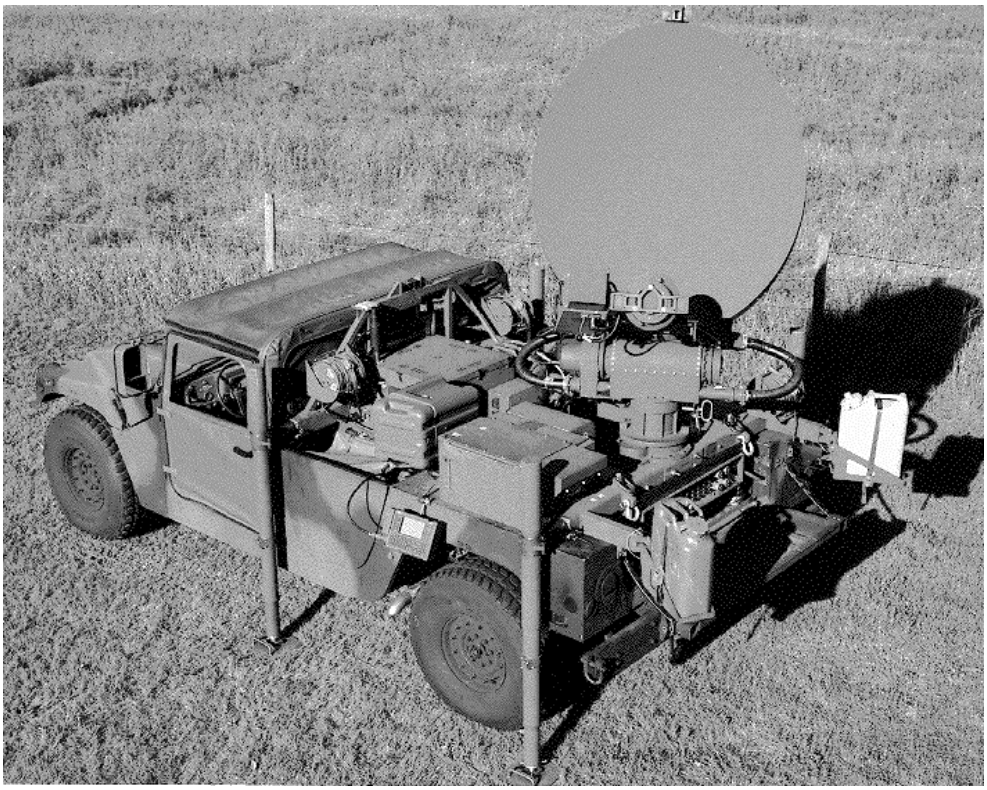
SECURE, MOBILE, ANTIJAM, RELIABLE, TACTICAL TERMINAL (SMART-T)



Army ACAT IC Program		**Prime Contractor**
Total Number of Systems:	318	Raytheon
Total Program Cost (TY$):	$1.28B	
Average Unit Cost (TY$):	$2.4M	
Full-rate production:	1QFY99	
Production Decision for AEHF Upgrade:	4QFY04	

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The Secure, Mobile, Anti-jam, Reliable, Tactical Terminal (SMART-T), a Military Strategic and Tactical Relay (MILSTAR) satellite communications transmit and receive terminal, is a core element of the Joint Service ground terminal segment of the MILSTAR satellite system. The primary SMART-T mission is multi-channel, near global extended range connectivity for the Army's Mobile Subscriber Equipment, which is the primary tactical communications equipment for corps and division operations. Operating at both the MILSTAR low (75-2400 bits/second) and medium (up to 1.544 mega-bits/second) data rates, it is designed to provide tactical commanders with secure, jam resistant, extended range, two-way, point-to-point and network voice, data, and video communications. In addition to overcoming the limitations of terrain masking and distance, SMART-T is designed to operate and survive in severe electronic warfare and nuclear, biological, and chemical environments. These characteristics should enable our forces to maintain ***information superiority*** throughout all levels of conflict, support the ***full-***

dimensional protection operational concept, and ensure that warfighters retain freedom of action through continuous, secure communication.

BACKGROUND INFORMATION

SMART-T entered the EMD phase in May 1992, and the low-rate initial production phase in February 1996. The SMART-T acquisition strategy was designed to deliver terminals in advance of the first Medium Data Rate (MDR) MILSTAR satellite being placed in orbit. The strategy does not require the terminals to demonstrate all operational effectiveness and suitability requirements during IOT&E and prior to the Milestone III full-rate production decision. The Program Office executed the first of three planned SMART-T full-rate production options in January 1999 based on IOT&E results. Further production options beyond the current 89 terminals were to be supported by additional operational tests in 4QFY99 using an on-orbit MDR satellite. However, the April 30, 1999 launch of the MILSTAR Flight 3 satellite failed. Consequently, the planned test has been delayed until after the next MILSTAR launch in 2QFY01. The Army Acquisition Executive approved a revised APB reflecting a new schedule for FOT&E and IOC on September 26, 1999.

