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MASTER OF MILITARY STUDIES

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**Regaining the Initiative in Ground Fires:  
The Transformation of Marine Corps Artillery 1999 to 2015**

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

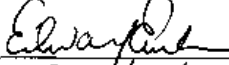
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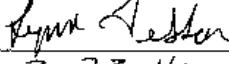
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## Executive Summary

**Title:** The Transformation of Marine Corps Artillery 1999 to 2015: Regaining the Initiative in Ground Fires

**Author:** Major Nathan M. Harvey, United States Marine Corps

**Thesis:** The transformation undertaken by the Marine Corps artillery community between 1999 and 2015 with regards to fire support weapon systems, personnel, and structure has prepared the organization to effectively support the requirements of the future operating environment as described in *Expeditionary Force 21*.

**Discussion:** Marine Corps artillery transformed at the beginning of the 21st century (1999-2015) improving the community's ability to provide increased mobile, scalable, and lethal fire support. A major factor driving the artillery community to change was newly developed doctrine such as Operational Maneuver From The Sea (OMFTS) and Ship To Objective Maneuver (STOM). As OMFTS and STOM continued to develop, the artillery community identified deficiencies with its ability to effectively support these new concepts due to weapon system limitation and an inflexible personnel structure. The artillery community implemented a plan to develop three new artillery weapon systems, which became known as the triad of fires, as well as adjust the personnel structure to better support maneuver in the future operating environment. This paper depicts the artillery community's transformation, the effectiveness of the transformation, and the relevance of the transformation in comparison with the EF 21 future operating environment.

**Conclusion:** The transformation undertaken by Marine Corps artillery in regards to developing and fielding three new complimentary fire support weapon systems, modifying organizational structure, and adjusting manpower structure effectively postured the community to effectively support maneuver forces in the future operating environment as described in *EF21*.

## Preface

I undertook the endeavor to analyze and better understand the transformation undertaken by Marine Corps artillery as it prepared to enter the 21st century largely due to having personally served in the community during this period. The transition from one weapon system to three weapon systems while fighting two separate wars and filling multiple in-lieu missions did not create an atmosphere supportive of drastic changes undertaken by the community. In addition to the changes to the weapon systems, the artillery community altered the organizational and personnel structures creating a more scalable and flexible fire support community. The purpose of increasing the scalability of the community is to better support maneuver forces in the conduct of Marine Corps's operational requirements. After examining the reasoning behind the community's course corrections, I sought to review if the adjustments in regards to weapon systems, organizational and personnel structure modifications effectively meet the current and future operating environments as depicted in *Expeditionary Force 21*. Finally, I provide analysis and recommendations on further course corrections the required for the artillery community to remain relevant in the future.

Throughout the research process Dr. Edward Erickson provided continuous encouragement and guidance on the direction of the paper. Dr. Erickson's previous experience serving as a U.S. Army field artillery officer ensured my arguments and overall paper were on time and on target. In addition, Lieutenant Colonel Stoutenborough provided in depth subject matter expert analysis improving the arguments within the paper. Having just served as a Marine Corps artillery battalion commander (2013-2015), he was able to provide up to date information and perspective. Additionally, Dr. Lynn Tesser provided positive critiques further enhancing arguments providing a non-artillery perspective. Her advice ensured the paper translates to personnel outside the artillery community. I would like to thank each of the three members listed above for their support throughout this process.

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## INTRODUCTION

The ever changing character of warfare caused by social, political, and technological innovation often requires military organizations to evolve in order to gain or maintain an advantage over opposing forces. As the United States Marine Corps prepared to enter the 21st century, the warfighting organization developed new doctrine such as Ship to Objective Maneuver (STOM) and Operational Maneuver from the Sea (OMFTS) to exploit technological advances. Both OFMTS and STOM forced communities within the organization such as Marine artillery to review current tactics, capabilities, and structure to ensure maximum effectiveness in support of the new doctrine. Multiple deficiencies were identified with the artillery community's ability to provide fires for maneuver forces conducting these new operational concepts. This paper seeks to review the Marine Corps artillery (weapons, personnel, and organizational structure) transformation as it prepared for the 21st century (1999 to 2015), specifically: if the completed transformation provided better support to maneuver forces and if further adaptation is necessary to support the operating concepts presented by *Expeditionary Force 21 (EF21)*.

At the turn of the century the future of Marine artillery was unclear. The only certainty was that a change was needed and it would start with the organization's single artillery weapon system, the M198 howitzer. The howitzer needed replacement due to inadequate mobility, limited range, and lack of survivability in comparison with competing artillery forces. Realizing the weapon's shortfalls, the artillery community created a plan to modernize ground fires by developing three new fire support weapon systems to replace the outdated howitzer. In addition to identifying a shortfall with the community's single fire support weapon system, artillery leaders also recognized deficiencies with the current organizational and manpower structure's ability to support maneuver. Realizing battery operations required additional flexibility; the

community developed a plan to create a more scalable force allowing maneuver commanders to employ artillery across the full Range of Military Operations (ROMO). Revisions to manpower were required to support the newly developed organizational structure. Additional manpower restructuring occurred in an effort to improve and professionalize fire support personnel within the community. The transformation undertaken by the Marine Corps artillery community between 1999 and 2015 with regards to personnel and structure has prepared the organization to effectively support the requirements of the future operating environment as explained in *Expeditionary Force 21 (EF21)* although additional adaptation is necessary to remain an effective fire support community.

