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This paper discusses the definition of long range fires, how the Army, Marine Corps and Navy view and what approach the Marine Corps took in defining it. There is a discussion of what the Navy/Marine Expeditionary Ship Interdiction System (NMESIS) is comprised of, which is the Remote Operated Ground Unit for Expeditionary Fires (ROGUE-F) and Naval Strike Missile (NSM). Command and Control and what networks need to be integrated with and how that must be done with tactical relationships.

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Long Range Fires in a Marine Littoral Regiment

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Long-Range Fires in a Marine Littoral Regiment

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## **Indo-Pacific Shift**

During the early 21st century, the United States Marine Corps (USMC) and Department of Defense was entirely focused on the counter-insurgency conflicts occurring in Iraq and Afghanistan. Because of this, capabilities had been developed to fight in a land campaign in the desert or against Russian adversaries. General Berger writes in *Force Design 2030*, “The 2018 National Defense Strategy redirected the Marine Corps’ mission focus from countering violent extremists in the Middle East to great power/peer-level competition, with special emphasis on the Indo-Pacific.”<sup>1</sup> Current artillery systems the Marine Corps has fielded are not capable of contributing to a contested naval fight within the first island chain. The United States Army and Marine Corps heavily invested in artillery systems that were COIN focused, sacrificing range and lethality for precision and speed. Very specific artillery systems such as the M777, Expeditionary Fire Support System (EFSS) and High Mobility Artillery Rocket System (HIMARS) were developed without an emphasis on Marines loading on ships and conducting amphibious landings. Because of this need, the Marine Corps has quickly shifted its acquisitions and capability focus to launchers that can contribute to this fight and support the Navy from land.

### **The Marine Littoral Regiment and Long-Range Fires**

The Marine Littoral Regiment (MLR) is the main effort to employ forces during Expeditionary Advanced Base Operations (EABO). The 38th Commandant of the Marine Corps directed the Marine Corps restructuring to become aligned with the United States Navy. General Berger writes in his *Force Design 2030*, “future force development requires a wider range of force options and capabilities. The Marine Corps must be able to fight at sea, from the sea, and from the land to the sea; operate and persist within range of adversary long-range fires.”<sup>2</sup>

Through integrated capabilities, planning processes, and flexibility in mission requirements is how the Marine Corps will serve as a “strategic sniper” for fleets globally.

One of these integrated capabilities is the Navy/Marine Expeditionary Interdiction System (NMESIS). This system can triple a High Mobility Artillery Rocket System (HIMARS) battery from six launchers to eighteen while not increasing personnel. This is through the usage of the Joint Light Tactical Vehicle (JLTV) chassis, which makes a scalable launcher, capable of firing multiple missiles and rockets from the same launcher. The semi-autonomous nature of ROGUE-F allows the launcher chief to control three launchers, vice one under the current HIMARS Battery structure. Currently the NMESIS launcher is in the prototype and testing phase, with fielding planned as soon as FY23. Berger writes, "this investment provides the basis, over time, for generating one of the fundamental requirements for deterrence, and ultimately successful naval campaigns – long-range, precision expeditionary anti-ship missile fires."<sup>3</sup> NMESIS will provide the Marine Corps with the ability to fight long-range battles and support the Navy in controlling sea lanes of communication by integrating Naval Strike Missiles (NSM) and any other rockets or missiles that will be integrated into the launcher. By fully integrating as a Naval supporter and developing systems that can communicate with Joint Services, the Marine Corps will meet the Commandant's Planning Guidance (CPG) and Force Design 2030.

### **Roadmap to an MLR**

Defining Long Range Fires is a debatable topic between the Army, Marine Corps and Navy. Each views this definition as it feeds a service specific view of sea control/sea denial, long-range fires, and their designed operational areas of responsibility. The relationship between the Marine Corps and Navy is critical to any EABO concept. In the past, the Marine Corps has aligned ground-based indirect fires with the Army. The Navy has the primary responsibility of

providing Anti-Surface Warfare, but the Marine Corps needs to deepen its acquisitions and operational ties with the Navy to provide a sea denial capability.

