

## **MULTIPLE LAUNCH ROCKET SYSTEM (MLRS) EXTENDED RANGE (ER) AND GUIDED-MLRS (GMLRS) ROCKETS**



### **Army ACAT III / IC Programs**

|                            |          |
|----------------------------|----------|
| Total Number of Systems:   |          |
| ER:                        | 4,332    |
| GMLRS:                     | 83,922   |
| Total Program Cost (TY\$): |          |
| ER:                        | \$223.7M |
| GMLRS:                     | \$3.67B  |
| Average Unit Cost (TY\$):  |          |
| ER:                        | \$32K    |
| GMLRS:                     | \$42.6K  |
| Full-rate production:      |          |
| ER:                        | N/A      |
| GMLRS:                     | 4QFY03   |
| Low-rate Production:       |          |
| ER:                        | 3QFY96   |
| GMLRS:                     | 2QFY01   |

### **Prime Contractor**

Lockheed Martin Vought Systems

### **SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010**

The Extended-range (ER) rocket is an enhanced version of the current rocket fired from the Multiple Launch Rocket System (MLRS). The ER rocket is expected to have a range of 45 kilometers or greater, compared to the fielded rocket's 31.5 kilometers. The ER rocket, like the current rocket, is

designed to be used against lightly armored and soft, stationary targets. The overall length and diameter have not changed. As with the current rocket, an MLRS launcher will carry twelve ER rockets.

Extended range is achieved by reducing the number of bomblets (from 644 to 518) and increasing the rocket's propellant. The bomblet pattern size is also being increased, which decreases the bomblet density. A zero-force detent modification is intended to help maintain accuracy at the extended ranges. This modification adds a small explosive charge to cut away the rocket's restraining bolts, providing a "soft" launch.

In addition, a modification of the bomblet will reduce the number of hazardous duds on the battlefield. Both current and ER rockets deliver Dual Purpose Improved Conventional Munition (DPICM) M-77 bomblets. The modified ER bomblet, M-85, has a redundant fuzing system with the addition of a self-destruct device. The bomblet modifications are not expected to affect the bomblet's lethality.

The Guided MLRS (GMLRS) rocket adds a Global Positioning System (GPS)-aided inertial guidance and control unit and new rocket motor to the ER rocket, intended to greatly improve accuracy and increase range. DPICM bomblet payload is expected to be reduced from 518 to about 405. GMLRS has been an Advanced Technology Demonstration program (ATD) since 1994.

ER and GMLRS rockets provide commanders an operational fire capability for *precision engagement* of the enemy throughout the depth of the battlefield beyond the range of currently fielded cannons and rockets. The targets include multiple rocket launchers, towed artillery, air defense units, and command/control/communications sites. The ER and GMLRS rockets' ability to engage the enemy at extended ranges supports the *Joint Vision 2010 dominant maneuver* force by helping the commander shape the battlespace.

## **BACKGROUND INFORMATION**

The need for ER and GMLRS rockets is based on the experiences of Operation Desert Storm and the continued threat of the proliferation of longer-range artillery systems. ER-MLRS is an Acquisition Category III program. Engineering and Manufacturing Development began in November 1992, and a full-rate production decision was scheduled for late FY99. An LRIP was approved in May 1996, contingent on additional testing discussed below.

A new Acquisition Program Baseline was approved in March 1998 that restructured the MLRS rocket programs. All Army procurement actions for low rate initial production were completed in FY98 with delivery of items ongoing. Full-rate production of the extended-range rocket will not occur. The LRIP quantities will be used to meet an urgent need for extended range capability by U.S. Forces, Korea (USFK). The total procurement of extended-range rockets will be 4,332. Delivery of the FY97 procured quantities to USFK was begun in FY99 using standard M-77 DPICM submunitions in the warhead as an interim measure until the self-destruct fuze high-rate production equipment is validated. Once the self-destruct fuze is in high rate production, remaining quantities of extended-range rockets will be built incorporating the M-85 grenade with the self-destruct fuze. This is anticipated to occur in May 2000.

GMLRS is an international program with France, Germany, Italy, and the United Kingdom.

## **TEST & EVALUATION ACTIVITY**

Developmental testing of the ER rocket in FY99 included a test firing of six rockets with M-77 bomblets to demonstrate improved accuracy with a new version of the ballistics algorithm. Earlier testing had revealed a range bias in which most rockets landed past the target. FY99 firings were conducted in November at White Sands Missile Range at 34.6 and 35.4 kilometers. Results are summarized in the next section. These firings were conducted as part of the MLRS M270A1 System Integration Test and contributed to the evaluation of the M270A1 launcher.

Testing in the GMLRS program included completion of the five-flight ATD program. These ATD flights were to demonstrate a guidance and control package capable of achieving a 2-mil accuracy with inertial-only guidance, and a 10-meter Circular Error Probable with GPS-aided inertial guidance. Accuracy of the two inertial-only ATD flights was 1.8 and 12 mils, respectively. Accuracy of the two GPS-aided flights was 140 meters and 2.1 meters, respectively. The fifth ATD rocket had a catastrophic launch failure. The first flight tests of GMLRS prototypes begin in FY00.

GMLRS IOT&E is scheduled for FY03, and will include the firing of 24 rockets against a towed artillery battery with surrogate personnel targets. The rockets will be fired in operationally realistic, multiple-rocket ripple missions as requested by DOT&E. Modeling will be used to relate observed test results to effectiveness requirements against other targets in the MLRS requirements document. IOT&E will also include a ground phase to demonstrate the command and control necessary for effective employment of the overall GMLRS system.

## **TEST & EVALUATION ASSESSMENT**

The ER-MLRS TEMP was approved in May 1996. Changes to the TEMP are being processed to align the T&E program with the new acquisition plan described in the March 1998 Acquisition Program Baseline.

The ER program has two Critical Operational Issues: munition effectiveness against specified targets and a hazardous dud rate of less than 1 percent. At the time of the 1996 LRIP decision, DOT&E determined that LRIP exit criteria for effectiveness were not being met for two of the three required targets, but could likely be achieved if an obvious range bias was corrected. The six rockets fired in November 1998 met the required accuracy and did not have the range bias errors seen in previous testing. Accuracy will continue to be checked during ER production verification testing, which consists of 24 rockets per year.

The hazardous dud rate at the end of pre-production qualification testing in 1996 was about 2.6 percent, compared to a requirement of 1 percent or less. Subsequent testing has demonstrated a reduced hazardous dud rate of 0.7 percent among almost 3000 bomblets over a range of distances and temperature conditioning. These results should reduce risk for the GMLRS rocket, since its DPICM bomblets will use the same self-destruct fuze. Risk for the GMLRS rocket should also be reduced by the demonstration in the ATD program of the technical feasibility of achieving the required GMLRS accuracy.

The GMLRS TEMP, approved by DOT&E in March 1998, has a rigorous T&E program that takes advantage of modeling and simulation to evaluate targets and conditions not tested in IOT&E. Live Fire Test and Evaluation will use existing M-77 data and M-85 data from IOT&E firings against a towed artillery battery target. For the first time in a fire support program, the TEMP includes targeting and command and control in a critical operational issue.

## **CONCLUSIONS, RECOMMENDATIONS, LESSONS LEARNED**

Early and active DOT&E involvement in the GMLRS program led to the opportunity to shape the development of the Critical Operational Issues. This will provide better linkage from T&E to the key user requirements and help ensure end-to-end evaluation of the total system.