft deliveries or freight shipping, but a tool for operational commanders to sustain units whose location presents too much risk to traditional means of supply delivery. The increased ability to move critical assets around a theater allows for the dispersal of logistical hubs, increasing the number of targets that an adversary must factor when attempting to disrupt U.S. logistical operations.

The crux of the issue driving the assignment of a logistics mission set to fighter/attack aircraft revolves around sustaining force projecting. Force projection is a staple in U.S. operations and is a critical mission for the Marine Corps.[2] Getting forces close to peer adversaries brings challenges, but sustaining those forces in a contested zone

is where our traditional forms of logistics will be most strained. Slow-moving ships and aircraft present easy targets for technically advanced adversaries. This is on top of the already precise ballet that is required of large force sustainment during combat operations. To view the complexities of large force sustainment, look no further than the U.S. invasion of Iraq in 2003 where almost half of the available supplies in theater could not be distributed, requiring an operational pause just shy of the push into Baghdad.[3] The Russian stalled conquest of Kyiv during their 2022 Ukrainian operation further demonstrates the complexities of force sustainment on a modern battlefield even when operating near home territory.[4] When considering these factors, the option to deliver critical supplies via fast, maneuverable, and defensible platforms might be the difference between a groundbased unit operating for one more day or giving up the fight.

The F/A-18 may be one of the best aircraft currently in the U.S. arsenal for the fighter/attack sustainment mission set. First, this multi-role aircraft can carry an assorted number of items on its external mounting stations. These include a wide array of weapons (anti-ship missiles, anti-radiation missiles, anti-air missiles, various guided bombs, etc) but also include external fuel tanks and external baggage containers (blivets).[5] Secondly, the F/A-18 is a shore and afloat capable aircraft, allowing squadrons to operate from numerous places around a theater. Finally, this aircraft *could* (during a single sortie) deliver supplies, strike an enemy vessel, fight enemy aircraft, and provide close air support. Conducting all these mission sets in a single sortie would make the aircraft less than ideal for any one mission set, but the aircraft's versatility is undoubtable. Additionally, using a single F/A-18 to transport supplies or aviation logistics assets is in no way cost-efficient. However, four or more aircraft may be able to carry enough food, water, batteries, or small arms ammunition to resupply small units or critical parts of larger units for a critical day or two. Additionally, two F/A-18D/Fs could carry enough mechanics and equipment to fix a swath of issues on stranded aircraft well enough to get the damaged aircraft to a better repair location.

Marines with Marine Aviation Weapons and Tactics Squadron One complete the refueling of an F/A-18 Hornet. *(Photo by Cpl Eric Ramirez.)*

A significant issue with using most fighter/attack aircraft (V/STOL aircraft excluded) is that they need lengthy runways to land on and finding a usable runway on a contested island may be a challenge. There are potential methods of resupplying combat forces ashore even without a usable runway if these potential methods are considered and funded before a conflict. Without prior consideration and funding, we risk isolating forward-deployed units, or at best, we hope that ingenuitive aircraft mechanics can jury-rig parachutes to blivets in the hopes that their aircrew could accurately drop a handful of supplies to their groundbased brethren, but that implies a lot of risk to the aircraft, the aircrew, and the vital supplies. Instead, we can develop methods now such as the High-Speed Air Drop Container (HISAC). The HISAC was a fully tested design by the Army in the 1980s that was supposed to carry 500 pounds of supplies for forward-deployed Ranger teams that could be dropped by most fighter/attack aircraft in the U.S. arsenal at the time.[6] Though this design was proven effective, it was never funded, most likely due to the end of the Cold War. An additional concept that can be explored with existing assets is the delivery of select supplies from modified PDU-5 Leaflet Bombs. This asset is essentially a cluster bomb that at a pre-designated altitude, opens up and lets it pay load scatter across the ground.[7] The supplies inside of any PDU-5 "supply bomb" would need to be attached to parachutes so that they would not be destroyed upon impact, but this munition does present possibilities for resupplying ground forces.