Within the Force Design 2030 document, General Berger requires a more Naval integrated Marine Corps that implements programmatic and capability changes. The desire to have a naval-focused Marine Corps will require integrated systems that can communicate on common platforms that are cost-effective for both the Navy and Marine Corps. General Berger states, "with the shift in our primary focus to great power competition and a renewed focus on the Indo-Pacific region, the current force has shortfalls in capabilities needed to support emerging joint, naval, and Marine Corps operating concepts."<sup>4</sup> Due to this, the Marine Littoral Regiment, specifically a NMESIS Battery, must be analogous to a "silent sniper" that can deter adversaries from shutting off or limiting global access to Sea Lines of Communication (SLOC).

A NMESIS Battery must be a part of a more significant Naval Force that operates globally. The Marine Corps has grown accustomed to working as a Marine Air-Ground Task Force (MAGTF), which requires Marine Artillery to provide fires in support of the Ground Combat Element (GCE). In this naval relationship, NMESIS and all surface fires would need to be in support of the Naval Fleet, this would add a new tactical relationship for the fires community. To achieve this, targeting information needing to be passed from sensor to shooter quickly, to fully integrate the Marine Corps must adapt practices and processes that are like Naval targeting and C2 structures. There will time delay in target approval and the ability to attack maritime targets. If this end state is not achieved, the Marine Corps will not fully achieve its desired end state of being a contributor to sea control/sea denial.

### **Long-Range Fires Defined**

Since the release of the CPG and Force Design 2030, the Marine Corps has attempted to define what the physical range of what is considered long-range fires. Fires must be able to engage enemy vessels in these types of environments to be effective. General Berger states, “this goal requires ground-based LRPF with no less than 350NM ranges – with greater ranges desired.”<sup>5</sup> The Commandant defines Marine Corps what he is looking for, to be a threat inside the first island chain. This range is based on crucial SLOCs that is required for any adversary to gain access past the first island chain and into the Pacific Ocean. This definition limits the Marine Corps and the EABO concept to specific missiles, targets, and island chains that heavily restrict the conversation's direction and classification level. Because of this, this paper will discuss unclassified capabilities of the NMESIS system that can be applied at higher classifications. This definition serves as a starting point for the Marine Corps since no other ground-based anti-ship missile currently exists in the U.S. military that can engage targets at that range.

If the Marine Corps is going to integrate with the Naval Force, C2 information, architecture, and missile development must be shared between the two services. The Marine Corps has aligned itself over the past twenty years with the United States Army regarding cannon and rocket artillery. This relationship has determined what kind of artillery cannon and High Mobility Artillery Rocket System (HIMARS) each service has mutually fielded together. Judson states, "the Army wrapped up a strategic fires study earlier this year that found a gap in the service's ability to reach enemy targets in the mid-range (about 500-2,000 kilometers), Judson told Defense News in a Sept. 4 interview."<sup>6</sup> Because of this difference, the Marine Corps has initially aligned itself with the Navy for sea denial fires. For this paper, the writer will choose the Over the Horizon Weapon System (OTH-WS) Program Office and Program Manager

Long Range Fires (PM LRF) definition of over 80NM. This range falls considerably short of what the Commandant lists in the CPG to be considered a land-based threat. However, it addresses what the Navy considers long-range surface fires. Currently the Navy and Army do not have a missile that can meet these ranges, nor do they have a missile that is in development to achieve effects over 200NM. The Marine Corps can counter this through multiple launchers that can contest specific areas globally. To achieve this success, the Navy and Marine Corps must work together to deter common threats and deter targets.

### **Working Relationship of PM LRF and OTH-WS**

In 2017, PM LRF teamed with OTH-WS to purchase, develop, and integrate NSM onto the Littoral Combat Ship (LCS) and the NMESIS launcher. Both program offices solicited government defense contractors to determine which missile would be best to field on their respective platforms. This collaboration goes further than just purchasing items from each other's contracts and sharing information. A Memorandum of Understanding (MOU), signed in August 2020, requires more detailed collaboration between the two offices. The MOU states, "both offices will share test assets, communications integration, and development and share the workforce for such events."<sup>7</sup> Due to the Marine Corps and Navy's unique problem, this collaboration is critical to solving how interservice communication and tasking of units will take place. Solving the current airgap with LINK-16 data transfer between Naval or Joint assets to the Marine Corps will shorten the target acquisition cycle and allow the MLR to operate within that dynamic environment.

