

Precision Guidance Kit (PGK)

Executive Summary

- In January 2011, the Army restructured the Precision Guidance Kit (PGK) Increment 1 program to address any necessary schedule changes due to reliability test failures that occurred in August 2010.
- Baseline reliability testing in August 2011 demonstrated that the contractor and program manager resolved the system's main reliability problems identified in 2010.
- In March 2012, the program received approval to accelerate fielding to Operation Enduring Freedom in FY13. The program currently has two tracks – the restructured baseline Program of Record and the Urgent Materiel Release (UMR).
- The program is currently undergoing government qualification testing and is revising the PGK Test and Evaluation Master Plan to support a Milestone C decision.
- In late October 2012, as part of the UMR program, the Army conducted an Early User Assessment that provided Soldiers their first opportunity to fire the PGK. The howitzer crew performed their tasks successfully in six operationally realistic end-to-end missions firing a total of 20 PGKs from an M777A2 howitzer. Preliminary data indicate that the PGK's accuracy is well within requirements.
- The PGK experienced two reliability failures. The program is investigating potential modifications to the GPS antenna and the ballistic parameters used to compute the firing mission when firing an M549A1 projectile.

System

- The PGK is a combined fuze and GPS guidance kit that improves the ballistic accuracy of the current stockpile of field artillery projectiles.
- The Army plans to develop PGK in two increments:
 - Increment 1. Provide 155 mm High-Explosive projectiles (M795 and M549A1) with 50 meter Circular Error Probable (CEP).
 - Increment 2. Improve delivery accuracy to 30 meters (threshold) and 20 meters (objective) CEP, as well as add anti-jam capability as a threshold requirement.
- The PGK will operate with existing and developmental artillery systems that have digital fire control systems and



inductive fuze setters such as the M777A2 Lightweight Towed Howitzer and the M109A6 Paladin Self-Propelled Howitzer.

Mission

Field Artillery units will use PGK to provide indirect fire support with 30 – 50 meters accuracy to combat maneuver units in all types of weather and terrain. Artillery units will use PGK to achieve comparable effects of conventionally fuzed projectiles using fewer rounds and thus reducing collateral damage.

Major Contractor

Alliant-Techsystems Advanced Weapons Division – Plymouth, Minnesota

Activity

- In January 2011, the Army restructured the PGK Increment 1 program to address schedule changes due to the reliability test failures that occurred in August 2010. The restructured program features a Milestone C decision in 2QFY13, an Initial Operational Test (IOT) in 1QFY14, a Full-Rate Production decision in 2QFY14, and an Initial Operational Capability in 3QFY14.
- The PGK Increment 1 has three Milestone C entrance criteria: interoperability, reliability, and accuracy. The program successfully demonstrated interoperability during DOT&E-approved testing in 2009.
- In August 2011, the Army tested a modified PGK to address known failure modes in order to demonstrate satisfactory

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baseline reliability to support entrance into the next phase of Engineering and Manufacturing Development.

- In March 2012, the program received approval to accelerate fielding to Operation Enduring Freedom in FY13. Thus, the program currently has two tracks – the baseline Program of Record and the UMR.
- The program is currently undergoing government qualification testing, which includes Sequential Environmental Tests for safety and performance.
- The program is revising the PGK Test and Evaluation Master Plan to support a Milestone C decision in 2QFY13. Following Milestone C, the program intends to begin the manufacturing of fuzes for the IOT and the validation of the production line to support the Full-Rate Production decision. The program plans to conduct an IOT in 1QFY14 at Yuma Proving Ground, Arizona.
- In late October 2012, as part of the UMR program, the Army conducted an Early User Assessment that provided Soldiers their first opportunity to fire the PGK. The howitzer crew performed their tasks successfully in six operationally realistic end-to-end missions firing a total of 20 PGKs from an M777A2 howitzer. These firings provided both accuracy and reliability as input to the UMR decision planned for 2QFY13.

Assessment

- In August 2011, the Baseline Reliability testing of 48 fuzes to support entrance into the next phase of Engineering and Manufacturing Development demonstrated 84 percent reliability with 80 percent confidence, exceeding the required 83 percent with 80 percent confidence. This was the target reliability for a successful program and approval of an accelerated fielding effort.
- This reliability estimate is on the reliability growth curve for the program leading to the Capability Production Document requirement of 92 percent by Initial Operational Capability. However, in the July 2012 Sequential Environmental Test – Safety, three rounds fell significantly short of the target. This indicates a possible new failure mode. These failures

are currently undergoing failure analysis. The Army will determine the effect of these failures on the program schedule upon completion of the failure analysis.

- The program is meeting accuracy requirements for the M795 and the M549A1 155 mm high-explosive projectiles at low- and mid-firing angles. The program has focused considerable resources and is making some progress in enhancing the PGK accuracy at higher firing angles.
- Results from the operational Early User Assessment of 20 fuzes in October 2012 indicate that the PGK demonstrated an 85 percent reliability with a lower 80 percent confidence bound of 74 percent. Two of the three failures in the small sample replicated a known failure mode with a planned corrective action in the Program of Record track but not in the initial UMR lots. Preliminary accuracy data indicate that overall, the PGK's accuracy met the threshold requirement of 50 meters CEP, demonstrating a 32-meter CEP although there was considerable variability in the errors – ranging from 9 meters to 131 meters. The program is investigating modifications to the GPS antenna and the ballistic parameters used to compute the firing mission when firing an M549A1 projectile. A change to the digital fire control software is in progress, which should be implemented with the upcoming UMR fielding.

Recommendations

- Status of Previous Recommendations. The Army has satisfactorily addressed all previous recommendations.
- FY12 Recommendations. The Army should:
 1. Continue to closely monitor developmental testing to ensure that the identified corrective actions for the known deficiencies are satisfactory and do not adversely affect other performance parameters prior to Milestone C.
 2. Determine the root cause of the rounds that fell short of the target and implement corrective action prior to Milestone C.
 3. Determine the causes of the substantial variance in accuracy observed in the Early User Assessment.