MULTIPLE LAUNCH ROCKET SYSTEM (MLRS) M270A1 LAUNCHER

Army ACAT IC Program

Total Number of Systems:	857
Total Program Cost (TY$):	$2,280.2M
Average Unit Cost (TY$):	$2.418M
Full-rate production:	1QFY02

Prime Contractor

Lockheed Martin Vought Systems

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The Multiple Launch Rocket System (MLRS) provides a non-nuclear, all-weather, indirect, area fire weapon system to strike high-payoff threat maneuver, fire support, forward area air defense, and command and control, and communications (C^3) targets at all depths of the tactical battlefield. MLRS consists of a self-loading launcher with an onboard fire control system. The MLRS M270 Launcher is the standard U.S. Army platform for firing surface-to-surface artillery rockets and missiles. The launcher is mounted on a mobile track vehicle that carries 12 rockets in two, six-rocket Launch Pod Containers (LPC) or two Army Tactical Missile System (Army TACMS) missiles, which can be fired individually or sequentially. Rockets have a range beyond 30 kilometers, and the Army TACMS Block IA missile can reach beyond 300 kilometers. M270A1 improvements are intended to enhance the field artillery's support to the ***dominant maneuver*** force, and improve ***precision engagement*** capabilities for shaping the battlespace at extended ranges.

The M270A1 program includes two major upgrades to the current M270 launcher. First is the Improved Fire Control System (IFCS), which replaces obsolete, maintenance-intensive hardware and software, providing growth potential for future munitions and the potential for reduced launcher

operation and support costs. IFCS includes a GPS-aided navigation system. Second, the Improved Launcher Mechanical System (ILMS) improves reaction times and increases ***full-dimension protection*** by decreasing the time to aim, fire, and reload the launcher. A faster launcher drive system that moves simultaneously in azimuth and elevation reduces the traverse time from the stowed position to worst case aimpoint by approximately 80 percent, and decreases the mechanical system contribution to reload time by about 40 percent. Additionally, the M270A1 program includes the re-manufacture of selected components and the application of selected Engineering Change Proposals to the basic M270 launcher to bring all launchers to the same configuration.

BACKGROUND INFORMATION

MLRS initial operational capability occurred in 1983. To combat the growing obsolescence, the Army initiated the IFCS program in 4QFY92. In 4QFY95, the Army began the ILMS program to address a requirement for faster prosecution of highly mobile, short-dwell targets. In FY96, the Army combined the IFCS and ILMS test programs under the M270A1 to undergo system-level testing even though both remained as separate ACAT III program elements through system integration. On May 28, 1998, the Program Executive Officer for Tactical Missiles approved low rate initial production (LRIP) of IFCS and ILMS hardware modification kits for integration into the M270A1. In 4QFY98, the program decided to replace the 486-based executive processor with a PowerPC processor, and the proprietary software operating system with the commercial VxWorks software operating system.

From January-April 1999, the launcher executed an Extended System Integration Test (ESIT) that included a position navigation unit test, field exercises, and a flight phase that was terminated because of system problems. In July 1999, IOT&E slipped 22 months to allow the program time to fix problems identified in the ESIT and Maintainability Demonstration, and to include the planned replacement of the executive processors and operating system. In August 1999, the program conducted a Customer Test for one platoon of M270A1 launchers side-by-side with a platoon of M270 launchers.

TEST & EVALUATION ACTIVITY

A 2QFY00 Confidence Demonstration demonstrated fixes to 102 “go-to-war” Software Trouble Reports (STR) and successful conversion to the PowerPC and VxWorks. From June-October 2000, the contractor conducted system integration testing with an Engineering Release of updated software. The M270A1 successfully fired rockets on August 1, 2000, and an Army TACMS Block IA missile on September 14, 2000. Government flight tests and a second ESIT (with soldiers) are scheduled in early 2001.

The Army conducted an MLRS survivability program to complete survivability estimates of the M270A1, determine the effects of M270A1 improvements on the survivability of the fielded launcher, and develop recommended changes to the M270A1 and MLRS tactics to enhance launcher and crew survivability. The Aberdeen Test Center completed blast and shock tests in 1997 and payload sensitivity tests in 4QFY98. The Army Research Laboratory, Survivability/Lethality Analysis Directorate completed component experiments in 1998 and a vulnerability analysis in 1999.