A critical component to the MLR integrating into the inter-service Naval fight is its ability to receive and translate LINK-16 message tracks. LINK-16 is a collaborative communication network that allows aircraft to communicate with ships and ground forces to pass

targeting information. The critical component is that the Marine Corps must enable access to the LINK-16 network at lower levels to allow the full AsW kill chain to be realized. USNI quoted Assistant Secretary of the Navy for Research, Development, and Acquisition James Guertz stating, "The United States Navy and Marine Corps are working with the Program Executive Office for Integrated Warfare Systems to leverage each other's' testing with the Naval Strike Missile to ensure they are not wasting money and time on redundant tests. This also include LINK-16 capable communications platforms that can integrate within both services."<sup>8</sup> Utilizing test data on all communications systems, missiles and training equipment will reduce development time and allow for interoperability between the services.

As of October 2020, both services have already participated in test events. Eckstein quotes Assistant Secretary of the Navy Hondo Guertz:

What we are doing is trying to structure that test program so we are demonstrating unique things where we need to – i.e., now it can initialize a missile correctly on a ground vehicle and get it into flight – but then take advantage for the whole community, any missile that flies provide data for everybody, he said.

So initially, if you think about a ground vehicle, it is proving that an existing missile can launch from the launcher; that was the previous test. Now it is really, can you put it in the right state, condition state, and initialize it, give it all the right data, all that, so that when it goes flying it is starting in the right condition," he said of the upcoming June test in California.<sup>9</sup>

To field a capability and employ it, the Marine Corps must determine what role this system will play and how it wants to integrate itself within the Naval Force. The Marine Corps determined

its role in naval integration with Force Design 2030. This transition from a Marine Corps engaged in land combat for the past twenty years to an integrated Naval Force will require time, effort, and experimentation with capabilities. In issuing guidance through change, Marines are now being forced to view complex problems through a naval lens.

### **Force Design 2030**

In March of 2020, the Marine Corps released its force design with an emphasis on naval integration. Force Design has come under great scrutiny from advocates because the Marine Corps removed the M1A1 Abrams Tank, transitioning from cannon artillery to rocket artillery, and reduction of helicopter units. Tanks operating in the Indo-Pacific island chains are limited in where they can travel and how much ship space they occupy. This also applies to current cannon and rocket artillery systems. To capitalize quickly on divestments, the Marine Corps must turn to rapid prototyping, Mid-Tier Acquisitions and Commercial Off the Shelf (COTS) capabilities that are fielded quickly. Due to the EABO fight consisting of different terrain and vehicle traversing limitations, the Marine Corps must look to new capabilities to ensure it has the right equipment to conduct an island chain fight.

*Force Design* reduces capabilities that the Marine Corps is traditionally accustomed to due to the expansive fight throughout the Indo-Pacific theatre of operations. This battlespace will require Marines to operate in austere and disaggregated environments spread over thousands of miles. Maneuver doctrine has led to capabilities being developed over the past twenty years; the Marine Corps has grown accustomed to its center of gravity, focusing on the infantry with support of tanks and other heavily armored systems. To compete in an island chain environment, the Marine Corps must accept that speed and maneuverability will enable force protection and allow long-range fires to support an additional maneuver force in the Navy. General Berger

states, "as the preeminent littoral warfare and expeditionary warfare service, we must engage in a more robust discussion regarding naval expeditionary forces and capabilities not resident with the Marine Corps."<sup>10</sup> This directive has changed the way the Marine Corps trains, plans, and prepares for combat. Integrating new capabilities and units while maintaining the current deployment cycle will be difficult but attainable depending on how the Marine Corps transitions to new units and capabilities.

Fielding a new force design will require capabilities and systems near production-ready and can provide a quick turnaround on when they can be available to organizational units. The Marine Corps must find systems that can be developed quickly and built on production lines. Eric Brown, Product Manager for Ground-Based Cruise Missile in PM Long Range Fires, states systems must have the "ability to integrate into existing USMC infrastructure and minimize impacts on manpower and logistics, and an elevation assembly that is universal in nature so that it can readily accommodate a wide range of missiles including the current family of HIMARS munitions."<sup>11</sup> Mirroring or developing new capabilities and fielding them concurrently will require the Marine Corps to find newer, more capable systems.

