Did the Marine Corps Fix Fires or Save an Airframe

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Did the Marine Corps Fix Fires or Save an Airframe

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Submitted by Captain Waco Lane
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In 1999 General Jones stated the Marine Corps needed to fix Marine artillery[1]. He was particularly interested in replacing the aging M198 with a lighter more mobile 155mm howitzer. The Marine Corps has since developed, tested, and fielded a replacement howitzer. However, by the time the requirements for this new howitzer were finalized, the weapon was no longer designed to make improvements over the M198. Instead the requirements were centered on the limitations of the MV-22 Osprey[2]. More specifically, the requirements were focused on weight rather than range, accuracy, mobility, and crew fatigue. The United States Marine Corps should not allow the transport limitations of the MV-22 Osprey to affect the capabilities of a fire support asset.

Background

A replacement for the M198, the M777, was in development for eight years before General Jones decided to fix artillery.[3] The M777 has always been designed as a light weight howitzer, however there were no weight restrictions placed on it as the prime mover is the 7-ton truck. The weapon was intended to utilize less deck space on an amphibious ship and be towed

[1] Hollis, Patrecia Slayden, (2000). Fixing the Marine Artillery. *Field Artillery,* 5, 3-5.
[2] Kevin McConnell, M777 Light Weight Howitzer Requirements Officer, Marine Corps Combat Development Command, Quantico, VA, personal interview conducted by the author, 17 November 2005.
[3] Colonel John Garner (Ret), Program Manager, Lightweight Howitzer, Marine Corps Systems Command, Picatinny Arsenal, NJ, personal interview conducted by the author, 21 November 2005.

easier by the 5-ton truck. Additionally, the original requirements were written to include some technological advances, such as an auto-loading system.[4] Later, as the M777 lightweight howitzer was gaining popularity and the popularity of the MV-22 Osprey was waning, a decision was made to link the two systems together. The logic was that if there were more programs tied to the osprey there was less of a chance the osprey program would be cut.

Limitations Caused by the Osprey

The Marine Corps did not develop the best howitzer $2.6 million dollars could buy. Instead, the Marine Corps developed the best howitzer capable of flying under the Osprey. "The Osprey has a maximum external lift capacity of 10,000 pounds. The Corps' new Lightweight 155mm Howitzer field artillery piece, at 9,800 pounds, was designed to accommodate the MV-22's lift capacity."[5] By allowing the limitations of the Osprey to dictate the weight restrictions of the M777, the Marine Corps developed a howitzer with limitations that could have been easily avoided.

One limitation is the displacement of the weapon when firing high charges.

> The weapon system has a displacement issue when firing high charges (7 White, 7 Red, 8 Super and Modular Artillery Charge System (MACS) equivalents). There are two types of displacement: Lateral and Longitudinal. Of greatest

[4] Colonel Garner interview.
[5] Lackey, Sue A., "Set to soar." *Sea Power,* 48, no. 9 (2005): 20-22.

> concern is the lateral displacement. When the howitzer fires a high charge at a low quadrant with the deflection greater than 100 mils off center, the weapon will begin displacing laterally. This causes the cannoneer to traverse the weapon more and more with each round fired until he reaches the mechanical traverse limits of the gun. The crew is then required to speed shift the gun back onto the azimuth of fire to continue the mission. This causes a delay of about two minutes in the mission. Longitudinal displacement is of less concern because the weapon can continue the mission without worry of reaching the mechanical limits.[6]

A heavier weapon would have limited the lateral displacement. By reducing lateral displacement the M777 could stay in the fight longer and not required a two minute delay to be re-laid in the middle of a mission.

Another limitation is costs. Due to the weight restrictions placed on the M777 the entire body and cradle are manufactured from cast titanium. Titanium caused the cost to climb from $800,000 to $2.6 million.[7] "Spending so much money on the types of materials used to build this howitzer meant there was less money to be spent on other improvements whether on the howitzer or in within the Department of Defense."[8] Currently the Marine Corps does not plan to purchase enough M777 howitzers to replace every M198. They are purchasing enough to support the current operational needs, however there are no plans for extra or float howitzers. The Marine Corps could have purchased

[6] Test directors comments
[7] Col Garner interview
[8] Col Garner interview

enough howitzers to replace all M198's if they would have reduced the cost by using steel.