A significant issue with using most fighter/attack aircraft (V/STOL aircraft excluded) is that they need lengthy runways to land on, and aboard a contested island, finding a usable runway may be a challenge.

When it comes to recovering stranded aircraft, many times one or two maintainers with the right equipment can repair an aircraft well enough to fly it directly back to a sufficient repair facility. Standard Naval Aviation practices require at least two qualified mechanics to fix most aircraft issues, but most mechanics could fix many issues by themselves in a pinch.[8] Pre-designed maintenance blivets could be assigned to a squadron's maintenance department and loaded onto a two-seat fighter aircraft that would also carry a single mechanic to assess and conduct hasty field repairs on stranded aircraft. Additionally, a second two-seat fighter could accompany the first aircraft to recover the pilot from the distressed aircraft if it could not be repaired. This recovery mission would allow U.S. forces to recover expensive, sensitive, and highly capable aircraft that would otherwise have to be written off while also bringing home valuable aircrew.

The limitations to the maintenance recovery mission include that the stranded aircraft be within the limits of capable maintenance for a single mechanic, that it be located at an operational airfield, and that it be within range of the recovery aircraft. Capable maintenance for a single mechanic can include repairs to fuel and hydraulic lines, hasty airfoil patches, and a variety of avionics issues.[9] Items such as removing and replacing large aircraft components would require more personnel and ground-support equipment which is beyond the carrying capacity for fighter/attack aircraft. Aircraft with vertical and/or short take-off and landing capabilities may be able to divert to areas inaccessible to traditional takeoff. In these instances, the stranded aircraft would need to be abandoned or slower means of recovery would need to be coordinated, if possible.

A final means of the fighter/attack aircraft performing a logistical role involves a modified mission set of a task that Navy F/A-18 Super Hornets already perform, refueling. The Super Hornet can conduct inflight refueling of other aircraft. This role would provide other fighter/attack aircraft the extra distance they may need to conduct other logistical missions. These same systems could be adjusted to refuel select ground equipment with some modifications. Additionally, all other fighter/attack aircraft in the U.S. arsenal can carry external fuel tanks for their own use. It is not a stretch to think these external fuel tanks could be carried and dropped off for units in isolated locations or used as air-delivered-ground-refueling points. It would take numerous aircraft to refuel any sizable unit for prolonged operations, but perhaps a few fighter/attack aircraft could provide just a few mission-critical ground vehicles with just enough fuel to prolong a fight or make a final push onto an objective.

The utilization of fighter/attack aircraft in the logistical support of small units is not a new concept.

The utilization of fighter/attack aircraft in the logistical support of small units is not a new concept. The Army's HISAC program was envisioned to resupply Ranger teams and the Navy Super Hornet inflight refueling mission is only designed to support a few additional aircraft. This article simply argues that a likely future exists where friendly forces may be isolated because a peer adversary can counter our traditional abilities to sustain forward-deployed units. Funding previously tested concepts, rethinking the utilization of existing resources (PDU-5s and external fuel tanks), and accepting changes to standard operating procedures (one mechanic versus a maintenance team) will allow the Marine Corps specifically and the U.S. military generally to deliver critical logistical support to vital units even when the adversary has a significant A2/AD capability.

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Theater Expeditionary Operations

First Punic War

by Mr. Joseph Miranda

One of the first strategic joint naval-ground campaigns in history was in the *First Punic War* (264-241 BC). The war pitted the growing Roman Republic against the established Carthaginian (or Punic) Empire. The Romans at this time controlled most of the Italian peninsula while the Carthaginian Empire ruled Northwest Africa, Southern Iberia, and various Mediterranean islands.

At the start of the war, Carthage possessed a large naval fleet and an army composed largely of mercenary contingents. The Romans had a citizen army with Italian allies but began with little in the way of a navy. The Romans quickly learned from combat experience and built up their own navy. Battles raged across the Western Mediterranean at sea and on land. After much campaigning the Romans gained the victory, though Carthage maintained much of its power and another big war would follow in 218 BC with the more well known Second Punic War which involved, among other things, Hannibal crossing the Alps with his elephants.