An example of this is the M142 HIMARS launcher; it is a more than capable launcher that can fire multiple rocket variants but is limited in an EABO environment. Road and bridging systems in the first island chain are not as developed compared to Middle East and European theatres. In most cases, military vehicles were not designed to cross or use lower than Class Three type bridges, which requires a vehicle to be under 20 tons. For a launcher to be reduced in weight and capable of driving off road with minimal limitations is ideal for this environment. The M142 launcher weights 36,000lbs and requires a developed road network for optimal

driving and launch conditions. The type of terrain within the INDOPACOM theatre is not conducive for legacy systems and their weight limitations.

### **What Capabilities Meet Inter-Service Requirements?**

A system currently exists and is capable of meeting General Berger's force design changes; and so Marine Corps acquisitions must adapt to meet an immediate fielding and implementation of capabilities that are ready now. Eric Brown states:

Middle Tier Acquisitions (MTA) is a faster pathway than Major Capability Acquisitions (MCA) for integrating developed technologies to form new weapon system capabilities for the warfighter. Other Transaction Agreements (OTA) offer flexibility to adjust scope on the go while saving time working contract modifications” the one thing I like most about the OTA is it encouraged industry collaboration without government involvement.<sup>12</sup>

The ability to develop prototypes and or field capabilities on current production lines serves as a critical aspect of fielding the MLR units. Traditional acquisition programs take years, if not decades, to develop, test, and field. Selecting capabilities and fielding approaches that are less than traditional and support immediate fielding and testing will benefit the Marine Corps. Eliminating redundant safety, weapons, and vehicle testing will enable the Marine Corps to quickly transition from systems it divested from, to ones that are being developed under rapid prototyping agreements. If the Marine Corps chooses to align itself with the Navy to quickly field weapons for sea control/sea denial, this transition will be faster to fielding of resilient layered systems.

The capability to fill this missile and rocket launcher based on the Joint Light Tactical Vehicle (JLT-V) chassis will allow commanders to deploy a capability based on what the mission requires. This is a critical capability for the Indo-Pacific region and how the Marine Corps plans on conducting EAB employment. PM LRF states that a system must "minimize cost, development time and time to field through the use of existing anti-ship missiles, maximize transportability on common USMC connectors including; C-130 transport, CH-53 sling load, amphibious ships, amphibious connectors, and Maritime Prepositioning Force (MPF) ships and an ability to maneuver in complex terrain and austere environments to improve employment and survivability."<sup>13</sup> This new vehicle set can carry large payloads of missiles and rockets while maintaining the JLTV driving capacity. Having a launcher that enables the Marine Corps to navigate terrain, utilize naval connectors, launch anti-ship missiles, and integrate within the LINK-16 network will enable the MLR to provide a ready response force.

Fielding an unmanned JLTV called the Remotely Operated Ground Unit for Expeditionary Fires (ROGUE-F), coupled with NSM, will enable the Marine Corps to field NMESIS Batteries with MLR units in under months. According to Stephen Stange, "in utilizing a missile that is being fielded by the United States Navy on the Littoral Combat Ship (LCS), the Marine Corps will readily be able to field and deliver a significantly advanced missile that is designed to engage sea combatants."<sup>14</sup> The Marine Corps must use rapid prototyping, testing, and development to shorten the acquisitions cycle to field a capable system that will meet the CPG's intent. This process will alleviate and support communications integration as well. In doing this, both the Navy and Marine Corps will be able to integrate a full system that can communication and provide effects on target.

To properly use this system in a naval engagement, the Marine Corps must have the ability to operate and communicate in the LINK-16 network. Currently, there is not a fully digital pathway to utilize the full capabilities of NSM. Lead Engineer for NMESIS, John Pomfret writes, "for Naval Strike Missile to successfully engage targets, the common communications picture must be the same for the Navy and Marine Corps. In order to achieve this, the Marine Corps must be able to receive and process tracks from LINK-16 the same way the Navy does, and currently, the Marine Corps is unable to do that from the sensor to shooter in digital architecture."<sup>15</sup> For the Marine Corps to be a land-based shooter within the ASW battle a reduction in approval and authorities' timelines must be developed. This network will require the Marine Corps to be integrated through LINK-16 with the Navy, Air Force, and Army; without this ability, it would cause the Marine Corps to fail at its ASW mission.

