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ADAPTATION: BALANCING READINESS AND FORCE MODERNIZATION TO COMPETE IN THE 21ST-CENTURY

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

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Executive Summary

Title: Adaptation: Balancing Readiness and Force Modernization to Compete in the 21st-Century

Author: Major Matthew Edward Sladek

Thesis: To ensure the current and future force can compete in future warfare requires the Force Development process to adapt faster to the needs of the warfighter. Maintaining the proper balance between readiness and force modernization while capitalizing on the strengths of the Department of Defense bureaucracies and adhocracies can deliver sustainable options and outcomes for policymakers.

Discussion: The DoD bureaucracy that has evolved alongside American democracy is "geared toward rationalized and consistent outcomes."[1] This approach has served the American military well over the decades taking control of what it could while striving to maintain a technological advantage in competition against adversaries. The 21st-century operating environment described in the 2018 National Defense Strategy renews the need for the proper balance between readiness and force modernization. Across both efforts' reforms tailored to "[delivering] performance at the speed of relevance"[2] require a foundation built upon:

1) service members able to "better integrates [technology] [while] [adapting] its way of fighting,"[3] more quickly than an adversary,
2) "backing into requirements," utilizing a buy, try, inform mentality,[4]
3) a government-owned interface control document (ICD) that facilitates open architecture design able to rapidly ingest best of breed technology as it develops,
4) a "fail fast "rapid prototyping mentality while accounting for the future fiscal uncertainty.

Examining the revitalization of Marine Corps Ground-Based Air Defense from 2016-2018 proves rapid prototyping can pace emerging threats.

Conclusion: If the past is any sign of the future, accurately predicting the shifting character of warfare will continue to remain elusive. The cyclic assessment that seeks to balance readiness and force modernization will remain an enduring challenge. "While visionary genius works outside the box by imagining future systems, mastery is needed inside the box to reorder existing systems to incorporate emerging ideas,"[5] and DoD must excel at both. Readiness focused on developing capabilities required in the near term able to rapidly adapt to the changing operating environment will be critical to support the development of current options for policymakers. Force modernization tailored to developing solutions against projected threats with projected technology is also critical to develop future options for policymakers. Understanding that these future systems will be required to adapt to a future operating environment leads to a singular conclusion. Competition in 21st-century warfare requires readiness and force modernization to be balanced and both must be designed to rapidly integrate emerging technology.

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Preface

This paper is the result of my participation in the Marine Corps University (MCU) Command and Staff College (CSC) AY2018-2019 Gray Scholars Program. The concept presented in the paper is not new, original or revolutionary. Rather it is a collection of the experiences from adhocracy formed to solve an immediate warfighter need and the framework used to deliver capability and capacity. What was accomplished is attributed to flexibility and discretion given to the "team" by senior leaders combined with the individual will of Marines working alongside government and industry partners. Collaboration with a hyper-focused purpose enabled the delivery capability to those in harm's way at the speed of relevance.

Special thanks to Dr. Benjamin Jensen and Dr. Nathan Packard, the professors that led the Gray Scholars,. Thanks also to the staff at the Marine Corps Warfighting Laboratory and the Ellis Group. Finally, thanks to my fellow Gray Scholar colleagues for their insights and experiences.

[1] Nina Kollars, "Organising Adaptation in War," *Survival* 57, no. 6 (December 2015): 116, EBSCOhost (00396338).
[2] US Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America* (Washington, DC, January, January 19, 2018), 10.
[3] US Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America* (Washington, DC, January, January 19, 2018), 10.
[4] United States Special Operations Command, *Acquisition Management System Policy*, USSOCOM Directive 70-1, March 20, 2018, H-6.
[5] Nina Kollars, "Genius and Mastery in Military Innovation," *Survival* 59, no. 2 (April 2017): 126, EBSCOhost (00396338).

Introduction

> "So long as I have not overthrown my opponent I am bound to fear he may overthrow me. Thus I am not in control: he dictates to me as much as I dictate to him."[6]
>
> **-Carl Von Clausewitz**

> "War displays broad patterns that can be represented as probabilities, yet it remains fundamentally unpredictable."[7]
>
> **-Marine Corps Doctrinal Publication 1**

> "Deliver performance at the speed of relevance. Success no longer goes to the country that develops a new technology first, but rather to the one that better integrates it and adapts its way of fighting."[8]
>
> **-Summary of the 2018 National Defense Strategy of the United States of America**

