CRUSADER HOWITZER AND RESUPPLY VEHICLE

The Crusader system is the Army's next-generation, 155mm, Self-Propelled Howitzer (SPH) and its companion re-supply vehicle, either tracked (RSV-T) or wheeled (RSV-W). Crusader will be the indirect fire support system for armored and mechanized forces of the U.S. Army's Counterattack Corps.

The Crusader SPH will employ Advanced Solid Propellant Armament using a modular propellant charge system, auto-settable multi-option fuze, automated ammunition handling, Global Positioning System (GPS)-based position location and azimuth reference system, with improved mobility, reliability, and maintainability. The SPH is designed to deliver unassisted munitions at ranges to 30 kilometers and assisted munitions to 40 kilometers, provide a maximum rate of fire of 10 to 12 rounds per minute for 3 to 5 minutes, and provide a sustained rate of fire of 3 to 6 rounds per minute. It is required to have the agility and mobility to keep up with the supported maneuver force of M1 Abrams tanks and M2 Bradley fighting vehicles. It must be able to complete a survivability move of 750 meters within 90 seconds of identifying a potential threat. There will be an equal mix of RSV-Ts and RSV-Ws with automated ammunition and fuel re-supply functions and GPS-based navigation systems. The SPH and RSV-T will each have a crew of three to replace the four and five crewmen, respectively, currently on the Paladin and the M992A1 Field Artillery Ammunition Support Vehicle. The RSV-W will have a two-man crew.

BACKGROUND INFORMATION

The Crusader SPH and RSV program, formerly the Advanced Field Artillery System and Future Ammunition Re-supply Vehicle, began in 1992. Crusader Operational Requirements Documents were approved in June 1993. In November 1994, the program completed a successful Defense Acquisition Board Milestone I review and entered the Program Definition and Risk Reduction phase. In 1997, a decrement in program funding caused a revision to the Acquisition Program Baseline and a slip of the Milestone B review. The Milestone B decision is now scheduled for April 2003.

In 1QFY00, the program again restructured to address software development/integration problems, a funding reduction, and a change in the Army's priorities. Crusader re-entered the preliminary design phase to make it lighter (38 to 42 tons per vehicle), enabling both C-5s and C-17s to transport two SPHs without weight waivers. The program restructure added an RSV-W with an automated re-supply module mounted on a palletized load system carrier. Crusader has also joined the Abrams program in seeking a common engine. The Milestone B Review slipped to 3QFY03, with IOT&E and first unit equipped in 2008. In August 2000, DOT&E approved a Crusader TEMP. The approval memorandum requires a revised TEMP for Milestone B to update the LFT&E strategy, vehicle designs, and the power train development.

TEST & EVALUATION ACTIVITY

Throughout 2001, the Self-Propelled Howitzer-1 Emulator (SPH1E) has been undergoing propellant handling and firing tests at Yuma Proving Ground, AZ. SPH1E includes the chassis, armament, and ammunition handling equipment hardware of a heavy Crusader prototype with emulation electronics and software. SPH1E achieved a 40-kilometer range and fired a ten-round mission at the maximum rate of fire.

United Defense, the prime contractor, has built test stands of heavy system armament and ammunition handling hardware to assist the development of software and assessment of hardware reliability. The test stands have already exceeded 25,000 test cycles. United Defense will soon integrate the test stands, crew stations, electronics, and tactical software into a Crusader Integrated Test Station (CITS). Build 3 of Release 3 of Crusader software has been completed and is ready for integration into CITS. CITS will be used to exercise fire missions (inert charges and rounds), re-supply, upload/download, and inventory management functions for both the SPH and RSV.

The Crusader program continued Vulnerability Reduction Measures (VRM) tests during FY01. Those activities included a Survivability Test Section experiment that simulated the effects of a propellant compartmentation ignition. The experiment provided engineering data to the designers of the SPH propellant bustle developing blow-off panels and compartment designs to protect the crew from fires and low-level explosions in the propellant stowage area. The VRM program is a key element of the LFT&E strategy and will serve as a significant data source for the vulnerability evaluation. The LFT&E Integrated Product Team has actively worked to develop a mature LFT&E strategy for incorporation in the TEMP at its next revision.

TEST & EVALUATION ASSESSMENT

Test firings with the SPH1E have shown that the Crusader has the potential to meet its range and rate of fire requirements. However, technical problems have delayed SPH1E testing intended to demonstrate that Crusader can consistently achieve those requirements.

The TEMP includes an effective operational testing program that includes an early user experiment to support the Milestone B decision, a Limited User Test (LUT) to support a Milestone C decision, Force Development Test and Experimentation (FDT&E) to support development of tactics, techniques and procedures, and IOT&E to support the full-rate production decision. The LUT (FY05) and FDT&E (FY07) will allow soldiers to exercise Crusader prototypes under operational conditions, while the IOT&E (FY08) will put a battery of LRIP Crusaders through 96 hours of simulated combat.

The LFT&E plan is not yet completed for the redesigned system to replace the LFT&E assumptions in the current TEMP. Sufficient test assets must be programmed to assure adequate vulnerability characterization and crew survivability assessment. The plan must also identify simulation models that can be leveraged to maximize our understanding of Crusader vulnerability and fill-in test gaps. Assets must be allocated for verification, validation, and accreditation of those models.

Key areas of risk in development of the Crusader have been software development, tube cooling, tube life, and system reliability. Weight reduction initiatives have added parallel Abrams-Crusader Common Engine and drive train development, design margin of safety, and material properties of titanium, aluminum, and composite material components to the watch list. These initiatives increase the program's technical, cost, and schedule risk.