#### **Common Command and Control Network for ASW**

The United States Navy has a vastly different command and control (C2) architecture within which the Marine Corps is attempting to better integrate itself. This network enables a ship's commander to directly communicate with a Combatant Command to gain approval for target engagement. This process allows the ship's commander to have real-time conversations with commanders located thousands of miles away to gain immediate guidance on avoiding or engaging an enemy naval combatant. According to Gavin Swanson Communications Architecture Lead OTH-WS/NMESIS Program Offices:

The Marine Corps must mirror an architecture that follows the Navy's ASW path. Currently, the Marine Corps has a very thorough method of control for fires that requires liaisons and approvals at multiple levels of commands based on the type of munition being used and target being engaged. The Marine Corps and Navy will be able to safe a flight corridor for NSM

through sharing a Common Operating Picture (COP). While useful for a land battle, this systematic approach is not the most efficient way to engage targets at sea due to the evolving nature of a sea battle that requires swift action for fires.<sup>16</sup>

Field Artillery assigns Seven Inherent Responsibilities for Field Artillery units as designated in Table 1. These relationships define how artillery units support maneuver units with fires and determine where liaisons and observers are imbedded to deconflict fires. Because the Marine Corps is taking on a Naval-specific fires mission, this table must be amended to reflect a Naval Fires relationship. This additional relationship is critical to ensuring a NMESIS Battery is employed within its appropriate command and will alter the Marine Corps traditional fires relationship with a ground maneuver element. Tactical relationships are defined by Field Manual 3-09-22 as:

**Table D-1. Seven Inherent Responsibilities of Field Artillery Tactical Missions**  
**Appendix D**

AN FA UNIT WITH A TACTICAL MISSION OF-	DIRECT SUPPORT	REINFORCING	GENERAL SUPPORT REINFORCING	GENERAL SUPPORT
Answers call for fire in priority from-	1. Supported unit  2. Own observers <sup>1</sup>  3. Force FA HQ	1. Reinforced FA  2. Own observers <sup>1</sup>  3. Force FA HQ	1. Force FA HQ  2. Reinforced unit  3. Own observers <sup>1</sup>	1. Force FA HQ  2. Own observers <sup>1</sup>
Has as its zone of fire-	Zone of action of the supported unit.	Zone of fire of reinforced F.A.	Zone of action of the supported unit to include a zone of fire of reinforced F.A. unit.	Zone of action of the supported unit.
Furnishes fire support personnel <sup>2</sup>	Provides temporary replacements for causality losses as required.	No requirement.	No requirement.	No requirement.
Furnishes liaison to-	No requirement.	Reinforced F.A. unit H.Q.	Reinforced F.A. unit H.Q.	No requirement

Establishes communication with-	Company fire support officers (FSOs) and supported maneuver unit H.Q.	Reinforced F.A. unit H.Q.	Reinforced F.A. unit H.Q.	No requirement.
Is positioned by-	DS FA unit commander or as ordered by force H.Q.	Reinforced F.A. unit or as ordered by force F.A. H.Q.	Force FA HQ or reinforced F.A. unit if approved by force F.A. H.Q.	Force FA HQ.
Have its fires planned by-	Develops own fire plan.	Reinforced F.A. unit H.Q.	Force FA HQ.	Force FA HQ.

These relationships must be applied in the same manner towards a Strike Group or individual ship afloat, transiting within a zone of fire. In this instance, the ship would have the same relationship with an NMESIS Battery that a cannon artillery battery has with an infantry unit it is supporting. Making these additions to Table 1 will allow a focus to shift on the types of platforms needed to integrate into the Naval C2 architecture through focused efforts and prioritize newer systems over older fire support platforms.

Currently the Marine Corps artillery uses the Advanced Field Artillery Tactical Data System (AFATDS) for cannon artillery only; it is not the primary method to compute firing solutions for rocket and missile artillery. AFATDS is a laptop computer system that provides fuse, propellant, projectile weight, weather, and locations of all units to compute data to provide an accurate flight path for the projectile to hit its intended target. This allows artillery units to communicate and determine solutions to provide fires for infantry or any other supported units. AFATDS has been used for over thirty years and is an older fire control system that was not designed with LINK-16 integration as a primary or secondary objective. Integrating the appropriate messages into AFATDS from LINK-16 would take significant effort and money to translate the right information to fire an NSM and therefore not feasible or fiscally prudent.