## **BACKGROUND**

Immediately upon assuming his post as the 32nd Commandant of the Marine Corps in 1999, General James Jones made it a priority to review the Marine Corps artillery mission, role, organization, and equipment due to a concern about the community's ability to provide fire support in an expeditionary environment. The Commandant's concerns were largely due to witnessing a 57% personnel reduction in the Marine artillery community from 1988 to 2000. General Jones made the following statement about the drastic reduction to the artillery community, "We (the Marine Corps) have decreased our fire support systems too far".<sup>1</sup> Having commanded maneuver forces ranging in size from platoon to division in both combat and training, General Jones understood the importance of ground fires in support of expeditionary operations.

In addition to General Jones's unease with the overall reduction of Marine artillery was his concern with the community's outdated weapon system, the M198 155mm towed howitzer. Despite being viewed by many as an "all-purpose [fire support] tool"<sup>2</sup>, technological advances

highlighted the aging howitzer's limitations and inadequacies in comparison with competitor capabilities. The Commandant realized the M198's limited mobility, survivability, and lethality needed to be replaced in order to provide maneuver forces effective fire support in future operating environments. Realizing the need to replace the outdated howitzer and reinvigorate the artillery community, General Jones "issued a directive to review the role, mission, organization, doctrine, structure, and training of the Marine Corps Field Artillery comprehensively as one of his priorities."<sup>3</sup>

The leaders in the Marine artillery community used the Artillery Operational Advisors Group (AOAG) to develop, implement, and oversee the way ahead for Marine artillery.<sup>4</sup> The AOAG consisted of the four artillery regimental commanders and Fort Sill Marine Artillery Detachment Commanding Officer. In early 2000, the group (led by artillery Colonel James Pace) proposed that "fire support organic to Marine forces is inadequate for today's battle and poorly postured to meet required OMFTS/STOM capabilities that must be in place by 2015. To get there, we need a 'triad' of short, medium, and long range fire support systems that have complementary and mutually supporting capabilities."<sup>5</sup> By identifying the capabilities needed to effectively support maneuver in the future operating environment, the AOAG laid the framework that would be developed in the triad of fires. The community continued to develop the framework and settled on a fires triad consisting of the M777A2 155mm lightweight towed howitzer to cover the medium range fires, the M142 High Mobility Artillery Rocket System (HIMARS) to cover the long range fires, and the Expeditionary Fire Support System (EFSS) consisting of the M327 120mm towed rifled mortar to cover the close range fires. The triad of fires was designed to increase fire support capabilities and provide maneuver forces with a more mobile, lethal, and scalable artillery force able to support OMFTS and STOM. <sup>6</sup>

After finalizing the way ahead with artillery weapon systems by composing the triad of fires, the artillery community shifted focus toward reviewing internal organizational structure and improving the capability and proficiency of fire support personnel. The current organizational structure and employment techniques for firing batteries were deemed inadequate due to rigidity in supporting STOM and OMFTS.<sup>7</sup> In light of this determination, the AOAG discussed and approved dividing individual firing batteries into two firing platoons capable of conducting independent operations. Platoon operations provide a maneuver commander a scalable fire support solution capable of operating combined or independently to support the scheme of maneuver. Overall, the transition to platoon operations appeared to better posture artillery forces to support the Marine Corps in the conduct of STOM, OMFTS, and distributed operations. A major drawback to the platoon organizational structure change was the additional manpower required to operate two firing positions autonomously.<sup>8</sup> Requests for additional billets were not easy to come by as the Marine Corps focused on a drawdown with an approved plan in place to decrease the organization's end strength.

In addition to addressing deficiencies with the M198 howitzer and reorganizing the firing battery structure to support maneuver, the artillery community worked to professionalize its fire support personnel. Addressing the fire support community came largely in part due to General Jones's comment that "Marine artillerymen must integrate the MAGTF's fires from all sources. Failure to develop professional fire supporters could result in disaster."<sup>9</sup> This fire support personnel restructure did not end when the Commandant reactivated the Air Naval Gunfire Liaison Companies (ANGLICOs) but continued down to the artillery regiments and battalions. Artillery fire support liaison personnel were removed from firing batteries and consolidated into a fires platoon within the battalion headquarters battery. The realignment allowed the fires

section to focus efforts on the training demands required to maintain Joint Terminal Air Controllers (JTACs) and qualifications. After consolidating the fire support personnel, the community standardized their training continuum to maximize proficiency at all ranks within the scout observer military occupational specialty. The next portion of this paper reviews how Marine artillery was able to overcome the combined feat of simultaneously developing and fielding new weapons systems, restructuring firing batteries, and professionalizing the fire support community.