The Department of Defense (DoD) bureaucracy that evolved alongside American democracy is "geared toward rationalized and consistent outcomes."[9] This system has served the American military well over the years providing policymakers options while simultaneous striving to mitigate risk through consistent development of capabilities that gave the warfighter a superior technological advantage in competition against adversaries. In *Organising Adaptation in War,* Nina Kollars states, "the key structures that [made] it possible for bureaucracies to produce, stable, long-term outputs are a function of highly regularized internal procedures and roles that ensure that daily functions can be carried out in a machine-like way, with a degree of automaticity,"[10] have now been called into question as humanity enters the 21st-century warfare. The Planning, Budget, and Execution (PPBE) and Joint Capabilities Integration and Development System (JCIDS) provided a sustainable standardized process that sought to minimize acquisition risk while maximizing value to the warfighter is now under fire for its inability to adapt to the current operating environment. A recent Marine Corps Gazette article stated, "this bureaucratic inertia must be overcome in order to field capabilities that overmatch contemporary threats or our Corps' ability to confront adversaries will erode."[11] Have we forgotten that one cannot control warfare for at its very core lives "the difficulties [that]

accumulate and end by producing a kind of friction that is inconceivable?"[12] Should the system that delivered unprecedented military advantage to the American warfighter be burnt down? Or should we recognize and acknowledge that adapting to 21st-century warfare requires minimal reforms to the DoD bureaucracy and that sustaining American military power lies in the art of balancing readiness and force modernization focused on long term competition within a system "that enables the production of consistent outcomes?"[13]

To compete in the future conduct of warfare demands the proper balance of readiness and force modernization (Figure 1). To ensure the current and future force can compete in future warfare requires the Force Development process to adapt faster to the needs of the warfighter. Maintaining the proper balance between readiness and force modernization while capitalizing on the strengths of the Department of Defense bureaucracies and adhocracies can deliver sustainable options and outcomes for policymakers. Readiness reforms tailored to "[delivering] performance at the speed of relevance"[14] requires a foundation built upon the principles of:

1) service members able to "better integrate [technology] [while] [adapting] its way of fighting,"[15] more quickly than an adversary,
2) "backing into requirements," utilizing a buy, try, inform mentality,[16]
3) a government-owned interface control document (ICD) that facilitates open architecture design able to ingest best of breed technology as it develops,
4) a "fail fast "rapid prototyping mentality while accounting for the future fiscal uncertainty.

This approach to sustaining readiness should also be considered as planners contemplate force modernization. To sustain competition over time, eventually what is new becomes old and will have to adapt to maintain utility.

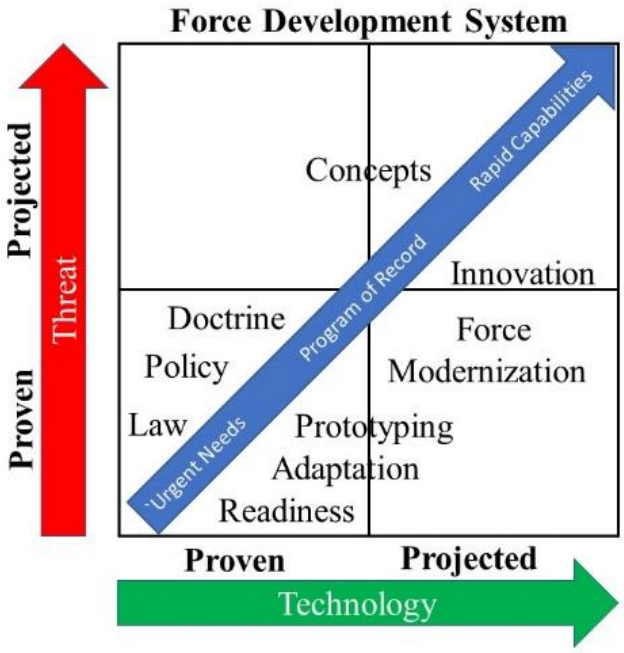

Figure 1. Force Development System Quad Chart. Author's depiction of balanced readiness and force modernization as they relate to threat and technology

Purpose

"Current processes are not responsive to need; the Department is over-optimized for exceptional performance at the expense of providing timely decisions, policies, and capabilities to the warfighter. Our response will be to prioritize speed of delivery, continuous adaptation, and frequent modular upgrades. We must not accept cumbersome approval chains, wasteful applications of resources in uncompetitive space, or overly risk-averse thinking that impedes change. Delivering performance means we will shed outdated management practices and structures while integrating insights from business innovation."[17]

-Summary of the 2018 National Defense Strategy of the United States of America

Commercial-Off-The-Shelf Unmanned Aircraft Systems (COTS UAS) changed the modern battlefield in 2014 requiring an adaptive approach to equip forward-deployed forces to defend themselves. Examining the response Marine Corps actions officers took between 2016-2018 to modernize legacy ground-based air defense (GBAD) capabilities provides a snapshot of force development at the micro level. The team did exactly what the 2018 NDS called for forming an adhocracy that was "manager-driven, modular and decentralised, and project- rather

than process-focused."[18] Leveraging developmental efforts and resources of other services, Marine Corps action officers were able to rapidly develop and deploy prototype equipment to warfighters in combat, leading to increase latitude from oversight bodies during that time period. The purpose of this concept is to propose a method that seeks to refine the current force development system while striving to retain the initiative through constant assessment of the balancing between readiness and force modernization to ensure that the needs of the warfighter are met today, tomorrow and in the future.