Due to the sea battle's evolving nature, the Marine Corps must change how it uses fires and its approval timelines to be effective in a sea domain. The NMESIS Battery must be flexible in its communications pathway and how it communicates with the Navy. Stephen Stange states, "there is a paradigm switch that must take place at the user level. The Marine that has to plan out the mission for a missile flight is very different than how an artillery Battery has been deployed in the past. Missile capabilities like the Naval Strike Missile (NSM) are very different from traditional artillery. From a salvo perspective, depending on the target, a mission could be accomplished with as little as a single NSM."<sup>17</sup> By using the Fire Direction Terminal (FDT), which is a Kongsberg and Raytheon version of AFATDS, the firing battery is able to access the full capabilities of NSM for mission planning and employment.

Currently, an NMESIS Battery will use AFATDS and the FDT. The Raytheon Missile Systems, and Kongsberg Defense will be the primary tool to conduct mission planning and data to the NMESIS launcher. AFATDS will operate as a platform that will not directly communicate or provide direction to the FDT for how to engage targets. AFATDS will serve as a potential platform that provides a Common Operating Picture (COP) to higher headquarters, and all mission data will be "air gapped." This will be needed to report the COP to reinforced units, so a battlefield awareness is maintained. As stated in the FM 9-22, reinforcing tactical relationship, "zone of action of the supported unit to include a zone of fire of reinforced F.A. unit."<sup>18</sup> The Marine Corps currently cannot conduct surveillance organically to a sea zone of fire and will need AFATDS to support this in an undetermined manner. Thus, it would need to be established in a communications network and tactical relationship that supports this unit alignment and relationship. The FDT will directly tie into the LINK-16 network, enabling an NSM to engage vessels at sea, well over 100 nautical miles.

When employing a NMESIS Battery, the Marine Corps must utilize C2 platform with the Navy to ensure timeliness of fires and support this type of tactical relationship. Gavin Swanson, Command and Control Lead for OTH-WS states, "both the Navy and Marine Corps needs to establish a tactical relationship that allows for ease of communications, from ship to the ground-based launcher. In doing this, they can pass targeting information the same way the Marine Corps currently passes information between infantry and artillery units. Be defining this relationship, and it will allow a much easier and simpler communications relationship to occur."<sup>19</sup> Adding the Navy to a supported relationship or tactical relationship will streamline the Marine Corps determine how to integrate to complete a Navy/Marine Corps ASW kill chain. The TCA is a start that will allow the ability to integrate enough LINK-16 tracks for an NMESIS Battery, but it may not be the final solution based off its limitations.

The TCA provides the Marine Corps with an answer now for LINK-16 to a NMESIS Battery because it can integrate what the appropriate tracks to prosecute naval surface targets. According to Swanson, "at a tactical level, it provides what essential tracks are needed. It is not all, and there will be time to integrate or develop something the Navy and Marine Corps can use. However, for the fight right now, the Marine Corps has tested and shown that something would put missiles in the air to engage an enemy combatant. Which is more than we have ever had between the two services."<sup>20</sup> For the fight today, this is what the Marine Corps must invest in initially and work through in exercises to determine whether more funding should be invested in a software application while a more elegant and refined communications system is developed. This would allow Marine Artillery to develop the tactics needed initially and have the chance to validate how responsive they want a communications system to be.

## **Employment of an NMESIS Battery**

In developing and employing a new capability, the Marine Corps must not remain dependent to previous fire support systems such as AFATDS, and the M142 as legacy systems. According to Eric Brown, "the technology of the ROGUE-F vehicle is in the final testing phase with the Army and has a significant capability that the Marine Corps needs to get hands-on user feedback. This will inform both requirements and acquisition workforces on where the development funding needs to focus on."<sup>21</sup> There is no training manual on how to employ a semi-autonomous missile launcher in the Department of Defense. The Marine Corps must be creative in how this is done and how feedback is given to the commands that would write the tactics and technical manuals needed to employ and sustain such a system. A foundation is established in the FM-50, Cannon Battery Operations, and TM 9-2320, the Technical Manual for HIMARS Operators. By drawing information and experience from these manuals, the Marine Corps can create doctrine and tactics for such a system.