### **ARTILLERY WEAPON SYSTEM EVOLUTION: THE TRIAD OF FIRES**

The following section addresses the major changes taken by Marine artillery to transform from a community centered on one fire support weapon system to three mutually supporting, flexible, and scalable weapon systems. The first weapon system created to replace the M198 was the M777 lightweight, 155mm, and towed howitzer. The lightweight howitzer was viewed as the workhorse weapon system and provided similar capabilities to the M198 as depicted in figure 1. The addition of a rocket platform drastically increased range allowing ground fires to shape in the maneuver deep fight. Finally, the conception of the 120mm mortar system created a scalable fire support weapon capable of internal transport aboard a MV-22 Osprey. The ability to internally transport the 120mm mortar provides ground forces an indirect fire weapon capable of maneuvering over distances and speeds unsupportable by the other two weapons. The three weapon systems became known as the triad of fires. Each of the weapon systems within the triad provide an overlapping capability ensuring maneuver forces receive adequate fire support throughout an area of operations. The following subsections will review the capabilities of each weapon system and the ability of the triad to support the concepts and future operating environment explained in *EF21*.

## **M777 155mm Lightweight Howitzer**

In 1996, both the United States Army and Marine Corps coordinated a joint venture to initiate a program to develop a lightweight 155mm howitzer replacement for the M198 weapon system. The movement to identify a replacement for the M198 actually occurred prior to the direction of General Jones. The purpose of replacing the aged artillery piece was to increase fire support mobility, lethality, survivability, accuracy, and rates of fire increasing support to maneuver forces on the battlefield.

An additional factor driving the Marine Corps to seek an improved fire support weapon system was due to the organization's expanding doctrine of OMFTS and STOM. Both OMFTS and STOM further highlighted the requirement for a more mobile and scalable fire support system to replace the outdated M198 howitzer. The replacement for the aging howitzer was a lighter weight, more mobile, more survivable, and digital fires capable 155mm howitzer known by its nomenclature as the M777. A key design element for this lightweight howitzer was to ensure it could be airlifted by the MV22 Osprey aircraft. The Osprey became a cornerstone element to conducting OMFTS and STOM due to its advanced speed, range, and capabilities as compared to other aircraft. The creation of the M198 replacement was the primary focus of the community to ensure no gaps were created during the development of the triad. As directed by the 32nd Commandant of the Marine Corps, the lightweight howitzer would serve as the primary artillery direct support weapon system in each Marine division.<sup>10</sup>

The M777 maintains the same range capability as the M198 while bringing multiple other features which improves the howitzer's mobility, lethality, and survivability as shown in figure 1. The first instrumental improvement was the lighter weight of the howitzer allowing the M777

to be externally lifted by an MV-22. By ensuring the howitzer could be lifted via the Osprey makes the M777 a viable option to support STOM. In addition to the lighter weight, the improved terrain trafficable howitzer allows increased speeds and the ability to occupy positions previously inaccessible to the older and heavier howitzer. The decreased time required to emplace and displace increases survivability and lethality of the weapon system. Also, the Digital Fire Control System (DFCS) and ability to shoot Excalibur rounds (precision guided munition) enhances the accuracy and in turn the lethality of the new weapon system.

Following the AOAG’s determination to develop and field the lightweight howitzer in 2000, the Marine Corps began fielding the lightweight howitzer to active duty units in 2005.<sup>11</sup> Although multiple adjustments and additional requirements were identified throughout the process, in just five years the community was able to field a drastically improved weapon system capable of replacing the aged M198 howitzer.

	<u>M777</u>	<u>M198</u>	<u>Improvement</u>
<b>Weight</b>	<b>9,800 lbs</b>	<b>16,000 lbs</b>	<b>39%</b>
<b>Emplaces</b>	<b>2:10 min</b>	<b>6:35 min</b>	<b>304%</b>
<b>Displaces</b>	<b>2:23 min</b>	<b>10:40 min</b>	<b>448%</b>
<b>Terrain Trafficable</b>	<b>83%</b>	<b>63%</b>	<b>32%</b>
<b>C-130 Load</b>	<b>2</b>	<b>1</b>	<b>100%</b>
<b>Digitized</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
<b>Excalibur Ready</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>

FIGURE 1: M198 and M777 howitzer mobility, survivability, and lethality comparison<sup>12</sup>

### **M142 High Mobility Artillery Rocket System (HIMARS)**

The M142 High Mobility Artillery Rocket System (HIMARS) was developed to provide commanders an organic, all weather, 24/7 ground indirect fire weapon capable of delivering deep fires to shape the battlespace. The addition of HIMARS provides an extended umbrella of

protection to maneuver forces due to its coverage of targets outside the range of the lightweight howitzer. The M142 is currently a Marine Division asset that can be requested by subordinate units.<sup>13</sup> The rocket system is a great general support weapon system due to the ranges it can engage targets, as depicted in figure 2 (classified ranges not listed).