Time Horizon, Assumptions, and Risks

"You go to war with the army you have, not the army you might want or wish to have at a later time."[19]

-Defense Secretary Donald H. Rumsfeld

Balancing readiness, force modernization, and personnel is the art of balancing risk, and the force development process seeks to mitigate risk over time. As the changing character of warfare continues to accelerate, balancing risk becomes increasingly complex and even more vital to national security. Ensuring capabilities delivered to the warfighter maintain a high level of readiness and are agile enough to rapidly adapt to this operating environment aids in mitigating risk over time.

Sun Tzu said, "what is of supreme importance in war is to attack the enemy's strategy."[20] In the upper left quadrant of Figure 1, this mindset can be observed in the Chinese approach to force development as it seeks ways to counter American power projection capabilities with multiple lines of effort, one is investment in short, medium, intermediate and cruise missiles capabilities and capacity.[21] This Chinese approach seeks to challenge the American ability to establish conditions for offensive operations by contesting its ability to gaining and maintaining local air superiority.[22] With the Joint force accustomed to freedom of maneuver, the mix and

mass of Chinese offensive and defensive missile capabilities challenge traditional American power projection and increases the risk to force when conducting operations inside a weapons engagement zone.

On the lower left quadrant of Figure 1, another emerging threat challenging the American approach to offensive operations is the introduction of COTS UAS to the battlefield. This was witnessed in Iraq and Syria beginning in 2014, adding additional complexity to the battlefield and escalating the need for a balanced sustainable strategy to counter current and emerging threats in the air domain.

To counter both emerging air threats, the DoD has renewed investment into Short Range Air Defense (SHORAD) capabilities in the Army and Marine Corps. Both services are currently looking to rapidly build tactical air defense capacity with the Maneuver – SHORAD Directed Requirement[23] and the establishment of the Marine Air Defense Integrated System Program.[24] Both of these programs need to delivery capability and capacity now and in the near future to support tactical maneuver.

To support the roles and missions of the Marine Corps, a rapidly adaptable GBAD capability must be part of a layered defense in depth able to counter UAS, cruise missiles, and traditional fixed wing and rotary wing threats. As technology continues to evolve, the proliferation of more capable UAS and cruise missiles should be anticipated and as we seek force modernization these capabilities must be designed to rapidly adapt.

Military Problem

"Defense is a stronger form of fighting than attack."[25]

-Carl Von Clausewitz

"Invincibility lies in the defense; the possibility of victory in the attack. One defends when his strength is inadequate; he attacks when it is abundant. "[26]

-Sun Tzu

Today, the Joint Force is optimized to conduct operational offensive and tactical defense under the umbrella of strategic deterrence. 21st-century warfare against resurgent competitors demands an ability to conduct operational defense to set conditions for a transition to the offense at all levels of war at a time and place of our choosing.[27] Current force development is unbalanced with a bias creation of operational offensive and strategic deterrence capabilities for reasons exceeding the scope of this paper.

To rebalance force development and canalizing an adversary to compete at all levels of war, requires development of tactical defensive systems that have operational impact. To gain and maintain the initiative across all levels of war requires the ability to rapidly adapt existing weapon systems to ensure warfighter readiness is sufficient to compete today while balancing force modernizing to ensure the warfighter has the tools at his disposal to compete tomorrow and in the future. To reduce the time necessary to adapt existing weapon systems to meet today's needs of the warfighter requires an open architecture framework able to consume technology as it evolves while maintaining interoperability with legacy systems. The Joint Force needs to be able to cost-effectively mass defensive tactical systems to achieve symmetry against adversary offensive capabilities which will create an operational ripple effect creating opportunities to reapply operational offensive capabilities to pursue victory.

The 2018 National Defense Strategy (NDS) calls for the Department of Defense (DoD) to "[emerge] from a period of strategic atrophy" by emphasizing the necessity to reform current bureaucratic practices to compete in an increasingly complex operating environment defined by a return to great power competition.[28] For decades the business practices of the Department delivered unparalleled air power providing warfighters an enduring asymmetric advantage, but in 2014 in the battlefields of Iraq symmetry came in the most unlikely of packages with the

introduction of low-cost UAS.[29] To defend American and partner forces from COTS UAS in Iraq, Afghanistan and Syria a Joint Urgent Operational Need (JUON) was signed by the Commander, United States Central Command and action officers across all services with government and industry partners began to rapidly prototype and produce capability.[30]

ISIS and COTS UAS

"There was a day [in early 2017] when the Iraqi effort nearly came to a screeching halt, where literally over 24 hours there were 70 drones in the air...At one point there were 12 'killer bees,' if you will, right overhead and underneath our air superiority…and our only available response [at the time] was small arms fire."[31]

