

ABRAMS TANK (M1A2)



Army ACAT IC Program

Total Number of Systems:	1155
Total Program Cost (TY\$):	\$9976.3M
Average Unit Cost (TY\$):	\$7.84M
Full-rate production:	3QFY94
SEP Production	4QFY99

Prime Contractor

General Dynamics Land Systems

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

Changes to the M1A2 Abrams Tank contained in the M1A2 System Enhancement Program (SEP), are intended to improve lethality, survivability, mobility, sustainability, and provide increased situational awareness and command & control enhancements to provide *information superiority* to the *dominant maneuver* force. The Abrams Tank and the Bradley Fighting Vehicle are two central components of the *dominant maneuver* digital force.

The mission of the M1A2 Abrams tank is to close with and destroy enemy forces using firepower, maneuver, and shock effect. The M1A2 is being fielded to armor battalions and cavalry squadrons of the heavy force. SEP upgrades are intended to:

- Improve target detection, recognition, and identification with the addition of two 2nd generation FLIRs.
- Incorporate an under armor auxiliary power unit to power the tank and sensor suites.
- Incorporate a thermal management system to provide crew and electronics cooling.
- Increase memory and processor speeds and provide full color map capability.
- Incorporate Force XXI Battle Command, Brigade and Below (FBCB2) Integrated Combat Command and Control (IC³) to share battle command information and situational awareness with all components of the combined arms team.

In addition to the aforementioned SEP components, additional weight reduction measures, survivability enhancements, and safety improvements applied to the M1A2 will be incorporated into the configuration that will undergo LFT&E.

BACKGROUND INFORMATION

The M1A2 IOT&E was conducted from September-December 1993. Based on the results of the IOT&E, the Director determined that the M1A2 was operationally effective but not operationally suitable, and unsafe. That assessment was based on poor availability and reliability of the tank and instances of the uncommanded main gun and turret movement. FOT&E I was conducted September-October 1995 to verify corrective actions resulting from the IOT&E. This test was halted due to continued instances of uncommanded main gun and turret movements. FOT&E II in June 1996 confirmed the adequacy of the applied corrective actions and the M1A2 was assessed as both operationally effective and suitable.

The M1A2 SEP is a further upgrade to the M1A2 tank. OT conducted to date on the M1A2 SEP include a Detection, Acquisition, Recognition, Identification (DARI) test, conducted October-November 1998, and FOT&E III, conducted April-May 1999. The DARI was a side-by-side comparison between the M1A2 SEP equipped with 2nd generation FLIR and the baseline M1A1 equipped with a 1st generation FLIR. The results of the DARI demonstrated an improved capability of the 2nd generation FLIR over the 1st generation FLIR to detect, recognize, and identify targets at operationally relevant ranges. FOT&E III consisted of crew gunnery tables involving three M1A2 SEP tanks and four baseline M1A2 tanks. Its focus was to assess whether the M1A2 SEP possesses an increased capability over the baseline M1A2 to acquire, engage, and hit targets. During FOT&E III, the M1A2 SEP demonstrated a significantly better performance during night engagements over the baseline M1A2 in the number of targets hit as a percentage of the total number of target presentations. During day engagements, no performance difference was detected between the M1A2 SEP and the baseline M1A2.

The Director approved the M1A2 TEMP Update 3 in June 1999. This update included changes to the M1A2 SEP's T&E program necessary to address the system's incorporation of digital C².

The M1A2 SEP, along with the additional engineering changes included in the Abrams tank since 1993, sometimes referred to as the M1A2 Tank 2000, is considered a LFT&E "covered" product improvement requiring a LFT&E program with realistic vulnerability testing of full-up, combat

configured vehicles. In July 1999, the Director approved an M1A2 Tank 2000 LFT&E strategy. This strategy includes a fourteen-shot, full-up, system-level live fire to be conducted between FY00-02.