The First Punic War game, appearing in *Strategy & Tactics Magazine* #336, provides lessons in joint expeditionary warfare.

Littorals and Peripheries

The First Punic War is a two-player game, with one side controlling the Romans and the other the Carthaginians. A player wins by controlling vital cities around the map, especially ports given their importance for commerce and naval basing. In the optional rules, additional points are awarded for establishing colonies abroad as this will place your empire in a better position to fight the next war!

>Mr. Miranda is a prolific board wargame designer. He is a former Army Officer and has been a featured speaker at numerous modeling and simulations conferences.

The biggest lesson from the war is that control of the sea is vital for conducting amphibious operations. A quick look at the map shows the Mediterranean Sea is the pathway to the littorals of land campaign areas. Several major islands such as Sicily dominate the center of the Mediterranean and are useful as forward naval bases. Much of the game strategy comes down to seizing those bases and then launching operations against the peripheral regions.

Since the game covers a period of some fourteen years and spans several regions within the overall theater of operations, there is a strong strategic element. You cannot win with a single battle or campaign. Control of the Mediterranean Sea provides a central position from which a player can strike against the regions of the peripheries (Spain, Southern Gaul, the hinterland of Africa). Players will fight combined land-naval campaigns for each sub-theater.

The main game mechanic is Action Points (AP). APs represent the command and logistical capabilities of the respective Roman and Carthaginian states. Think of the points as a sort of staff capability for directing and sustaining joint operations. Players get a predetermined number of APs each turn (representing their basic mobilization ability) plus more for control of various fortresses around the map (for supply and local sea control). You can use APs to recruit your army and fleet units and to initiate various campaigns to send them marching and sailing across the map.

You must determine your force mix, whether you want to build up land or naval power or a combination. There are some special units, like Carthaginian marines which facilitate amphibious assaults. The Romans have a detachment of Mamertine mercenaries which initially hold a beachhead on Sicily at Massena. You need fleet units to deliver ground forces to seize ports to use as bases for further operations. Joint operations are a real opportunity.

Another part of the strategic spectrum is in diplomacy. There are several minor powers potentially in play such as the city-state of Syracusa on Sicily and the Greek colony at Massilia (modern Marseilles). Players can engage in diplomacy to win over these powers as allies or to subvert the enemy's alliances. Since the minors often control vital bases, their control can provide major game changers.

This gets back to control of fortresses, especially those with ports. Fortress control provides additional APs, enhancing both recruiting and campaigning. The situation has analogs with the Pacific Theater of Operations in 1941–42, with elements of today's oceanic confrontations between major powers. Think of this rule in terms of control of such bases in the Pacific Ocean as Okinawa, Guam and Singapore, or Diego Garcia and Djibouti in the Indian Ocean.

Carthagian colonial sphere

Roman heartland

Island chains providing bases for operations against littorals of the periphery

Major naval bases

(1) Green outline areas: Libya (contemporary Tunisia) is Carthaginian heartland. Other green areas are primary Carthaginian colonial sphere (Numidia, Iberia, western Sicily). (2) Red outline area: Italia is the Roman heartland. (3) Blue circled areas are the Western Mediterranean island chains. (4) Massilia and Syracusa are independent minor powers.

A related aspect is in stratagems, a term for the ancient equivalent of various unconventional operations. Stratagems represent special tactics, diplomatic maneuvers, treachery, and the like. This rule accounts for things such as the Roman corvus, a special naval boarding device, to gain a brief but critical tactical advantage at sea. Stratagems are a way for the commander to multiply the effects of hard and soft power.

Another operational aspect is in logistics. Players can build camps representing fortified positions and logistical depots. Upon landing on a hostile shore, build a camp to secure your beachhead then use it to support your army moving inland. The payoff of planning ahead will be a successful expeditionary campaign.

