C-5 Avionics Modernization Program (AMP) and Reliability Enhancement and Re-engining Program (RERP)

Executive Summary

- The completed Avionics Modernization Program (AMP) development forms the baseline for the Reliability Enhancement and Re-engining Program (RERP). The AMP production decision was made in February 2003 prior to the completion of developmental test in August 2005.
- DOT&E approved the initial combined C-5 Modernization Program Test and Evaluation Master Plan (TEMP) in October 2001 prior to the Milestone B review for RERP. A revised TEMP was approved in August 2005.
- The Air Force Operational Test and Evaluation Center (AFOTEC) started AMP OT&E on September 7, 2005, and suspended testing in October 2005. Legacy reliability problems, AMP software deficiencies, and immature technical orders contributed to the suspension of AMP OT&E.
- Live Fire tests:
  - Showed the wing leading edge dry bay fire suppression system did not suppress ballistic fires from all threats tested
  - Evaluated C-5 susceptibility to Man Portable Air Defense System threats

System

- The C-5 is the largest four-engine transport aircraft in the United States. The C-5 has 36 pallet positions and can carry a maximum payload of 270,000 pounds. The typical crew size is seven.
- The AMP incorporates a glass cockpit with digital avionics and state-of-the-art communications, navigation, and surveillance components for air traffic management functionality.

- The RERP provides commercial engines, nacelles, thrust reversers, pylons, and extensive reliability enhancements.

Mission

- Units equipped with the C-5 perform strategic airlift, emergency aero-medical evacuation, transport of brigade-size forces in conjunction with other aircraft, and delivery of outsize or oversize cargo to the warfighter.
- The C-5 can execute missions at night, in adverse weather conditions, and in civil-controlled air traffic environments around the world.
- The C-5 receives in-flight aerial refueling for extended range missions.

Activity

- Four Integrated System Evaluations (two pre-planned and two more for verification of deficiency corrections) were accomplished during development test and evaluation. First flight of a C-5 AMP aircraft (B model) was in December 2002. A second AMP test aircraft (A model) first flew in August 2003. The C-5 Systems Group declared development testing and evaluation on AMP complete in August 2005.
- In 2005, the C-5A/B/C Global Air Traffic Management Operational Requirements Document was updated. The C-5 Test and Evaluation Master Plan was updated for consistency, and approved by DOT&E in August 2005.
- AMP OT&E began on September 7, 2005; approximately one year behind schedule. The AFOTEC Commander suspended testing on October 10, 2005, primarily because of legacy and AMP performance deficiencies and maintenance technical order shortfalls. The AMP OT&E will restart after conditions established by AFOTEC have been met.
- C-5 RERP modifications began in late 2004 on a B-model aircraft. A second B-model and an A-model began modifications in 2005.

- Live Fire hardware-in-the-loop testing evaluated C-5M susceptibility to Man Portable Air Defense System threats during FY05.
- Live Fire ballistic tests provided data to evaluate the effectiveness of wing leading edge dry bay fire suppression systems.

Assessment

- C-5 AMP software development and integration as well as technical order development (flight manuals and maintenance manuals) were incomplete at the start of OT&E.
- Air Mobility Command personnel and equipment resources are strained by operational commitments resulting in limited support for AMP OT&E.
- The C-5 AMP operational test plan includes real-world airlift missions, maintenance demonstrations, and information assurance evaluations. Real-world operational missions for OT&E are intended to provide opportunities to evaluate the aircraft in typical environments.
- AMP development has experienced unrealistic schedules, unstable software systems, and immature systems integration. Resolution of AMP deficiencies, extension of the AMP OT&E schedule, and the RERP development timeline are affected.
- Wing leading and trailing edge dry bays are vulnerable to threat induced fires. The fire suppression system is not effective against all expected threats.
- The C-5 RERP is nine months behind schedule.

Recommendations

1. An updated executable acquisition strategy is necessary for program success.
2. Continuity among the current AMP and the future RERP test teams should be maintained to the maximum extent possible.
3. Consider development of improved dry bay fire suppression systems in the wing leading edge and evaluate them against expected ballistic threats.