TEST & EVALUATION ACTIVITY

SMART-T IOT&E was conducted June 1-12, 1998, at Ft. Gordon, GA, using eight production representative terminals. The test used an on-orbit MILSTAR satellite for LDR communication and the Massachusetts Institute of Technology (MIT)/Lincoln Laboratory MDR/LDR satellite simulator for MDR communications. SMART-T's were deployed replicating a typical division and corps Area Common User System. The terminals were moved over improved and unimproved roads with varying conditions designed to stress the system and soldier/machine operations and demonstrate operational suitability of SMART-T.

There were two major limitations to SMART-T IOT&E:

- As there was no MDR-capable MILSTAR satellite on orbit, the MIT/Lincoln Laboratory satellite simulator was used MDR communications. The satellite simulator does not replicate all the physical acquisition and tracking characteristics of an orbiting satellite, nor does it replicate the delay times or footprint associated with an orbiting satellite. Testing of the on-orbit satellite will be delayed until after MILSTAR Flight 4 is launched in late 2000. This testing will be conducted under operationally realistic conditions to replicate Mobile Subscriber Equipment range extension operations.

- The Automated Communications Management System (ACMS—an objective communications management tool used for MILSTAR network planning and management control) was not available during the test. ACMS is an interim planning tool used to do the network planning for IOT&E. ACMS is still under development but is expected to be available to support MILSTAR Flight 4 strategic (LDR) operations in 2000.

The Program Manager conducted a RAM confidence demonstration in April 1999 to substantiate the improvements made to SMART-T since IOT&E. Additional Reliability Growth Testing (RGT) has demonstrated a terminal reliability of 489 hrs Mean Time Between Failure (MTBF) at 80 percent LCL.

The on-board SMART-T diesel generator successfully demonstrated its required reliability of 500 hrs MTBF at 80 percent LCL during RGT in fall 1999.

TEST & EVALUATION ASSESSMENT

DOT&E reported the results of the June 1-12, 1998 IOT&E in our B-LRIP report to Congress in January 1999. Sufficient progress in system reliability has not been demonstrated in developmental testing and verified through operational testing to warrant changing the basic assessment of SMART-T operational effectiveness and operational suitability. We note, however, that the Program Office is making significant progress in addressing shortcomings. The major issues from the B-LRIP are summarized below:

- Operational effectiveness could not be fully demonstrated because ACMS was not available for IOT&E and there was no MDR MILSTAR satellite in orbit. Additionally, a SMART-T orderwire (an initial, rudimentary communications link) was not planned for or used during IOT&E. The Program Office has planned for an orderwire with SMART-T, and is fielding baseband devices to support the orderwire.

- SMART-T is not operationally suitable. The most serious shortfall occurred in achieving the expected operational reliability. Field test results for MTBF were only 50 hours (point estimate). Also, the observed Mean Time Between Operational Mission Failure was 43 hours (point estimate) in IOT&E. This is substantially below the 700-hour requirement the system must demonstrate prior to a fielding decision. Failures were attributed to a wide range of software, hardware, training, procedural issues, and operator errors.

- SMART-T is operationally survivable. The performance was evaluated using contractor and independent laboratory tests and analyses, models, and open-air tests.

Cold weather setup/teardown testing of a SMART-T was conducted at the Cold Region Test Center (CRTC), Ft. Greely, AK, from November 8-18, 1999. Thirteen setup and teardown sequences were successfully performed. This test successfully demonstrated that SMART-T can be setup and tore down by a two-man crew wearing cold weather gear within the 45 minute ORD requirement.

CONCLUSIONS

The Program Office has made significant improvements to SMART-T since IOT&E in June 1998, and DOT&E is confident that the program is on its way to becoming operationally effective and suitable. However, the following conclusions remain valid:

- Operational effectiveness has not been fully demonstrated, and cannot be confirmed until the MILSTAR communication management system is fully developed and operationally tested. This testing should take place in mid-year 2001 after the launch of MILSTAR Flight 4.

- SMART-T is not operationally suitable. Although the program office has made numerous modifications to improve reliability and other system shortfalls, none of the fixes have been verified in an operationally realistic test. Additionally, although MTBF has grown to over

450 hours (80 percent lower confidence level), the required 800-hour level (the entrance for follow-on operational testing) has not been demonstrated.

- Operational survivability is satisfactory.

RECOMMENDATIONS

The following recommendations are based on observations from the June 1-12, 1998 IOT&E and Program Office activities since that time.

- A fielding decision should not be made until operational testing confirms that SMART-T is both operationally effective and operationally suitable.

- In order to meet operational reliability requirements, the Program Office should continue executing an aggressive growth program until SMART-T demonstrates that it meets technical reliability requirements and entrance for follow-on operational testing.

Additionally, DOT&E recommends that the following items receive special attention during future operational tests and evaluations:

- Improvements in training, troubleshooting procedures, and technical manuals must be verified in operational testing.

- The numerous user man/machine interface shortcomings must be corrected. Additionally, the SMART-T terminal should be evaluated for overall quality of construction.

- Integrated logistics issues such as poor computer screen readability in sunlight, inadequate audible alarms, and poor placement of generator switches must be corrected.

- DOT&E recommends that SMART-T be evaluated for vulnerability to non-nuclear, high-power microwaves to determine its ability to withstand this emerging threat.

DOT&E will continue oversight of SMART-T and work with the Program Office, the Army, and the operational test community to further refine test requirements and ensure that SMART-T is operationally effective and suitable prior to fielding.