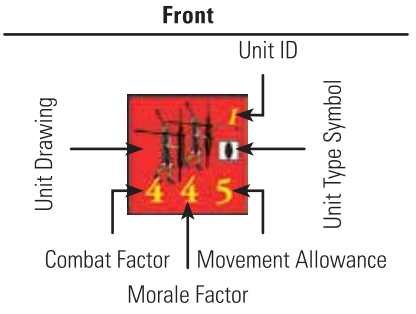
Fog of War and Friction Factors

Players must deal with a certain amount of uncertainty in the game. Naval movement is subject to random factors, representing the potential for storms at sea which often destroyed entire fleets. This is one reason why port control is vital because a fleet which embarks from a port has a better chance of surviving the voyage. Again, much of the game strategy comes back to a contest for ports.

In the bigger picture, during each turn players check the augurs table rep-

(1) Roman army of two legions plus cavalry (red counters) have landed at Massena in Northeast Sicily and established a fortified camp at Massena in Northeast Sicily. Romans are allied with Hiero of Syracusa (orange counters). The allied plan is to sweep up weakly held cities on the island.

(2) Hamilcar has landed in Lilybaeum in Northwest Sicily with a Carthaginian army to include the elite Sacred Band plus marines (green counters). The plan is to make a diplomatic attack against the Syracusans to subvert their alliance with Rome. Then Hamilcar will conduct a joint naval-land assault to retake Massena.



resenting the wide-ranging effects of the fortunes of war. These can include negative events such as plagues and pirate raids and positive events like friendly forces rallying to the standards plus good omens providing more stratagems. There is also the crisis event which makes a randomly determined fortress on the map the center of attention. If a player can get a leader unit to that point, then they gain additional APs. The crisis event represents a unique diplomatic or military situation to exploit if you can get there with sandals on the ground. Since the fastest way to move around the map is via naval movement, it provides another payoff for sea dominance.

There is also the human dimension. Players can recruit leaders, representing historical commanders. Leaders are important for reducing the randomness of naval movement and for enhancing the chances of winning a battle. Leaders can also conduct diplomacy so having the right general at the right point can decide a operation.

Different paths to victory are possible. One is to conduct campaigns in peripheral areas to build up a surplus of action points. Another is to concentrate on a big offensive to seize control of the enemy's homeland, Rome, or Carthage. Many courses of action are available to the player who exploits joint operations in one of the first great expeditionary campaigns of history.

FIRST PUNIC WAR

264–241 BC

Image: Library of the University of Seville

First Punic War simulates the first great military clash between the Roman Republic and the Carthaginian Empire, spanning 24 years in the 3rd century BC. Rome controlled a federation of states in Italy, while Carthage was the major power of the Western Mediterranean. The war was centered around the island of Sicily, but also saw campaigns in Sardinia and North Africa, with the possibility for more operations elsewhere around the region. Roman combat units represent legions plus attached cavalry (4,000–5,000 men) and groupings of auxiliaries. Carthaginian units represent groups of various troop types representing 1,000–10,000 men. Naval units represent about 50 warships each. ❖

Players: 2 (Republic of Rome vs. Carthage)
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Game Turn Scale: 3 years

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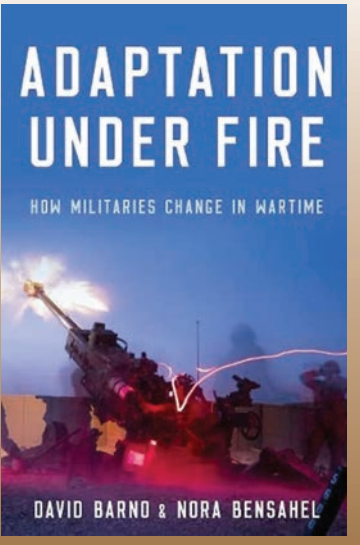
Adaptation Under Fire

reviewed by 1stLt Victor Wu



ADAPTATION UNDER FIRE: How Militaries Change in Wartime. By David Barno and Nora Bensahel. New York: Oxford University Press, 2020.
ISBN: 9780190672058, 430 pp.

The Marine Corps exists by nature in a state of uneasy paradox. Its doctrine praises adaptation and innovation, and it officially urges its members to demonstrate freethinking and initiative. Yet, it is also rigidly hierarchical in structure and jealously protective of its traditions. In theory, a lance corporal with a great idea—or a critique of an existing one—ought to be able and willing to convince a colonel of its merits. But how often does this really happen in practice?

