M1A1 Firepower Enhancements Program: Maintaining the Combat Edge of the M1A1

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Maintaining the Combat Edge of the M1A1
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M1A1 Firepower Enhancements Program:
Maintaining the Combat Edge of the M1A1

The M1A1 Abrams is arguably the world's finest main battle tank. Originally built to fight against numerically superior Soviet tanks forces as an Army platform, the M1A1, when it was fielded in the early 1980's, represented an evolutionary leap forward in armor design. The M1A1 entered Marine Corps service shortly be Operation Desert Storm in 1990. Since Operation Desert Storm and up to the present conflicts in Operation Iraq Freedom I and II, the tank has proven decisive. In all these campaigns, the Abrams outmatched the Soviet designed armor fielded by Iraqi forces. Furthermore, during more recent operations in Fallujah, as well as other Stability and Security Operations, the M1A1 has proved itself an invaluable asset when dealing with Iraqi insurgents. Though the Abrams is formidable, it's utility comes from being able to maintain its lethality, mobility and survivability over its opponents. However, if left unimproved, it is only a matter of time before threat systems close the gap with the M1A1.

Marine Corps Systems (MCSC) envisions a series of upgrades that will maintain the lethality of the Marine Corps' Abrams fleet. One of the most important systems

developments is the Fire Power Enhancement Program. The Fire Power Enhancement Program or FEP is a program managed by PM Tank Systems, Armor and Fire Support Directorate, Marine Corps Systems Command in Quantico, Virginia. The FEP is a suite of upgrades to the M1A1's fire control system of the 120mm Main Gun. The upgrades FEP provides will increase the M1A1's combat capabilities by allowing improved target identification and extended engagement ranges.

Background

As of 2005, the M1 Abrams family of tanks has been fielded for over 25 years. Therefore, the Marine Corps tank community is looking to the future. The far term material solution is the Marine Air Ground Task Force Expeditionary Family of Fighting Vehicles or MEFFV. The MEFFV is a conceptual design that is foreseen as a tank and Light Armored Vehicle (LAV) replacement in 2015. The MEFFV will completely replace the capabilities provided by the USMC's current family of Light Armor Vehicles (LAVs) and the M1A1 Main Battle Tanks in the years 2015-2020. In the interim, the M1A1 needs to maintain its combat edge. The FEP program will maintain the combat viability of the Marine Corps' Abrams fleet until the MEFFV becomes a reality.

The Requirement

The stated mission of the M1A1 is: “to close with and destroy the enemy utilizing armor protected firepower, shock effect, and maneuver, and to provide anti-mechanized fire in support of the Marine Division (1).” According to the Revised Marine Corps Operational & Organizational Concept for the M1A1 Main Battle Tank, the operational capability of the M1A1 Fire Control System must provide the Marine Corps with an armored warfighting capability that exceeds the enemy threat. The Fire Control System is required to provide a rapid and accurate engagement capability with extended engagement ranges and increased lethality in order to defeat the current and expected future threats. The FCS must also provide accurate target location at extended ranges (ORD p.2). The guiding principle of the FEP is to maintain the combat overmatch of the M1A1 MBT on the present and future battlefield by being able to acquire, identify, and engage threats at extended ranges. Every tanker going through the Armor Course at Ft. Knox is taught the “gunslinger” mentality: “He who shoots first wins.” The success of the M1 family of tanks is the direct result of the ability to accomplish this.

System Description

The M1A1 FEP system and components will provide thermal imaging and Far Target Location (FTL) capability, which will overmatch the threat sensor performance, therefore improving the ability of the USMC to engage and defeat an enemy at extended ranges. The M1A1 FEP system will provide for increased target detection, recognition, identification, and FTL capabilities during and night operations, through smoke, fog, or other battlefield obscurants.

The M1A1 FEP system consists of a second generation FLIR and north finding module integrated into the USMC M1A1 Tank. The second generation FLIR will replace the current first generation FLIR that is located in the Gunner's Primary Sight (GPS) at the Gunner's station. Two of the items that are attached to the GPS are the current Thermal Receiver Unit (TRU) and the Image Control Unit (ICU).

The second generation FLIR upgrade, consists of removing/replacing the existing TRU with a 2nd Generation TRU, removing/replacing the ICU with a Biocular Image Control Unit (BICU), and removing/replacing the existing PCU with another PCU. The FTL system consists of a North Finding Module (NFM), bracket, cables, and inputs from the existing laser rangefinder and Precision Lightweight Global

Positioning System Receiver (PLGR). The FTL system will provide the tank crew with accurate target location with two seconds after lasing the target. The FTL solution is determined by utilizing the inputs of the laser rangefinder, PLGR, and NFM. This capability currently does not exist on the USMC M1A1.