Ship to Objective Maneuver is not Feasible

Ship to objective maneuver (STOM) is unrealistic for the M777. "The MV-22 Osprey tiltrotor aircraft is the centerpiece of the Marine Corps' transformation to sea-based operations and Distributed Operations, its new concept of maneuver warfare."[9] Part of Distributed Operations is STOM. The number of MV-22 aircraft required to deliver just one battery ashore with fifty projectiles per gun is between twenty and twenty-six depending on the situation.[10] Twenty to twenty-six does not account for the continued requirement of ammunition re-supply. The Operational Mode Summary/Mission Profile of an artillery battery is sixteen missions per day for a medium intensity conflict.[11] Each mission is planned to consume eight rounds per howitzer. A one day supply is 768 projectiles. Each projectile weighs approximately ninety-eight pounds.[12] A total of 75,264 pounds of projectiles must be delivered to the battery each day. At maximum capacity eight sorties would be required to re-supply the battery. Eight sorties are just for projectiles. The

[9] Lackey 20
[10] McConnell interview
[11] Marine Corps Operational Test and Evaluation Activity, "Independent Evaluation Report for the Multi-Service Operational Test and Evaluation of the M777E1 Lightweight 155mm Howitzer with Towed Artillery Digitization." January 2005 13.
[12] United States Army, FM 6-50

battery also requires propellants, fuses, and small arms ammunition. All these figures are just for one single six gun battery. To sustain just one battalion would consume a very large portion of the Marine Expeditionary Forces assets.

Additionally, the prime mover for an artillery battery is the medium tactical vehicle replacement (MTVR) 7-ton truck.[13] The MTVR does not fly under or inside the Osprey.[14] Not having a prime mover to fly with the howitzer creates a whole new set of problems. A firing battery's best defense is the ability to move. However, the battery is unable to move until the trucks are off loaded and then driven to the position, or fourteen to twenty Ospreys return to move the battery to a new location. This inability to move may lead to friendly forces maneuvering beyond the range of artillery. Or even worse, the battery is engaged by counter battery fire and unable to displace.

Missed Capabilities

Because of the requirements placed on the development of the M777 by the Osprey, a number of capabilities were left out. First, the system was developed without a hydraulic position ascending component (HYPAC). A HYPAC is a hydraulic system that lifts the howitzer from its firing position onto the wheels. Under the current design, a Marine must manually pump each side of the howitzer onto the wheel. This process takes about forty

[13] Table of Equipment for a battery
[14] MTVR operations manual.

to fifty seconds. Also, when moving and shifting, the crew experiences unnecessary fatigue, which causes a delay in displacement. There is no HYPAC because of weight and cost restrictions.[15] A HYPAC would have decreased displacement times and lessened crew fatigue. The standard table of organization (T/O) is ten men per howitzer. Due to manpower shortfalls, a typical battery only has seven to eight men on each howitzer. When the weapon is employed with less than the standard crew the emplacement and displacement times increase. With the addition of a HYPAC, the system would be more responsive.

The auto ramming system was the first item cut from the M777 howitzer when the weight restriction was imposed.[16] This system would have rammed the projectile into the tube quicker and more uniformly then the current method. Currently two men must use a ramming staff to seat the round in the tube. Through training the crew is able to develop the necessary technique to ram the projectiles properly. However as the crew becomes fatigued, the rams become weaker, and the chance of a firing incident increases. An auto ramming system would have increased responsiveness and lessened crew fatigue. A uniform ram also increases the accuracy of the weapon. The projectile would always have a tight seal in the tube and prevent blow by. Blow by is a cause for a short or erratic round. Although, the M198

[15] Col Garner interview
[16] Col Garner interview

and the M777 are both hand rammed, the addition of an auto rammer to the M777 would have lessened the risk of short rounds.

An auto ramming system coupled with a heavier tube would have allowed an increase in the rate of fire of the M777.[17] The current maximum rate of fire for the M777 is four rounds per minute for two minutes.[18] After the initial two minutes the crew can sustain a rate of two rounds per minute.[19] A T/O crew is capable of achieving eight rounds per minute.[20] The maximum rate of fire is based on the tube thickness. A thicker tube does not heat up as quickly as a thin tube. The maximum rate of fire would have been increased by both rounds per minute and minutes at the maximum rate if a thicker tube was used. The current tube has been reduced to save weight.

Opposing View

One advantage of the M777 is the addition of a digital fire control system (DFCS). The DFCS will enable the howitzer to self locate and determine directional control, eliminating the need for an aiming circle. The crew will be able to re-lay themselves, saving valuable time during a mission. The DFCS also provides a more robust communication capability never seen on a towed howitzer. This new capability provides remarkable

[17] McConnell interview
[18] M777 Technical Manual
[19] M777 Technical Manual
[20] Marine Corps Operational Test and Evaluation Activity

digital communication ability and allows the battery more flexibility in howitzer placement.

The lightweight and balanced design allows the crew to pump the howitzer to ride height within thirty to forty seconds. The crews who participated in the operational tests stated in numerous surveys that they prefer the HYPAC however the effort required to manually pump the howitzer is minimal and easily overcame with training.[21]

In order to reduce the chance of a battery being stranded without a prime mover the Marine Corps Systems Command is developing a lightweight truck to replace the MTVR. This smaller, lighter truck will fly under an osprey.

Conclusion

The Marine Corps allowed the Osprey to drive the development of the M777 LW155 howitzer. Transportation should support rather than drive the development of new equipment. Because of this influence, the M777 is a mere replacement instead of a magnificent improvement over the M198. The Marine Corps should revisit the role of cannon artillery. Despite the enormous amount of money spent in the last ten years, cannon artillery is still broken.

[21] Marine Corps Operational Test and Evaluation Activity

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