The Marine rocket system was adapted from the Army’s M270 Multiple Launch Rocket System (MLRS).<sup>14</sup> The MLRS underwent multiple modifications as the Army and Marine Corps transitioned it into a more expeditionary weapon system. The first adjustment was transitioning from a tracked vehicle to a wheeled vehicle supporting maneuverability and utility on the battlefield. The speed and ability gained by transitioning to a wheeled 5-ton vehicle came at the cost of payload. The 5-ton vehicle can only carry one pod of six rockets or one ATACMS missile whereas the tracked vehicle carried two pods. The Marine Corps determined sacrificing one pod was acceptable due to the maneuverability and lighter weight of the wheeled variant. By reducing one pod of ammunition and transitioning to a wheeled vehicle, the total weight of the M142 is 24,000 pounds while the previous MLRS tracked vehicle was well over 44,000 pounds. Although both vehicles appear heavy, HIMARS can be transported via C-130 aircraft whereas the MLRS requires a larger C-5 or C-7 for transport.<sup>15</sup>

	<b>M26</b>	<b>M26A1</b>	<b>M26A2</b>	<b>M30</b>	<b>M31</b>
Length	3.94 m (12 ft. 11 in)				
Diameter	22.7 cm (8.94 in)				
Range	10-32 km (20 miles)	13-45 km (28 miles)		15-60 km (37 miles)	
Propulsion	Solid-fueled rocket				
Warhead	644 M77 DPICM bomblets	518 M85 DPICM bomblets	518 M77 DPICM bomblets	404 M85 DPICM bomblets	51.5 HE

Figure 2: HIMARS Rocket Projectile Capabilities<sup>16</sup>

Despite the versatility of the weapon system, the Marine Corps determined the need for only one active duty battalion and one reserve battalion of HIMARS. The 5th Battalion, 11th Marines (active duty) and 2nd Battalion, 14th Marines (reserve) began fielding the system in 2005. HIMARS was so drastically different from operating artillery cannons that the Marine Corps established new military occupational specialties to operate the system.<sup>1</sup> Artillery crew members were retrained at the Marine Corps approved school house and certified at their parent command prior to firing the rocket system. The training school is co-located at Fort Sill, OK alongside the cannon crewman course and run by the Marine detachment aboard the base.

### **M327 120mm Towed Mortar and Expeditionary Fire Support System**

The final artillery weapon composing the triad of fires is the Expeditionary Fire Support System (EFSS). Each EFSS consists of a 120mm mortar, two Internally Transportable Vehicles (ITVs), and an ammunition trailer.<sup>17</sup> The 120mm mortar system was designed to serve as a direct support weapon for the vertical assault element of the Ship to Objective Maneuver (STOM) force. A key factor required to support STOM is the ability to internally transport the fire support weapon system within an MV-22 aircraft. After multiple redesigns of the ITV and ammunition trailer, the EFSS achieved the space and weight parameters to be stowed and transported via Osprey airlift. In 2009, the Marine Corps began to field The EFSS in addition to the newly fielded lightweight howitzer. Artillery cannon firing batteries were required to maintain and certify Marines on both the M777 howitzer and M327 mortar.

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<sup>1</sup> The Marine Corps established the MOS 0814, High Mobility Artillery Rocket System (HIMARS) Operator in order to track and monitor Marines qualified to operate the HIMARS weapon system. Current cannoneers (MOS 0811) were sent to Fort Sill in order to be trained and certified at the MOS producing school if they received orders to a rocket battalion.

EFSS has a maximum range of eight kilometers (km) with a Precision Extended Range Munition (PERM) currently under development that will extend the range to over 17km. The additional range and lethality of the 120mm mortar enhances the appeal of the weapon system over the usage of organic 81mm mortars despite the additional lift requirement. The weapons system can emplace in under three minutes after driving off an MV-22 providing a responsive artillery firing capability to forces throughout the battlespace.<sup>18</sup>

### **The Triad of Fires in Support of *EF21***

*EF21* provides in depth guidance for all communities to support the Marine Corps's expeditionary ethos by maintaining a force that is fast, flexible, austere and capable of operating across the full Range of Military Operations (ROMO). The document explains the most likely future operating environment occurring in a congested and diverse area within the littorals. The triad greatly enhances the organization's ability to meet the expeditionary needs by providing flexible fire support options between the EFSS, M777, and M142. The triad supports speed and tempo as both the lightweight howitzer and the 120mm mortar system can be flown throughout the battlespace via MV-22 or CH-53 or moved on the ground via prime mover vehicle. Finally, all artillery units are capable of providing local security no matter how austere the location. The replacement of the M198 with the M777 and the addition of the M142 and EFSS provide a scalable fires solution capable of deploying and employing to support maneuver in any environment.