-General Raymond A. Thomas III, May 2017

In 2014 the Islamic State of Iraq and Syria (ISIS) began to integrate COTS UAS into their formations flying fixed-wing airframes such as the Skywalker X8 and Talon Unmanned Aircraft Vehicle (UAV) to adjust artillery fire and conduct area reconnaissance in open terrain (Figure 2), while multi-rotors such as those made by the Da Jiang Innovations (DJI) were used to conduct reconnaissance in urban areas. With onboard cameras, both types of airframes recorded video aiding ISIS' ability to deliver its propaganda message. The creativity of ISIS UAS cells quickly led to the development and employment of a "trojan horse" fixed-wing UAS airframe packed full of explosives.[32] Weaponization of multi-rotor UAS soon followed and were employed by ISIS with great effect during the Battle of Mosul.[33]

If the adaptive approach ISIS employed in the development of a low-cost tactical air force through the integration of COTS technology to achieve any number of desired effects is any sign of the future character of war, it also offers a glimpse into how to counter emerging threats. For the DoD to find balance between readiness and force modernization it must use a method similar to that of ISIS by directly tying the needs of the warfighter to resources and those able to develop solutions. Today, such a process exists through the Rapid Fulfillment of

Combatant Commander Urgent Operational Needs with services maintaining internal processes.[34] For the DoD to affordably maintain readiness while "delivering performance at the speed of relevance" requires accelerating the Observe, Orient, Decide, Act (OODA) loop.[35] Countering emerging threats with the adaptation of emerging technology able to rapidly integrate into an open architecture framework is central to achieving defensive symmetry. This approach to generating readiness creates a dilemma that an adversary must account for through the rapid production of capability and capacity intended to solve an immediate problem. The ability to sustain this adaptive approach to force development generates readiness wresting initiative from a potential adversary, and positions American forces to transition from defense to offense and victory.

Figure 2. IS fighters launching a Skywalker X8 in a propaganda video focusing on their drone program.[36]

Today, the DoD bureaucracy has a process in place to facilitate this approach to generating readiness through the Rapid Fulfillment of Combatant Commander Urgent Operational Needs with services maintaining internal processes.[37] For the DoD to affordably maintain readiness while "delivering performance at the speed of relevance" requires

accelerating the Observe, Orient, Decide, Act (OODA) loop.[38] Countering emerging threats with the adaptation of emerging technology able to rapidly integrate into an open architecture framework is central to achieving defensive symmetry, regaining the initiative, and facilitating the transition to offense and victory.

Central Idea

"DoD's highest priority is to provide warfighters involved in conflict or preparing for imminent contingency operations with the capabilities urgently needed to overcome unforeseen threats, achieve mission success, and reduce risk of casualties. An agile U.S. defense is essential in a world of rapid change."[39]

-Department of Defense Directive Number 5000.71

"Prioritizing adaptability. In the face of unpredictability, future military equipment should be adaptable and resilient rather than narrowly defined for niche requirements. To achieve this, the requirements process should be modified to place a premium on operational flexibility. New criteria of this kind will require new metrics of merit."[40]

-Richard Danzig

"Experimentation with trial products provides opportunities to develop and refine new concepts of operation to fully exploit the new capability, to evolve operational requirements as experience and understanding are gained, and to operate militarily useful quantities of prototype systems in realistic military demonstrations, and on that basis, make an assessment of the military utility of the new capability."[41]

-Peter Layton

Balancing readiness, force modernization, and personnel that delivers sustainable options for policymakers is the art the DoD bureaucracy seeks to achieve. However, with gaps outpacing the capability and the capacity required to counter emerging threats requires a re-evaluation of the architecture used for force development. Assuming that the future operating environment will continue to remain elusive, DoD must be able to rapidly adapt to counter emerging threats. The Joint Rapid Acquisition Cell (JRAC) and DoD Directive Number 5000.71 acknowledges that operating environment is constant of flux and to compete in this operating environment requires adapting current capabilities to meet the needs of the warfighter.

The art of balancing readiness and force modernization should naturally lead to a path where DoD attempts to,

> "Build more for the short term. Major acquisitions are now built for long-term use but would benefit from greater recognition of the unpredictability of technology development and combat environments. The defense community should seek to acquire more equipment for the short term, as is done in the consumer environment."[42]

This approach can be seen in the way Special Operations Force Acquisition, Technology and Logistics (SOF AT&L) seeks agility in force development by, "[responding] to a continuously changing Combatant Command environment. SOF acquisition professionals maintain a robust foundation in acquisition expertise and possess the depth of knowledge to adapt their strategy in response to change."[43] Special Operations Command also leverages Combat Evaluations (CVs) to inform force development decisions as part of their Special Operations-peculiar (SO-p) Equipment Acquisition Full Life-Cycle (Figure 2). This adaptive model allows operators to maintain pace with emerging threats while balancing fiscal responsibility through build what it needs for the short term while informing future requirements.