In March 2000, DOT&E approved a revised M270A1 TEMP. The IOT&E ground phase is now scheduled for August 2001, followed by the OT flight phase in September. Milestone III will occur in

2QFY02. However, as of December 2000, the Army Test and Evaluation Command had not funded the required $4.2 million for the IOT&E that is to occur in 4QFY01.

TEST & EVALUATION ASSESSMENT

IFCS software problems have been a continuing challenge. The IFCS development contract was extended nine months through September 1998 to improve software robustness and maturity. Lack of software maturity in the 1999 ESIT caused crews to re-boot the system and re-configure communications frequently, and resulted in low mission transmission and fire mission completion rates. M270A1 crews in the Customer Test had to employ an extensive list of workarounds for software problems, but M270A1 times from stowed position to first round fired were from 35 to 80 percent better than the basic M270 launcher times. The Confidence Demonstration showed that communications, system and mass storage device lockups, and prompt delay problems have been corrected. The June Engineering Release corrected an additional 49 suitability and maintainability STRs. However, launcher problems in updating missile software and stowing the Launcher Loader Module (LLM) during the latest flight test in September 2000, along with two safety problems identified during the Preliminary System Integration Tests, have caused an additional six month schedule slip. The safety problems involve an uncommanded LLM movement and undamped oscillations around the commanded azimuth.

Inadequate BIT/BITE performance in the FY99 Maintenance Demonstration showed a capability of detecting and isolating a problem to the line replaceable unit level of only 60-70 percent against a requirement for 95 percent. Fourth quarter fiscal year 2000 trials are close to meeting the requirement, and the launcher, tools, and Interactive Electronic Technical Manuals should be ready for the Maintenance Demonstration in March 2001.

A number of system vulnerabilities were found in the survivability program. Some can be corrected with minor engineering changes to such components as the fuel filter bracket and radiator cover to reduce the vulnerability of the system to “cheap” automotive kills. Others, however, are more significant, and their correction will entail additional armor protection to lessen the likelihood of payload initiation. The PMO provided funding to the Army Research Laboratory (ARL) to investigate possible ways to improve the armor protection of the MLRS Launcher Loader Module to inhibit a possible payload reaction from enemy fire. ARL is conducting a model-based analysis of three viable engineering solutions to improve payload protection. When the analysis is completed, the results will be provided to the PM for consideration and appropriate action.

CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

Even though the IFCS software development was primarily conversion of existing logic from JOVIAL to Ada, the program experienced serious integration, robustness, and maturity problems. All software development programs, no matter how trivial they may seem, require intensive oversight and management.

Problems observed, and resulting M270A1 configuration changes during the 1999 ESIT flight tests, showed that the operational test (flight and ground phases) should be conducted after hardware and software configurations have been frozen. As a result, the U.S. Army Operational Test Command has developed a Software Configuration Control Plan for the M270A1 IOT&E, and the M270A1 platoon will use LRIP launchers.

After the PM has reviewed ARL's feasible designs to improve payload protection, the best candidate should be selected and applied to all MLRS launchers. At the same time, the Army should correct some potential chassis-related vulnerabilities that were discovered during LFT&E of the Command and Control Vehicle, which uses a modified MLRS chassis.

Operation Desert Storm first identified a critical need for faster prosecution of highly mobile, short-dwell-time targets by MLRS launchers. Emerging North Korean tactics have further highlighted the importance of reducing M270 reaction times in order to engage threat mobile rocket launchers while they are exposed outside Hardened Artillery Sites (HARTS). Although problems in the Customer Test showed that further development was warranted, launcher fire mission performance indicated that the M270A1 would significantly reduce MLRS reaction times, improving the Army's ability to engage short-dwell targets.

Finally, unless the Army funds this IOT&E, DOT&E will be unable to assess the system in 2001. As a result, M270A1 full-rate production will be delayed until completion of the system's IOT&E and DOT&E's assessment to Congress that the system is effective, suitable, and survivable.