In addition to maintaining the expeditionary ethos, *EF21* identifies four Lines of Effort (LOE) as the Marine Corps prepares for the future operating environment.<sup>19</sup> The first LOE, refining the organization, stresses the importance of continuing to fight as a Marine Air Ground Task Force (MAGTF). The LOE highlights structural changes and identifies the significance

supporting of Company Landing Teams (CLTs) due to their scalable nature. The triad is well positioned to provide CLTs a scalable fires solution as east and west coast Marine Expeditionary Units (MEUs) are forward deployed with a mix of four M777s and four M327s. A MEU can deploy all three of its subordinate companies in a distributed manner with a battalion level fires asset in direct support (81mm mortars, 120mm mortars, and 155mm howitzers). The mobility and scalability of the triad provides effective fire support options in support of the smaller more distributed CLTs expected to represent the maneuver posture in the future operating environment. Regardless of the MAGTF's size, the triad of fires provides a scalable ground fire support capability for maneuver forces in any situation.

The second LOE, adjusting our forward posture, focuses on ensuring one-third of the Marine Corps's operational forces are forward deployed.<sup>20</sup> This is in response to the request of Geographic Combatant Commanders (GCCs) for additional forces. The Marine Corps continues to expand its deployed forces with the implementation of Special Purpose MAGTFs (SPMAGTFs) to meet the security needs of the forward operating environments. The additional artillery weapon systems provide maneuver commanders the opportunity to enhance military to military engagements, discourage hostilities, and provide additional depth for contingency operations. The scalable fire support weapon systems can encourage allies and partners while being kept at a size that does not escalate tensions with opposing nations.

The third and fourth LOE, increasing naval integration and enhancing littoral maneuver capability, will be covered more in depth when discussing the artillery personnel restructuring and future of artillery toward the end of the essay.<sup>21</sup> But it is important to note that the EFSS and its ammunition were approved for storage on US Navy shipping. Also with the addition of

HIMARS, maneuver commanders can employ it from on a nearby island to provide fire support during amphibious operations.

Finally, the recent Global War on Terror (GWOT) renewed the Marine Corps's understanding and need to maintain the ability to rapidly mass an area fire weapon system as well as conduct precision strikes from a ground based weapon system. The artillery community has adapted munitions for the M777 as well as the M142 which provide precision strike capability to limit collateral damage. A precision guided munition is currently being tested for the M327 which ,when complete, will provide each element of the fires triad a precision strike capability.<sup>22</sup>

Marine artillery has ensured its ability to support maneuver in future operating environments by improving the ability to scale fire support assets while maintaining the ability to mass indirect fires and conduct precision strikes from a ground platform. The implementation of the triad of fires provides maneuver commanders the organic fire support tools needed to effectively employ close and deep fires to shape their battlespace. The combination of all three complimentary weapon systems effectively supports the expeditionary nature of the Marine Corps in any clime and place.

## **ARTILLERY STRUCTURAL AND MANPOWER ADJUSTMENTS**

The following section addresses the major modifications taken by Marine artillery to transform the organizational and manpower structure to support maneuver forces. General Jones determined the M198 was too bulky and lacked the necessary mobility required to effectively support ground forces in the current operating environment. The Commandant's determination combined with EF21's depiction of CLTs operating in a dispersed manner drove the Marine artillery to modify organizational and manpower structure. The community identified the need

to provide a more scalable fire support capability as well as increasing the professionalism, proficiency, and capability of fire support personnel.

### **Structural Change: Platoon versus Battery Operations**

With the course set to develop and field three new indirect fire weapon systems to the artillery, the leaders of the community began to review how best to employ the system. Lessons learned during Operation Iraqi Freedom and Operation Enduring Freedom as well as discussion on how to best support distributed operations led much of the analysis. The need for a more scalable fire support force was the underlying tone from maneuver commanders due to operating over vast areas of land. The solution provided by the artillery leaders was to set up platoon operations in order better support maneuver across the full ROMO.

Platoon operations would divide a battery into two platoons capable of operating independently or consolidated depending on the maneuver commander's determination. This new structure provided maneuver commanders the ability to provide artillery fires in multiple locations separated by expansive distances that are not mutually supportable. Previously the artillery community could conduct split battery operations but only for 48 hours or less, limiting the commander's options. Maneuver leaders had the capability to weigh the importance of massing fires as a battery or providing enough fire support to subordinate units operating across vast distances.

The shift from a battery conducting consolidated operations to a battery conducting platoon operations required an increase in personnel structure. As the Marine Corps was preparing to drawdown the force following OIF departure and OEF force drawdown a request to increase manpower would likely not be well received. Implementing the platoon structure required the community to prioritize manpower structure within the community. “[The]

Structure for these additional personnel came “out of hide” from the artillery regiments and from some reinvestments of personnel from the force reduction generated from the Force Structure Review Group”.<sup>23</sup> Despite the organization’s movement to shrink the active duty force, Marine artillery justified the need and importance for platoon operations and was approved to transition manpower to make it happen.