In the development of training doctrine, the Marine Detachment at Ft. Sill, Oklahoma, leads the way in all things Marine Artillery. Colonel Christopher Tavuchis is the Commanding Officer of the detachment and has been working with his staff to develop a curriculum with little information known on the system other than the information received through briefs. Colonel Tavuchis writes, "the system would deploy in support of the Navy – or some other Service-related means as envisioned the Light Amphibious Warfare (LAW) vessel as part of a Naval Maritime Strike or Naval Component. The system would operate similar to any former "shore battery" or missile system on a naval vessel with the difference of being onshore, mobile, and dispersed to enhance survivability and extend the Navy's firepower within the Weapons Engagement Zone (WEZ) (as advertised). Essentially, we would "weaponize" various locations

and create a tactical and operational dilemma for the enemy in his back yard (so to speak).”<sup>22</sup> Employing the system the same as a shore battery and operating it in dispersed formations is what the Marine Corps must begin to do for the initial effectiveness of the capability. Due to its ability to disaggregate and operate at long distances, artillery units must begin working in isolated firing positions that are further away than from higher headquarters locations typically are under current doctrine.

When operating as a part of a Naval Maritime Strike, an NMESIS Battery must scale accordingly to fight in coastal locations or locations advantageous for fires going to sea or communicating seaward. The battery's employment method must not be restricted to its land-based fire control agencies and measures due to the rapidly evolving naval battlespace. Col. Tavuchis writes, “the value of having a highly trained force that can disaggregate is the ability to contest a peer adversary along the littorals and ultimately threaten is the ability to maneuver and economically sustain. The CMC's guidance lays this out: "Forces that can continue to operate inside an adversary's long-range precision fire weapons engagement zone (WEZ) are more operationally relevant.”<sup>23</sup> Due to the fluidity and quickly changing naval theatre, a ground launcher must be as flexible as a surface combatant while being highly trained and capable of performing multiple mission requirements.

With the rapidly evolving and technical mission requirements for a coastal defense unit, a NMESIS Battery must be focused on sea control/sea denial. When the Marine Corps forms for combat, the MAGTF combines all aspects of ground, air, and supporting units. Due to the complex nature of engaging naval combatants and the required speed to engage naval targets, a NMESIS Battery must be looked at as the new central combat provider for the MLR. Because of a new supported relationship, the battery must support a new form of maneuver, the United

States Navy. The changes proposed to the Marine Artillery paradigm focus on providing fires not in support of an infantry unit. The tactical support relationship must change to where the MLR must ensure the firing battery's survival in a contested zone. Providing fires in a naval battlespace must be this unit's primary focus, while the remainder of the MLR provides the overall security and logistics support to ensure the battery meets its mission requirements to support a Naval Maneuver Force.

The idea of a Naval Maneuver Force is something the Marine Corps must consider when determining command and tactical relationships. Because of how rapidly evolving a naval battle is compared to a land battle, approval times and authorities must be in place to ensure a missile is launched while a ship is transiting or entering a weapons engagement zone. The need to provide MLR liaisons within naval commands, whether stationed on the ship or embedded in shore-based units, ensures the missile flight path is safe and timely. According to Stephen Stange, "putting Sailors and Marines within both grounds and sea-based commands allows for each service to understand the control measures that must be in place to support each other. Establishing a direct communication from the Navy to the MLR will these approvals to be pushed timely and not be bogged down by unnecessary checks by individuals that do not need to know or do not impact the mission."<sup>24</sup> Creating the appropriate approvals that streamline this relationship is key to providing fires and ensuring a Naval Maneuver Force is protected by the MLR.

### **The Way Forward**

The Marine Corps must view the NMESIS Battery as a maneuver unit supporting a Naval Fleet, all other Marine units within an MLR must be supporting its battlefield survival. For the MLR to be successful in providing support to a Naval Fleet, this new tactical relationship must be realized and accepted. According to Stephen Stange, "the fluidity of the Naval fight and how

often it is changing, through simple weather or the course a ship takes, the battery would need to be flexible in how it is supporting. Without this flexibility in who it reports to, opportunities would be delayed through approval processes.”<sup>25</sup> Nested within this, the Marine Corps must look to purchase radios, vehicles, launchers, and missiles that are easily compatible with the naval fight. These must also be capable of integrating seamlessly into that architecture, while allowing Marine liaisons and commanders to have the awareness needed to know the battlespace around them.