Figure 2. SO-p Equipment Acquisition Full Life Cycle[44]

Prototyping solutions to warfighter problems and getting those solutions into the hands of the warfighter to conduct CV while learning and further adapting is what the SO-p model strives for. This balances between immediate readiness and force modernization, prioritizes then adapts to warfighter needs. Conversely, peacetime innovation can inadvertently prioritize the needs of the bureaucracy's desire for consistent outcomes by, "placing bets on the kinds of technology, training and force structures that will be needed for a world that has yet to emerge. As such, the implicit assumption is that experienced warfighters will take a back seat in the shaping of the future force."[45] However, if prototyping is used "as a vehicle to learn something about the system's technology or concept that will inform subsequent decisions,"[46] it can coexist in a bureaucracy seeking consistent outcomes.

Failure typically has a negative connotation when viewed through the lens of the current acquisition model. However, to deliver a force able to compete and adapt more quickly than an adversary can react will lead to cases of failure. Thus "failing fast" and learning faster than an adversary can react is critical to sustaining readiness. For example, in the Counter UAS fight identification of aircraft is critical. Currently, an identify friend or foe (IFF) capability on Group 3 and below UAS does not exist driving the necessity for a high fidelity electronic optical/infrared (EO/IR) optic to conduct positive identification. If a requirement existed to be able to identify these airframes at stand-off ranges while on-the-move acquisition professionals could develop a performance specification and release a Request for Proposal (RFP) to industry. Then industry would look internally and determine what existing optic could meet the requirement or what could be adapted to meet the requirement. If industry required added engineering funds to develop a solution to the requirement it would be built into their response to the RFP. Acquisition professionals would then down select a few RFPs, industry would deliver,

and the equipment would be tested on a range to determine if what was delivered met the p-spec. All this takes time and warfighters in combat may not have the time to wait for the process to run its course.

Conversely, acquisition professionals could submit an RFP asking industry to bring their current optics to test range with a requirement to be able to interoperable with government-controlled interface. Then through the course of a test, it could be determined what was in the current of the possible. This approach allows industry partners to participate in tests and learn alongside acquisition professionals and capability officers backing into requirements. This approach may lead to failure but the adhocracy learning from failure can lead to delivering "good enough" capabilities to the warfighter at the speed of relevance.

Historical Case: The Invention of Air Power and the Ground-Based Air Defense Paradox

Prior to World War I, European nations focused force development on equipping armies to battle other armies in the ground domain. Potential opportunity in the air domain had not been realized nor the need to defend against it.[47] While most European nations ignored the need for GBAD prior to the war, "Germany began World War I with 18 antiaircraft guns; six of them motorized and 12 of them horse-drawn."[48] Most of these initial Ground-Based air defense weapons were repurposed artillery pieces, "modified to elevate higher and traverse through a wider arc than standard artillery pieces."[49] This initial attempt of adapting existing capabilities to an emerging threat proved to be a greater challenge than artillery at ground targets as the air defender had to hit a target in three dimensions while the artilleryman engaged targets in two dimensions.[50] Projectiles of the day were unguided and paired with inadequate capabilities to detect and track aircraft.[51] This first attempt at adapting existing capabilities to meet needs of air defenders fell short and the first antiaircraft weapons were ineffective as stand-alone weapons

requiring massed fires in the air to achieve destruction of aircraft but war would force an evolution.

During World War I, nations achieved advancements in air defense weapons by adapting capabilities specific to countering the threat. Ground-Based air defenders employed, "sound-detection systems, searchlights, optical range-finders, and mechanically timed fuzes,"[52] and were able to gain parity with aircraft of the day who achieved only modest improvements during the war. After the war continued adaption of air defense capabilities lagged behind the innovation occurring in the aerospace industry. During the interwar period planes were developed that could fly faster and at higher altitude rendering the existing air defense weapons obsolete and returning the advantage to the offense from the air.[53]

Marine Corps Defense Battalions

In the mid-1930s Marine Corps planners began conceptualizing a framework for what would be required to hold key terrain in the Pacific Ocean against Japanese attacks from the air and sea. Although primarily focused on offensive operations, the Marine Corps trained to defend the territory it seized and, "in 1936...the Marine Corps schools at Quantico, Virginia taught 10-month course in base defense, stressing coordination among aviation, antiaircraft, and artillery,"[54] even though it lacked dedicated defensive units. The course established the framework for the future defense battalions and:

> "By 1937, the Marine Corps was discussing the establishment of battalion-sized security detachments on key Pacific outposts, and the following year's War Plan Orange proposed dispatching this sort of defense detachment to three of the Hawaiian outposts-Wake, Midway, and Johnston...The plan called for units to deploy by M-Day-the date of an American mobilization for war."[55]

By 1940, four battalions had been created with two additional battalions authorized.[56]