### **Manpower Changes: Creation of the Fires Platoon**

In addition to developing and fielding the triad of fires and adjusting battery structure, Marine artillerymen focused on identifying ways to professionalize and improve the proficiency of fire support personnel. Originally, infantry battalion fire support personnel belonged to the individual firing battery serving in a direct support capacity. The artillery community identified the focus of training in a firing battery often revolved around the battery firing position and did not always maintain or develop the most proficient fire supporters. Marine artillery chose to consolidate all fire support personnel within the artillery battalion under the headquarters battery to enhance the training opportunities.<sup>24</sup> In recognition of the limited training and critical capabilities fire support personnel bring to the battlefield, the community chose to consolidate all fire support personnel into a platoon under the battalion headquarters battery.

Consolidating fire support personnel into one platoon was designed to allow unity of effort and focus needed to enhance the proficiency and professionalism of the force. Centrally locating all fire support personnel within a battalion facilitates standardization of tactics, techniques, and procedures. Unity of effort in professionalizing the force was achieved by removing the fire support personnel from the firing battery chain of command and replacing it with a fire support chain of command.

## **Increased Rank for Battalion Fire Support Advisors**

In addition to consolidating the force, again the artillery community identified the need to increase rank structure to ensure competent, mature, and experienced advisors were being provided to the maneuver commanders. It was not a surprise that the community determined a first lieutenant with two years of experience in the Fleet Marine Forces (FMF) did not have the experience needed to effectively advise a maneuver commander on fire support planning and employment. The community requested and was approved to increase the maneuver battalion fire support officer rank structure from first lieutenant to captain. The goal of the community was assign a post B-billet and post firing battery commander as the battalion fire support officers. Additionally, Marine artillery was approved to increase the battalion fire support chief from staff sergeant to gunnery sergeant in an attempt to increase experience and maturity to the fire support advisor position. The increased rank structure to fire support maneuver advisors was a movement to professionalize and mature the leadership within the fires platoon and improve advising of maneuver forces.

## **Expansion of Joint Terminal Attack Controllers (JTAC)**

A JTAC is the term used in the United States Armed Forces and some other military forces for a qualified service member who directs the action of combat aircraft engaged in close air support and other offensive air operations from a forward position.<sup>25</sup> The expansion of JTACs was largely related to the increased usage of precision air strikes in support of maneuver during OIF and OEF. The ability to control precision air strikes within urban areas became the predominant form of fire support due to ground fires (artillery and mortars) restrictions based upon the need to limit collateral damage. Previously, only certain units, such as ANGLICO, were allowed to send non-aviation officers and staff non-commissioned officers to attend the

Tactical Air Control Party (TACP) school in order to obtain the JTAC qualification. The artillery community identified the need for additional JTACs and created a training pipeline to allow staff non-commissioned officers scout observers (MOS 0861) to attend TACP school. The community was approved by the Marine Corps to add three additional 0861 billets to each infantry battalion fire support team to fill JTAC requirements.<sup>26</sup>

The active duty artillery regiments throughout the Marine Corps took ownership of maintaining the JTAC program within each Marine Expeditionary Force (MEF). This was largely due to the personnel tax on the 0861 community to provide additional JTACs. By maintaining the program at the regiment, the community enabled enlisted Marines continued fire support chief training as well as the ability to maintain JTAC qualifications to create a well-rounded fires advisor.

### **Current Artillery Structure's Ability to Support *EF21***

The artillery community's new platoon organizational structure provides maneuver commanders with more scalable and maneuverable fire support assets capable of enhancing the support for distributed operations such as CLTs as depicted in *EF21*. Marine Expeditionary Unit or battalion commanders now have the ability to operate more effectively across the ROMO in multiple locations for extended periods of time with only one artillery battery in support. Multiple weapon systems also provide commanders a scalable fire support response depending upon the situation.

The consolidated fires platoon allows more focused training opportunities for fire support personnel. The community enhanced the proficiency and perception of fire support personnel largely due to the increased training focus as well as increased rank requirements for chiefs and fire support officers. The community increased support and credibility by assigning more mature

personnel as advisors to supported units. The addition of JTACs in the artillery community enhanced the ability to control fire support even when ground fires are not applicable. The consolidation of the fires platoon professionalized the fires community, enhanced the training and sustainment of required qualifications for JTACs, and allowed firing battery commanders to focus on battery operations.

## **ARTILLERY TRANSFORMATION ANALYSIS**

There have been multiple criticisms of the Marine artillery transformation between 1999 and 2015. Some criticisms are warranted and some arise due to a lack of understanding or proficiency. Like any organization, some individuals are opposed to change. Some of these critics have conducted an honest assessment and do not believe the transitions undertaken was effective and worthwhile to advance the organization's ability to conduct its mission. This paper reviews some of the latter criticisms against the effectiveness of the artillery transformation. The criticisms range from the effectiveness of the newly developed weapon systems to fire support personnel and organizational structure adjustments.