TEST & EVALUATION ACTIVITY

No OT was conducted in FY00. FOT&E IV was conducted from October-November 2000 in conjunction with the BFVS-A3 IOT&E.

Most of the testing this year has been devoted to ensuring the M1A2 SEP will be ready for the FOT&E IV. Last year, the program modified its technical approach to integrating digital C². Much of the technical testing has focused on ensuring the successful integration of this new approach, called Integrated Combat Command and Control (IC³). Software and C² performance testing was conducted in July 2000 at Aberdeen Proving Ground on the M1A2 SEP with IC³. In addition, digital communications connectivity between the M1A2 SEP and BFVS-A3 was tested at the same time. Results of this testing were positive. Required digital messages were successfully transmitted between the two platforms and the M1A2 SEP's IC³ demonstrated sufficient maturity to proceed to FOT&E IV.

Testing was also conducted this year to confirm fixes to the FLIR "washout" problem identified during FOT&E III. "Washout" caused by the main gun muzzle blast caused the FLIR to be ineffective for a short period after each main gun firing. Testing conducted in February 2000 substantiated the adequacy of these fixes, with FLIR performance comparable to the currently fielded M1A2.

Phase I LFT&E activities continued through FY00. Phase I addresses M1A2 SEP specific design features with component-level ballistic shock tests, non-destructive tests, and engineering analyses. Ballistic shock tests of the Commander's Independent Thermal Viewer with its 2nd generation FLIR and the Commander's Electronics Unit were conducted in May and June 2000. A production M1A2 SEP tank was also subjected to deliberate non-destructive electrical and electronic failures in a Controlled Damage Experiment conducted during the same time period.

The M1A2 LFT&E IPT continued to develop plans for the Phase III system level tests that are scheduled to begin in 1QFY01. The shotlines for two system-level and fourteen full-up system-level tests were selected by the IPT in January 2000.

TEST & EVALUATION ASSESSMENT

The integration of IC³ has been the primary technical challenge to the program. IC³ is designed to meet a key system requirement for digital battle command and is the M1A2 SEP link to FBCB2. A full evaluation of the M1A2 SEP requires that the system include functional, production-representative IC³. Technical testing conducted on the M1A2 SEP indicated that the system's IC³ was sufficiently mature to enter FOT&E IV and successfully demonstrate system digital C² requirements.

As noted above, the DARI test established the superiority of the M1A2 SEP 2nd generation FLIR's target acquisition capability in comparison to the currently fielded system.

The development of the Under Armor Auxiliary Power Unit (UAAPU) has proven to be a significant program challenge. The UAAPU is intended to provide auxiliary electrical and hydraulic power to the system during the conduct of mounted surveillance, thus reducing engine usage during tactical operations while improving operational fuel consumption rates. Engineering design problems

encountered during developmental testing with the UAAPU have led the program to delete the UAAPU from the M1A2 SEP production configuration. The UAAPU remains an important system requirement, however the program is not currently funded to continue UAAPU development and the UAAPU is not currently included in the production configuration of this system.

During FOT&E III, as well as previous developmental testing, the thermal management system experienced a number of hydraulic leaks. The program office has instituted fixes to this problem, which were confirmed in DT and will be evaluated during FOT&E IV.

FOT&E IV, conducted in October-November 2000, consisted of 16 force-on-force battles between a M1A2 SEP/BFVS-A3 equipped company team and a baseline company team consisting of M1A2's and BFVS-A2's. This event, in which four M1A2 SEP's participated, was intended to evaluate the overall operational effectiveness and suitability of the M1A2 SEP. Results of FOT&E IV are not anticipated before January 2001. FOT&E IV was conducted with only the FBCB2 component of the Army Battle Command System (ABCS). M1A2 SEP-equipped units are scheduled to participate in future FBCB2 OT events, allowing for the opportunity for the M1A2 SEP to demonstrate full interoperability with the remaining components of ABCS.