The tensions between tradition and innovation, certainty and change, reside in every organization. Military organizations like the Marine Corps, however, face these challenges to a unique degree. Militaries are necessarily large, bureaucratic institutions that place a high premium of uniformity, obedience, and discipline. This is because they must ensure that their members can ultimately be counted on to understand and execute orders in the most chaotic, urgent, and stressful of conditions. Yet, without a robust culture of learning, risk-taking, and adaptation, militaries will inevitably find themselves unprepared and unable to respond to the complex, constantly shifting demands of war.[1] So how do we achieve this inherently difficult goal?

This is what David Barno and Nora Bensahel propose to answer in their impressive new book, *Adaptation Under Fire*. Barno, a retired Army lieutenant general, and Bensahel, a political science professor, bring a vast wealth of both personal experience and academic insight to bear on this topic, in the same tradition of contemporary soldier-scholars such as David Petraeus, John Nagl, and James Mattis. Their contribution is distinctive, though, for the extent to which it seeks to synthesize and bridge discussions across all three levels of war—tactical, operational, and strategic. In particular, as they note, they are focused most on filling scholarly gaps at the operational level. Their ultimate aim is essentially a practical one: to provide senior commanders and their civilian counterparts with a useful framework for action to improve the U.S. military's capability to adapt and win in future theaters of war.

... without a robust culture of learning ... militaries ... find themselves unprepared ...

Barno and Bensahel pursue this aim through a blended historical and social-scientific approach. Their book consists of three interconnected parts: first, an analytical framework for understanding military adaptation, then the application of that framework to the wars in Iraq and Afghanistan, and finally their evaluation of and recommendations for the U.S. military's readiness to win its future wars. They single out three key elements of adaptation: doctrine, technology, and leadership. For each element, they discuss illustrative case studies in adaptation from modern military history, both successful and unsuccessful, distilling from them more general themes and implications. Some of the cases, particularly of failure to adapt, are well-known—the U.S. in Vietnam, or the French in World War II. Others are relatively unfamiliar, such as Israel's victory against Egypt in the 1973 Yom Kippur War, a fascinating example of "mistaken and adaptable" doctrine triumphing over an "accurate and rigid" counterpart.[2] Some are frustrating and even outright infuriating, calling to mind LTC Paul Yinglings' (Ret) searing critique of the early theater-level leadership in the Iraq War: "As matters stand now, a private who loses a rifle suffers far greater consequences than a general who loses a war."[3] Yet all are instructive. As any good military leader knows, the mistakes of the past, filtered through the lens of understanding, are the best teachers for the future.[4]

>1stLt Wu is an 0802 Field Artillery Officer assigned to 1st Battalion, 12th Marines. He has served as the Fire Support Officer for Alpha Company, 1/3 Mar and is currently the Maintenance Management Officer for 1/12 Mar.

The key theme throughout the book is *uncertainty*. As Clausewitz understood and Marine Corps doctrine reinforces, war is defined by radical uncertainty—about our enemy, our environment, and even ourselves. Under the perpetual constraints of time and human imperfection, we can make our best guesses about the future, but they are ultimately just that, guesses. "What matters most, then," Barno and Bensahel argue, "is the *ability to successfully adapt to unforeseen circumstances as they arise.*"[5] This idea, more than any specific analysis or recommendation, is the heart of their book. Any student of *MCDP 1, Warfighting,* certainly will find their perspective quite familiar. As Barno and Bensahel would likely caution, though, the devil is in the details. It is one thing to profess adaptability; it is quite another to actually realize and institutionalize it in practice. As the Marine Corps and U.S. military writ large prepares itself anew for the rigors of great-power competition, the insights Barno and Bensahel offer for how to do so are more relevant than ever.[6] After all, we must fight the war we are given, not the one we chose. The only certainty is that there is none.