An important question amongst many in the Marine Corps as well as the artillery community was why the organization did not attempt to replace the M198 with a howitzer capable of providing increased range. This question on range arises from the fact many foreign nations have howitzers capable of outranging the M198 and M777 howitzer (see figure 3). Despite drastic improvements to survivability, mobility, and weight, the M777 howitzer fires the same 155mm rounds at the same distances as the older and heavier howitzer. In a scenario where HIMARS is not available, multiple countries have the ability to outrange US artillery placing Marine maneuver forces at a disadvantage. Marine ground units may be required to rely

on air power or non-organic fire support assets to provide coverage beyond the range of enemy artillery fires.

Country	Weapon	Armament	Conventional Munition Rg	Extended Munition Rg	Max Rate of Fire
Singapore	SLWH Pegasus	155mm 39 Caliber Towed	22.6 km	30 km	4 rounds per minute
South Africa Iran, Thailand	GHN-45	155mm 45 Caliber Towed	24.7 km	39.6 km	7 rounds per minute
Spain and Columbia	APU SBT	155mm 52 Caliber Towed	30 km	55-60 km	10 rounds per minute
Germany, Italy, Greece Netherlands	PzH 2000	155mm 52 Caliber Self Propel	30 km	55-60 km	10 rounds per minute
France, Thailand, Saudi Arabia	Caesar	155mm 52 Caliber Self Propel	30 km	55-60 km	6 rounds per minute

FIGURE 3: Foreign artillery weapon systems and ranges<sup>27</sup>

Another criticism is the delicate design of the M777 howitzer. The lightweight howitzer is built with hydraulic struts which if damaged, deadline or greatly detract from the weapon system's abilities to support maneuver on the battlefield. In addition to the sensitive struts, the replacement howitzer contains multiple fiber optic cables required to maximize efficiency and operation of the weapon. The sensitive cables can be damaged beyond repair if handled roughly, tramped on, or forcefully connected causing the weapon to operate in a degraded status.

The final major criticism to the M777 is the weapon system pushes the MV-22 to its maximum lift capacity.<sup>28 2</sup> As the weapon system continues to advance with new technology there is a chance that additional equipment placed on the howitzer will exceed the lift capacity of the tilt rotor aircraft. Exceeding the lift capacity for the MV-22 does not detract from the weapon's ability to support OFMTS or STOM via CH-53 helicopter but the organization's ties to maintaining a howitzer capable of Osprey lift hindered movements to further adapt the capabilities of the M777.

The EFSS has received some major criticisms during its development and fielding process. The number one criticism to the 120mm mortar is that it should be organic to infantry units and not artillery. Captain Ryan Benson, an infantry officer who served in OIF and completed Expeditionary Warfare School, wrote an article stating "because of commonality of equipment, structure, and training already in place, the EFSS can be more quickly and effectively integrated into the infantry battalion than it can into the artillery battalion."<sup>29</sup> General Jones initial stance in 1999 supports Major Benson's article, "if the solution is a mortar, the system will remain an infantry weapon"<sup>30</sup>.

An additional criticism Marines identified with the EFSS is the amount of lift required to move an entire battery into position. The requirement of extensive MV-22 sorties to move a complete EFSS battery into position makes the mortar system less attractive as a fire support option.<sup>31</sup> The 120mm mortar only provides maneuver forces an additional 1,000m (smooth bore) to 2,500 meters (rifled) of range over the organic man-portable 81mm mortar.<sup>32</sup> The limited range of the weapon system and lack of precision munitions is another criticism of the weapon

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<sup>2</sup> Maximum external cargo hook lift capacity (which is required for the M777) for MV-22 Osprey is 10,000 lbs.

system. Multiple members of the community recommend divesting the weapon system and implementing a lightweight 105mm howitzer as a replacement.<sup>33</sup>

Removing fire support personnel from the battery removed the habitual relationships between the firing battery and maneuver fire support team. Previously a battery commander was responsible for training and preparing the fire support officer that would advise the supported maneuver commander. This structure allowed the commander to shape the understanding of the lieutenant going over to advise the infantry battalion commander. The lieutenant fire support officer would know the strengths and weaknesses of the battery due to having served in the unit for two to three years which would enable him to advise better capabilities and limitations of the unit. The lieutenant would have a better grasp on the battery's strengths and weaknesses than a captain fire support officer not having served in the unit for an extended period of time. The captain would likely reference training and readiness standards without having an appreciation for the unit's actual capabilities.

## **FUTURE ADAPTATION OF MARINE ARTILLERY**

The analysis of the artillery transformation (1999-2015) identifies the need for continuous review, verification, revision, and adaptation of Marine artillery ensuring it remains capable of supporting maneuver forces and current operating concepts. The artillery community must continuously use lessons learned from operational and training experiences in order to identify possible shortfalls or deficiencies. Additionally, the community must always look for ways to improve how it shoots, moves, and communicates in order to effectively support ground forces and maintain a fire support advantage over the competition. The remainder of this

section provides recommendations for possible gap corrections as the community plans for future employment

Marine artillery must continue to develop advanced range and precision munition platforms for each of the three weapon systems. Based on the understanding that future conflicts are likely to occur in urban cities, the community must continue to develop munitions which support a precision strike capability at greater distances. Due to HIMARS and the M777 having a precision strike capability, specific emphasis must be placed on the EFSS to develop and field a precision extended round munition (PERM). The ability to transport the mortar aboard an Osprey provides transportability forward over great distances at a speed unachievable by either of the other two fire support systems. The addition of precision munitions to the EFSS creates an artillery weapon system capable of supporting maneuver in the most forward urban or austere environment.