Those focused on equipping these new battalions fostered a mindset of providing maximum capability to these new units by adopting "the latest advances in automatic weapons, radios, tans, coast and antiaircraft artillery, sound-ranging gear, and the new mystery-radar,"[57] to counter a projected threat. Even with access to the latest technology early in the war, Ground-Based air defense assets were a high-demand low-density capability and assets that required defense had to be prioritized. On 8 December 1941, the Marines on Wake Island,

> "lacked radar and sound-ranging equipment forcing the 400-man Marine garrison to rely on optical equipment to and identify the attacking aircraft which inflicted heavy losses on the Americans during the first bombing raids."[58]

Marines would learn other Ground-Based air defense lessons throughout the war and adapt. "Experience dictated that the defense battalions land with the assault waves, whenever possible, and immediately set up their weapons."[59] Marines quickly recognized, "the vulnerability of the amphibious forces, especially to aerial attack, during and immediately after a landing,"[60] and adapted to best practices to win in the operating environment presented by the character of warfare.

Ellis Group Wargame

During the fall wargame COTS and government-off-the-shelf (GOTS) equipment adapted to the character of the fight in the United States Indo-Pacific Command (INDOPACOM) area of responsibility and through massing adequate GBAD capacity through the conceptual integration of capabilities onto a variety of chassis. Utilizing the doctrinal air defense principles of mass, mix, mobility, and integration while attempting to close conceptual gaps identified in the wargame necessitated this integration. Utilizing the Marine Air Defense Integrated System (MADIS) Family of Systems (FoS) capability framework, conceptual was designed to be adaptable into to provide the commander with options.

Two variants of pre-production prototypes used to support JUON CC-0558 were used to develop the capacity to defend forces ashore from air threats. The Light Marine Air Defense Integrated System (L-MADIS) (Figure 4) which is currently deployed with Marine Expeditionary Units and in CENTCOM and the Marine Air Defense Integrated System (MADIS) (Figure 5) which is currently deployed in CENTCOM. Both variants use the same C2, the government-owned Forward Area Air Defense Command and Control (FAAD C2), same radar, same electronic warfare capability.

Figure 4. Light Marine Air Defense Integrated System (L-MADIS) integrated into war game to provide on-the-move early warning and cueing against air threats and electronic attack effects.

Conceptually adapting the same hardware and C2 system from the L-MADIS and MADIS the onto the Mark V expanded the air defense umbrella with the added benefit of integrating a short-range anti-ship missile to support the Maritime Component Commander in sea control operations. The integration and fusion of these tactical defense capabilities had an operational impact within the context of the wargame.

The ability to adapt to the character of the fight within the wargame construct through the ability to rapidly integrate existing equipment and C2 onto a new chassis facilitates the ability to generate readiness by delivering capability at the speed of relevance. An added benefit of this

approach is the reduced time required for testing. Once a component is had matured in a specific operating environment, it only must adapt to the new operating environment. Beyond equipment this approach also enables the dual use of Marines trained to operate the specific equipment. The equipment and functionality remain the same. The change is the operating environment.

Figure 5. Marine Air Defense Integrated System on display at the Pentagon. The Reconfigurable Integrated Weapons Platform turret currently integrated onto Mine Resistant Armor Protected All-Terrain Vehicle was conceptually integrated on to a Mark V to provide the commander additional flexibility and extended defense in depth during the wargame.[61]

Figure 6. Conceptual Marine Air Defense Integrated System (MADIS) hardware integrated on to the Mark V to provide littoral air defense as an element of a layered defense while augmenting the Maritime Component Commander in sea control operations with the addition of an anti-ship missile.

Application and Integration of Military Functions

The MADIS PoR arose out of a need to adapt to the 21st-century battlefield. The prototypes developed and deployed to meet the urgent needs of the warfighter were incrementally improved, tested, and trained. The authority given to the adhocracy by the urgent needs process has now transitioned to the acquisition bureaucracy. It remains to be seen if blending the strengths of the urgent needs adhocracy and acquisition bureaucracy can remain in balance delivering sustained readiness and simultaneous future force modernization. Finding the balance in terms of building tactical air defense capability and capacity that have an operational impact will be critical to delivering policymakers options as the DoD seeks to balance readiness in US Central Command and other theatres while planning force modernization to support future operations in US European Command and US Indo-Pacific Command.

Necessary Capabilities

Beyond equipment, personnel trained to operate equipment are necessary to provide commanders capabilities to compete. Managing commander expectations of equipment/capability he or she may receive in response to a changing operating environment is critical for understanding and employing adaptive capabilities rapidly developed. Nina Kollars, in *Genius and Master in Military Innovation* says this is because, "developing a new piece of kit, and knowing how to employ it effectively in contested territory, are two different things. Doing the first requires knowledge only of the machine, while the second requires knowledge of the machine, the environment, the operators and the adversary."[62] Understanding that equipment produced rapidly is not produced to the same standards as PoR gear or in a perfectly replicated threat environment is critical (replicating the noise floor in Mosul may not be possible even under DOT&E procedures). Capabilities adapted to solve problems identified by JUONs do not

typically have the same robust logistics and maintenance tail as PoR equipment or the test hours required in various operating environments. This puts a premium on training operators on systems able to articulate capabilities and limitations of systems rapidly fielded, something that remains an ongoing challenge for C-UAS equipment delivery to US CENTCOM in response to JUON CC-0558.