Systems that are compatible and allow flexibility such as the Multifunctional Informational Distribution System (MIDS) Terminal, CAC2S ashore provide specific needed to integration between the Navy and Marine Corps. Currently fielded capabilities such as AFATDS are designed for cannon artillery and only are used for situational awareness and do not have a consideration within the technical computation for rockets or missiles. There must not be additional fiscal investment put into making AFATDS LINK-16 capable. The required work to make AFATDS compatible with NSM is extensive and will be difficult to achieve with proprietary information held by Kongsberg Defense. Quality track information that is passed from AFATDS to the FDT will always be air-gapped or require voice communications. The airgap will be due to AFATDS will never being compatible to receive or transmit the full track data NSM needs to fully utilize the entire missiles capabilities. The only way this will be achieved is by the TCA or another translator that can pull the required LINK-16 tracks required to engage surface targets.

Through experimentation and experience, the Marine Corps must develop the communications relationship and architectures needed to integrate a NMESIS Battery into a naval fight. To start off in its development and maturation, the Marine Corps must not remain

ties to its known relationships and how artillery fights and whom it supports. Currently established tactical relationships are a great foundation to begin the discussion on how the Marine Corps integrates within a naval battle. Inserting liaison teams within Naval commands that feed information to MLR Commanders will enable them to determine how to build a defense in depth around the NMESIS Battery that can support a task force. The foundation has been established with NMESIS and using the TCA to begin C2 integration at for a firing battery to fight within a naval construct. By expanding on these pre-existing efforts and refining them to streamline efforts will allow for a faster than expected integration for the MLR and NMESIS Battery.

## Bibliography

- Berger, David. 2019. *Commandants Planning Guidance*. Washington, D.C.: 38th, Commandant, United States Marine Corps.
- Berger, David. 2020. "Force Design 2030." *Journal*, Washington D.C.
- Brown, Eric, interview by Major Matthew Browning. 2020. *NMESIS Battery* (December 17).
- Eckstein, Megan. 2020. *Marines Will Field Portfolio of JLTV-Mounted Anti-Ship Weapons in the Pacific*. Washington, D.C.: USNI.
- Judson, Jen. 2020. *For the US Army's fires capability* (Judson 2020) (OTH-WS 2020), *2023 is the year that will change everything*. Washington, D.C.: Defense News.
- OTH-WS, PM LRF. 2020. "Memorandum of Understanding."
- Pomfret, John, interview by Major Browning. 2020. *Lead Engineer* (Pomfret 2020) (Swanson 2021) (Col Tavuchis 2020), *NMESIS* (December 17).
- Stange, Stephen, interview by Major Matthew Browning. 2020. *Lead Missiles and Development Engineer, Over the Horizon Weapon System* (December 15).
- Swanson, Gavin, interview by Major Matthew Browning. 2021. *NMESIS Questions* (Feb 8).
- Tavuchis, Christopher, interview by Major Matthew Browning. 2020. *Colonel* (December 18).
- Training Command, United States Army. n.d. *Field Manual 09-22*. United States Army.

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- <sup>1</sup> (Berger 2020)
  - <sup>2</sup> (D. Berger 2019)
  - <sup>3</sup> (Berger 2020)
  - <sup>4</sup> (Berger 2020)
  - <sup>5</sup> (D. Berger 2019)
  - <sup>6</sup> (Judson 2020)
  - <sup>7</sup> (OTH-WS 2020)
  - <sup>8</sup> (Eckstein 2020)
  - <sup>9</sup> (Eckstein 2020)
  - <sup>10</sup> (Berger 2020)
  - <sup>11</sup> (Brown 2020)
  - <sup>12</sup> (Brown 2020)
  - <sup>13</sup> (Brown 2020)
  - <sup>14</sup> (Stange 2021)
  - <sup>15</sup> (Pomfret 2020)
  - <sup>16</sup> (Swanson 2021)
  - <sup>17</sup> (Stange 2021)
  - <sup>18</sup> (Command n.d.)
  - <sup>19</sup> (Swanson 2021)
  - <sup>20</sup> (Swanson 2021)
  - <sup>21</sup> (Brown 2020)
  - <sup>22</sup> (Col Tavuchis 2020)
  - <sup>23</sup> (Col Tavuchis 2020)
  - <sup>24</sup> (Stange 2021)
  - <sup>25</sup> (Stange 2021)