Notes

1. For a discussion of the importance for militaries of an organizational culture of learning through the historical lens of counterinsurgency, see John A. Nagl, *Learning to Eat Soup with a Knife: Counterinsurgency Lessons from Malaya and Vietnam*, (Chicago, IL: University of Chicago Press, 2005).

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5. *Adaptation Under Fire.*

6. For a discussion of the Marine Corps' future that emphasizes its tradition of adaptability, see Gen David H. Berger, "Preparing for the Future: Marine Corps Support to Joint Operations in Contested Littorals," *Military Review*, May 2021, available at https://armyupress.army.mil.

The Blue Age

reviewed by Dan Sukman

THE BLUE AGE: How the U.S. Navy Created Global Prosperity—And Why We're in Danger of Losing It. By Gregg Easterbrook. New York: Public Affairs Publishing, 2021.
ISBN-10 1541742540, 304pp.

In his most recent book, *The Blue Age*, prolific writer and author, Gregg Easterbrook, describes the power of and influence of the maritime domain. The book builds on the themes of some of the author's previous books such as *The Progress Paradox, Sonic Boom*, and *It's Better Than It Looks,* each of which describes the rapid pace of human progress and global economic development in the globalization era. In *The Blue Age*, the author seeks explanations for the conditions that have made this progress possible. Easterbrook looks to answer three questions in his writing. First, why has fighting on the waters declined; second, what is happening on the oceans right now; and finally, what does the future hold?

The book details the progress of global trade and civilization, which has been made possible by the global reach of the Navy. The author asserts that not only has the presence of the Navy made possible the leaps and bounds of globalization, but the overwhelming power also that has been unmatched since the Second World War has led to a decline in warfare upon the seas. Indeed, Easterbrook details how centuries of bloodshed culminating in the battles of the Pacific, Atlantic, and Mediterranean Sea restricted the movement of goods while limiting trade between nations. Easterbrook argues that the opening of trade, and more specifically free trade, led to rises in global wealth and life expectancy and a massive decrease in global poverty and illiteracy rates. With these arguments, Easterbrook's book is a decisive defense of globalization, market-based economies, and the usefulness of America's Navy serving as a global policeman on the world's seas.

Easterbrook explains how what occurs on the seas is largely unseen by those who live and work on land. Moreover, Easterbrook describes how what does not happen on the oceans (major battles) is paramount to global security and prosperity. Understanding this is crucial for leaders and policymakers throughout the Joint Force and government who want to understand the benefits of a strong Navy. As the Services compete for fewer resources and dollars, each should be aware of the risks that come with limiting the size and reach of America's maritime forces. Underwriting this analysis is the treasure the United States spent on the wars in Iraq and Afghanistan at the expense of modernization and expansion of our maritime forces.

The book's strength is Easterbrook's ability to emphasize the importance of maritime power through his storytelling. Supporting each point of emphasis is a narrative of historical examples of the benefits of globalized trade upon the oceans or the consequences when sea lines of communication are lost. Accompanying these narratives are the statistics and data to reinforce his arguments. Indeed, Easterbrook makes it clear that peace on the seas translates to prosperity on land. This is particularly important as everyone with a stake in national security should be thinking about the consequences of losing the edge of maritime power. Maintaining open sea lines of communication is important for global trade and crucial to transporting and sustaining land forces engaged in foreign lands. Indeed, the last time U.S. land forces were isolated in a foreign nation without open sea lines of communication, the result was the Bataan Death March.

Leaders across the Joint Force and in the Department must understand the importance of the maritime domain and what the significance of peace means for American and global prosperity. As China continues to build its global position with an expanding naval presence, Easterbrook's explanations and analysis are helpful for the reader to comprehend these two facets and make a constructive addition to a national security thinker's bookshelf.

USMC

>LTC Sukman is a strategist and a member of the Military Faculty at the Joint Forces Staff College. Sukman is a graduate of Norwich University and earned master's degrees from Webster University and Liberty University. He served with the 101st Airborne Division (Air Assault), U.S. European Command, the Army Capabilities Integration Center, and the Joint Enabling Capabilities Command.

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