NAVSTAR Global Positioning System (GPS)

Executive Summary
- The Global Positioning System (GPS) Architecture Evolution Plan (AEP) Operational Utility Evaluation (OUE) conducted by the Air Force Operational Test and Evaluation Center (AFOTEC) commenced in 4QFY07 in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP).
- The NAVSTAR GPS test community addressed previously identified concerns by including user equipment in operational testing and is working to create a comprehensive, GPS enterprise TEMP.
- The NAVSTAR GPS Modernized System needs to integrate operational end-to-end testing of the space, control, and GPS modernized (Military-code) receivers on representative combat platforms in realistic operational and threat environments.

System
- The NAVSTAR GPS is an Air Force-managed joint Service precision navigation and timing space program used for DoD and non-DoD operations.
- The NAVSTAR GPS consists of three operational segments:
  - Space Segment: The NAVSTAR GPS spacecraft constellation consists of 24 operational satellites in semi-synchronous orbit.
  - Control Segment: The control segment consists of the GPS master control station, operational system control antennas, a pre-launch compatibility station, and geographically dispersed operational monitoring stations.
  - User Segment: There are many versions of NAVSTAR GPS mission receivers hosted on a multitude of operational systems and combat platforms.
- The system is being modernized with a Military-code (M-code) enhanced capability to better meet the needs of operational users.

- The Air Force Space Command has launched three blocks of NAVSTAR GPS satellites and has two blocks of spacecraft in development:
  - Block I (1982-1992)
  - Block II/IIA (1990-1997)
  - Block IIR/IIR-M (Modernized) (1997-present)
  - Block IIF development (follow-on spacecraft)
  - Block III development (replacement spacecraft)

Mission
- Combatant commanders, U.S. military forces, allied nations, and various civilian agencies use the NAVSTAR GPS system to provide highly accurate, real-time, all-weather, passive, common reference grid positional data, and time information to operational users worldwide.
- Commanders use NAVSTAR GPS to provide force enhancement for combat operations and military forces in the field on a daily basis throughout a wide variety of global strategic, operational, and tactical missions.

Activity
- Operational testing of the Operational Control Segment (OCS) AEP commenced in July 2007.
- The Air Force plans to launch the third NAVSTAR GPS Block IIR-M (Modernized) satellite in October 2007 and will conduct early-orbit testing upon successful orbit insertion.
- The Integrated Test Team developed a draft TEMP for the Block IIIA satellites and the Next Generation GPS Control Segment (OCX).
- The 92nd Information Operations Squadron conducted Information Assurance testing during the OUE for the AEP.
- The test planning for GPS Block III and OCX made substantial progress in 2007; specifically, the Air Force designed a GPS enterprise schedule that identified GPS mission capabilities, control segment upgrades, and user segment requirements.

Assessment
- To ensure effectiveness for combat, the NAVSTAR GPS Modernized User Equipment (MUE) receivers must be integrated into production representative Military GPS User Equipment (MGUE) hosted on representative platforms (i.e., ships, aircraft, land, and space vehicles) and tested in realistic operational environments that include appropriate electronic warfare and Information Assurance conditions.

- The third Block IIR-M satellite is planned to launch in 2007; however, prototype NAVSTAR GPS MUE will not be available to conduct basic developmental testing of Block IIR-M unique capabilities until at least 2010. While this problem affects developmental testing, the Air Force should have production representative MUE in place for adequate operational testing scheduled for 2012.
- The synchronization of the development of the space, control, and user segments continues to be a concern; however, progress towards creating MGUE production representative articles has improved the situation. Delays in fielding MGUE preclude operational testing of IIR-M unique capabilities, but the risk to GPS III has been mitigated by the Air Force committing resources and planning to test GPS III capabilities with MGUE on operational platforms.

Recommendations

- Status of Previous Recommendations. There were no FY06 recommendations. The Air Force has made progress on previous FY05 DOT&E recommendations, yet four out of the five recommendations remain valid. The Air Force should continue to synchronize development of the three NAVSTAR GPS segments and include them in a rigorous end-to-end test with operationally representative platforms. DOT&E continues to advocate the operational testing of new and legacy NAVSTAR GPS receivers as early in the program as possible. The Air Force should test GPS in appropriate electronic warfare environments to ensure M-code capabilities are demonstrated under realistic combat conditions.
- FY07 Recommendations. None.