Brigadier General William D. Catto stated that the Far Target Locator is a capability that is initially "unique" to the Marine Corps (1). At some point in the future the Army will apply this upgrade to their M1A2 Main Battle Tanks. The Marine Corps' FTL will provide tank crews with accurate target location out to 8,000 with less than 35 meters Circular Error Probable (CEP). This means that an accurate grid location to within 35m of the target will be provided for situational awareness and or subsequent engagement by artillery or air.

A final upgrade is the replacement of the non-eye-safe laser rangefinder with a eye-safe rangefinder. This will have a profound impact both in training and in combat. The non-eye-safe system creates certain usage restrictions in peacetime and can be hazardous to friendly or non-combatants during operations. The eye-safe laser removes this deficiency without compromising **the** laser's ability to effective range targets.

Initial Testing

Initial Operational Test and Evaluation of the FEP was conducted at the Yuma Proving Grounds (YPG), Yuma, AZ, from 11-27 July 2004. The IOT&E focused on evaluating the ability of the FEP to Detect, Recognize and Identify (DRI) targets and to conduct FTL. Test events primarily included day and night stationary-to-stationary (SS) DRI trials under moderate weather conditions, fog-oil smoke-obscured conditions, and white phosphorus (WP) smoke-obscured conditions; day and night stationary-to-moving (SM) DRI trials under moderate conditions; and day and night FTL trials at various ranges and azimuths in each compass quadrant. Other special test events evaluated audio and light detection and the occurrence of biocular blindness resulting from thermal crossover. The results were very favorable and the FEP met or exceeded the standards established in the ORD.

Operational Experience. Operation Iraqi Freedom I: March-May 2003

Prior to the formal testing process, four prototype systems were installed on four respective USMC M1A1 tanks in support of Operation Iraqi Freedom I (OIF). Comments on the FEP include the following criticism and comments. The position location capability and the ability to range a

target and get a ten-digit grid were considered very useful. It proved valuable in fire missions and situation awareness. Some crews felt the fifty-magnification sight needs better resolution but proved useful. Thermal Bloom (washout in the TIS sites from fire trenches and burning vehicles) took one to three minutes of recover. The FEP site engaged vehicles in excess of 2300m. The thermal sight was used by Bravo Company to identify snipers in buildings. The North Finding Module was used as land navigation tool during road marches through Iraq. Worked well in open terrain and built-up areas. In static positions the FEP site was used to provide over watch for the tank company and to friendly infantry patrolling forward of lines. Crews recommended retaining the binocular site at the gunner's station. The ability to see in both day and night with the GPS and binocular site was very popular and useful to tank gunners (OIF MCSC Field Report p. 4). The evaluations of the individual crews were taken into account and reflected in the final system design.

Marine Corps Systems command will field as yet undetermined number of FEP upgrades to M1A1 presently supporting OIF II and III.

Extended ranges vs. Fratricide Avoidance

New ammunition such as the M829A3 will increase the effective range of the M1A1 120mm main gun. The 120mm ammunition variants in the U.S. inventory have always had a effective range advantage over potential threat systems. However, the major issue for American tank gunners was positive identification of targets and the very edge of the maximum effect range of these munitions.

Several systems have been designed since the first Gulf War in 1991 to assist in fratricide avoidance. Most recently fielded was the Blue Force Tracker (BFT) that proved a very useful situational awareness tool to Coalition commanders during OIF I. However, the ultimate fratricide avoidance tool is the ability of the tank commander-gunner team to positively identify the target. More importantly, they must positively identify that target as friend or foe and make a determination to engage in most case in matter of seconds. In other words, it is the shooter's responsibility in the end before the round travels down range.

The factors against a tank crew include low-visibility, either from darkness or battle-obscuration, and distance to potential target. The second generation FLIR with the extended optical range imager will enhance the

crews ability to overcome these adverse effects. The imagery the crew has in it's sights will be clearer in all inclement conditions, allowing them to acquire, identify and engage. This capability of the FEP will allow ammunition such as the M829A3 with maximum ranges exceed 4,000 meter to be used to the greatest possible extent.

Most importantly, the FEP will allow tank commanders to engage with a superior level of confidence and assist greatly in fratricide avoidance.

Conclusion

The Firepower Enhancements Program represents a major leap forward in the capabilities of the Marine Corps M1A1 Abrams platform. The thermal imagery system provides clarity of picture never before experienced. The Far Target Locator will now allow crew and Fire Support Teams to accurately determine enemy positions within literal seconds. This capability will allow the prosecution of those positions by combined arms of the MAGTF in a even more rapid fashion than currently. The Firepower Enhancements Program and many other upgrades will keep the

Marine Corps armor forces a lethal arm of the Marine Air Ground Task Force well into the twenty-first century.

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