Examining Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities and Policy (DOTMLPF-P) implications through the lens of the Marine Corps response to JUON CC-0558 will expand on the necessity to foster flexible processes as they relate to DOTMLPF-P.

Doctrine. Doctrine is supposed to be a collection of best practices. For capabilities developed rapidly to adapt to the changing character of warfare, how do you establish a collection of best practices within the existing Joint Capability Area framework that is codified in doctrine?[63] To successfully integrate the emerging capabilities, a collection of best practices extracted from After Action Reviews (AAR) must be collected and disseminated across the force. Although not as formal as doctrine, these AARs should be leveraged to ensure Marines continue to learn and adapt.

For the MADIS many assumptions about crew functions had to be made to facilitate continued development. These assumptions are currently being validated on the test range and will continue to be refined when the capability deploys. The collection of best practices consolidated in AAR will lessons learned and provide a foundation for continued adaptation.

Organization: When rapidly deploying capabilities, it may be identified that existing organizations are insufficient to compete in 21st-century warfare. This can be seen with the Marine Corps creation of the Marine Expeditionary Force Information Group (MIG). This new

organization seeks to synthesize and expand information related capabilities available to a Marine Expeditionary Force Commander, reorganizing what used to be called the Marine Headquarters Group.

The employment of MADIS will drive change to the existing Low Altitude Air Defense Battalion table of organization. Transitioning from hub and spoke employment to fighting pair employment changes the existing organization from the section up to the battery. The ability to rapidly adapt an organization to meet the needs of 21st-century competition will be critical to future success.

Training. As discussed above, you don't have a capability without trained operators. To facilitate training to generate readiness may require adapting training ranges to replicate the operating environment. As traditional acquisition efforts seek to update training ranges, training for designated personnel can occur at test ranges.

The MADIS will include a 30x113mm cannon. Today, many Marine Corps training ranges are unable to accommodate this caliber round. However, building crew proficiency has and will occur at designated test ranges until training ranges are able to adapt to meet training needs required to develop and maintain readiness.

Materiel. Previously covered.

Leadership and Education. 21st-century competition demands learning and adapting faster than an adversary. As discussed above, operators must possess the knowledge of systems adapted to meet operational needs and be able to articulate the capabilities and limitations of delivered systems to commanders. The existing leadership and education framework are sufficient to meets the demands of 21st-century competition, but it needs to be accelerated.

For LAAD Marines to provide commanders an air defense umbrella in the current operating environment requires expanding the education they receive on the capabilities inherent in the equipment are deploying with now and in the future. Today, education takes place as part of an abbreviated new equipment training package delivered to designated Marines at the test range. Developing knowledge of interactions occurring within the electromagnetic spectrum is critical to current educational efforts and will become increasingly important to understanding the operational environment when freedom of maneuver in the spectrum is contested.

Personnel. Assigning the right personnel with the correct Military Occupational Speciality (MOS) skill sets to operate adaptive equipment is critical to delivering commanders capabilities necessary to compete. With emergent problems, personnel may need to be surged through a training pipeline to provide the capacity required to support operations. However, rapidly increasing the populations of certain MOS comes with risk. If assumptions made, with regards to necessary skills evolve, then training must adapt to provide readiness. Similar to the constant assessment required to maintain balance between readiness and force modernization, ensuring the right mix of personnel to deliver the required capability and capacity need to be constantly assessed.

The rapid expansion of the LAAD structure depicted in Figure 7 shows the institutional response for rapidly surging capacity to defend against current and future air threats. Many assumptions have been made to shape the necessary capacity for the MADIS PoR. Over time these assumptions must be revisited and validated. Adapting to the character of warfare necessitates being able to adjust the skills necessary to compete.