In addition to creating a precision munition for the EFSS, the community needs to identify alternate platforms not reliant on GPS guidance. Due to rapid advances in cyberspace technology, competitors now have the capability to modify GPS satellites. Since projectiles such as Excalibur or HIMARS rockets are GPS guided, enemy forces may have the capability to prevent artillery precision strikes. The ability for competitors to modify satellites guiding munitions requires ground forces to ensure alternate indirect fire precision strike capability remains available. Marine artillery must identify and field alternate platforms such as laser guided munitions to maintain precision strike capability if GPS guidance is not an option.

As the Marine Corps continues to focus on distributed operations in the littoral, the artillery community must ensure the ability to support in this environment. Modifying the

HIMARS platform to allow the firing of rockets from the deck of a ship is a capability which is currently being tested and developed in order to provide another fire support option while operating in the littorals.<sup>34</sup> Additionally, the Marine Corps, with the artillery community as the lead, needs to increase coordination with the U.S. Navy on the future of naval gunfire to support operations in the littorals. Just as the Marine Corps is testing the firing of HIMARS from the deck of a ship, the Navy can also expand rocket capabilities to increase the attack options.

The artillery community must identify options to increase the range of the M777 howitzer. Options such as increasing the length of the barrel on half of the battalion's howitzers can add distance to the maximum range of the weapon system. The increased barrel length will increase the weight of the howitzer beyond the lift capacity of the Osprey but will provide the commander an additional fire support option capable of matching most peer competitors. The extended barrel/range howitzers can be used in a general support role whereas the EFSS and M777s without the extended barrel continue in direct support roles. Creating a howitzer with greater range provides maneuver commanders more fire support options and flexibility to adapt to an ever changing battlefield.

The current Marine artillery organizational structure is capable of supporting any operational or training exercise. Artillery firing units are scalable to support large scale division sized operations or small scale distributed CLTs as depicted in *EF-21*. The largest deficiency is training artillerymen to effectively advise, adapt, and employ the newly developed scalable force. Many members of the community get wrapped up on massing fires as the only way to employ artillery. Although massing fires has a greater effect on targets, it is not always feasible when supporting concepts of STOM and OMFTS. Sometimes suppression or harassing fires is all a maneuver force needs to accomplish the mission in the most expedient manner. One

member of the community recommends changing the artillery table of organization (T/O) to create ground strike sections (GSS) made up of one EFSS mortar with a crew of four personnel to operate the system, calculate the firing data, and observe the target via UAV to improve support to distributed operations.<sup>35</sup> This example of a GSS is exactly why further education on employment is needed within the Marine artillery. The ability to employ a GSS is already within the artillery T/O. The community and its advisors need to do a better job teaching and educating artillery employment options as a regiment, battalion, battery, platoon, or GSS.

## **CONCLUSION**

At the turn of the 21st century, leaders of Marine artillery displayed great foresight identifying the adaptations needed to keep Marine artillery relevant in the future fight. Even more impressive was the ability of Marine artillery to see the vision created in 1999 through to the end despite participating in two wars (OEF and OIF). The plan to modify fire support weapons shifted and adapted during testing and fielding of the equipment but never deterred to a point at which it was discarded or completely revamped. As depicted in the analysis and future adaptation portions of the paper, the community must continuously review the effectiveness and ability of Marine artillery to meet the needs of maneuver forces and current organizational operating concepts.

The community identified the capabilities provided by the new weapon systems and effectively restructured the organization and personnel to support. The modifications made ensured Marine artillery remained relevant and capable of accomplish its mission to “furnish close and continuous fire support by neutralizing, destroying or suppressing targets that threaten the success of the supported unit.”<sup>36</sup> Efforts to professionalize the fire support community

gained positive traction with supported commanders, specifically the increase in rank for fire support officer and fire support chief. Centralizing fire support personnel at the battalion allowed for the implementation of a thorough training curriculum enhancing fires support training and the sustainment of JTACs. Taking control of the JTAC program within the artillery regiments allowed the community to increase relevancy as the demand for individuals with these qualification continues to increase.

Reviewing the transformation undertaken by the Marine Corps artillery community at the turn of the 21st century provides future leaders a positive example of developing and implementing a strategy of change. The path taken by Marine artillery was met with some opposition and required continuous adjustments due to influences outside of their control. Yet the end state was met and it still very much resembled the initial plan created over 15 years ago. The transformation of Marine artillery between 1999 and 2015 prepared and postured the organization to provide the fire support requirements of the organization's expected future operating environment.

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