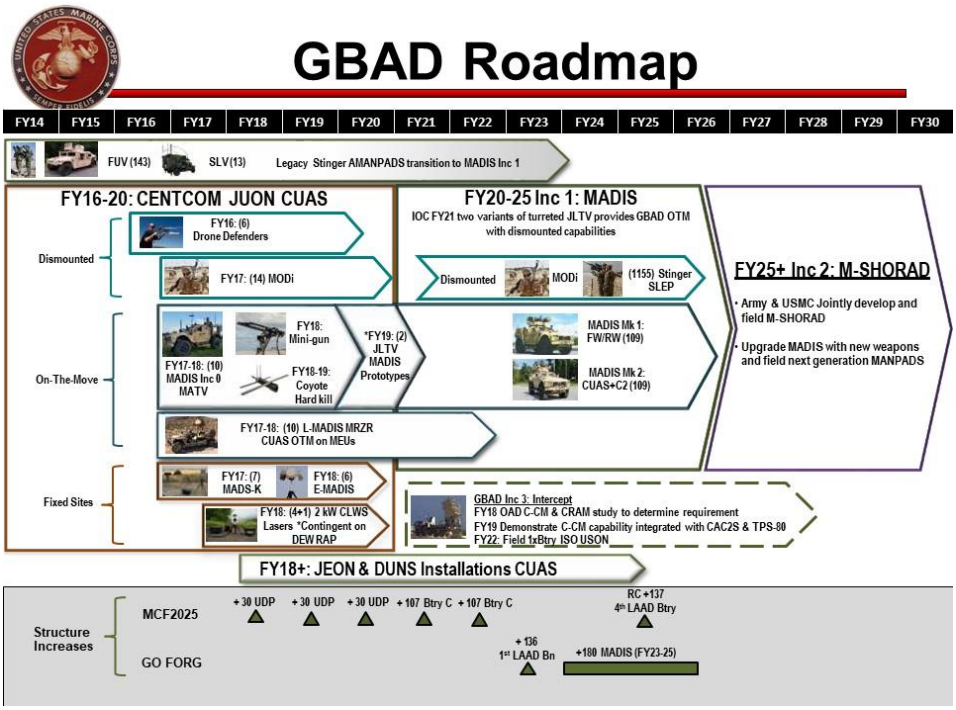

Figure 7. Ground-Based Air Defense Roadmap created and managed by the Aviation Command and Control Branch.

Facilities. As the GBAD PoR continues to understand the operating environment with regards to maintenance facilities, training, and ranges modifications will be required. Depending on the concept of logistics that is developed as the PoR is birthed will dictate the maintenance facilities required.

Policy. Sensors and jammers will require policy updates to facilitate training and steady operations. This is another methodical process that needs to be energized to facilitate competition. Outside the scope of this paper are the policy issues related to the evolution of air threats and the increasing negative acceleration towards resolutions as the entire national security bureaucracy is stuck understanding the operating environment. Viewing SHORAD capabilities through the lens of the competition mechanisms established by the JCIC with an overlay of the Strange model depicting SHORAD as a critical requirement seeking symmetry against air threats

to facilitate the Joint Force transition from defense to offense in an operational level center of gravity/critical vulnerability analysis may break the bureaucratic malaise.[64]

Conclusion

"Recall a few of the golden rules of defense planning: (1) Try to make small mistakes rather than big ones; (2) be adaptable and flexible so that you cope with the troubles your mistakes will certainly give you; (3) aim to have only minimal regrets in the future."[65]

-Colin S. Gray

"Building more for the short term. Major acquisitions are now built for long-term use but would benefit from greater recognition of the unpredictability of technology development and combat environments. The defense community should seek to acquire more equipment for the short term, as is done in the consumer environment."[66]

-Richard Danzig

"Rather than attempting to impose a false dichotomy of peace or war, or to assume an artificially static environment that can be broken into discrete campaigns with fixed end states, the JCIC recognizes the need for proactive, on-going campaigning that adjusts to fluid policy environments and changing conditions to create favorable and sustainable outcomes."[67]

-Joint Concept for Integrated Campaigning

If the past is any indication of the future, accurately predicting the shifting character of warfare will continue to remain elusive. The cyclic assessment that seeks to balance readiness and force modernization will remain an enduring challenge. "While visionary genius works outside the box by imagining future systems, mastery is needed inside the box to reorder existing systems to incorporate emerging ideas,"[68] and DoD must excel at both. Readiness focused on developing capabilities required in the near term able to rapidly adapt to the changing operating environment will be critical to support the development of current options for policymakers. Force modernization tailored to developing solutions against projected threats with projected technology is also critical to develop future options for policymakers. Understanding that these future systems will be required to adapt to a future operating environment leads to a singular conclusion. Competition in 21st-century warfare requires readiness and force modernization to

be balanced and both must be designed to rapidly integrate emerging technology. The principles of:

1) service members able to "better integrate [technology] [while] [adapting] its way of fighting,"[69] more quickly than an adversary,
2) "backing into requirements," utilizing a buy, try, inform mentality,[70]
3) a government-owned interface control document (ICD) that facilitates open architecture design able to ingest best of breed technology as it develops,
4) a "fail fast "rapid prototyping mentality while accounting for the future fiscal uncertainty.

allowed action officers to rapidly build capability to support warfare fighter needs leading to a rapid transition of pre-production prototypes to the MADIS PoR. Time will tell if these same principles will continue to be nurtured as the adhocracy formed to solve an immediate warfighter need flows back to the acquisition bureaucracy. Balancing the strengths while mitigating the weaknesses of both systems will become critical elements to 21st competition as DoD seeks to balance readiness and force modernization with the framework of force development.

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