

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

### Executive Summary

- The C-5 fleet is undergoing a two-phase modernization program. The first phase – an Avionics Modernization Program (AMP) – completed developmental and initial operational testing (B-model only) and is currently in production. The AMP production decision was made in February 2003 prior to the completion of developmental test in August 2005. The second phase – a Reliability Enhancement and Re-engining Program (RERP) – started development and completed first flight with a B-model aircraft on June 19, 2006.
- The Test and Evaluation Master Plan (TEMP) for AMP deficiency correction and RERP completion needs revision.
- The existing acquisition strategy is no longer executable due to cumulative program delays and funding shortfalls. An updated C-5 acquisition strategy should include RERP completion and programmed correction of AMP.
- The Air Force Operational Test and Evaluation Center (AFOTEC) started AMP OT&E on September 7, 2005, and suspended testing in October 2005. The C-5B AMP OT&E restarted in April 2006 and completed in June 2006. A C-5A/C AMP operational test is scheduled for January 2007.
- The observed performance of the C-5 AMP modifications is not adequate as a baseline for RERP.
- The C-5 AMP modifications are not operationally suitable.
- Live Fire tests showed the wing leading edge dry bay fire suppression system did not suppress ballistic fires from all threats tested.

### System

- The C-5 is the largest four-engine, military 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 mission computer, a glass cockpit with digital avionics (including autopilot and autothrottles), and state-of-the-art communications, navigation, and surveillance components for air traffic management functionality.
- The RERP provides 50 reliability enhancements, including new commercial engines, nacelles, thrust reversers, and pylons.

### 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 must be able to 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

- The C-5 B AMP OT&E began on September 7, 2005, approximately one year behind schedule. The AFOTEC Commander paused testing on October 10, 2005, because seven operational AMP airlift missions were attempted and none completed successfully. The C-5 AMP OT&E restarted in April 2006 and completed in June 2006.
- The OT&E consisted of 48 airlift sorties and 22 local training sorties for a total of 376 flight hours.
- The C-5 B AMP operational test plan included real-world airlift transport missions, maintenance demonstrations, and information assurance evaluations. Real-world operational missions for OT&E provided opportunities to evaluate the aircraft in typical environments.
- The first flight of the C-5 RERP occurred on June 19, 2006, using a B-model aircraft. A second B-model and an A-model

are currently in modification scheduled for completion in late 2006.

- Both the content and timeline of the RERP developmental flight tests are undergoing modification.
- DOT&E approved a C-5A/C AMP test concept brief in September 2006. Operational testing is scheduled to begin in January 2007.
- Live Fire ballistic tests provided data to evaluate the effectiveness of wing leading edge dry bay fire suppression systems.

## Assessment

- The observed performance of the C-5 AMP modifications is not adequate as a baseline for RERP. The instability of the flight management system, information assurance vulnerabilities, and frequent autopilot disconnects are contributing factors. Operator workarounds increased crew workload and impacted operational effectiveness. However, situational awareness regarding navigation and other air traffic improved. Navigation and data link capabilities performed well in OT&E.
- The C-5 AMP is not operationally suitable. High AMP component failure rates, inadequate integrated diagnostics, lengthy technical order trouble shooting times, and high maintenance man-hours per flight hours impacted the ability to generate aircraft missions.
- AMP development included unrealistic schedules, unstable software systems, and immature systems integration. These problems affected the resolution of AMP deficiencies, the AMP OT&E schedule, and the RERP development timeline. There

is no program documentation showing that lessons learned from the AMP development are being applied to the RERP.

- The AMP/RERP acquisition strategy is no longer executable due to program delays and funding shortfalls. The developmental program timeline is not realistic. Correction of AMP deficiencies, inclusion of the 14 delayed AMP capabilities, and RERP completion are not part of the current program of record.
- Wing leading and trailing edge dry bays are vulnerable to threat induced fires. The fire suppression system is not effective against the threats tested.

## Recommendations

- Status of Previous Recommendations. The Air Force has taken action on one of the three previous DOT&E recommendations. The remaining two are still valid.  
FY05 #1: The Air Force has not delivered an updated executable acquisition strategy as previously recommended.  
FY05 #3: DOT&E recommended that the Air Force consider development of improved dry bay fire suppression systems in the wing leading edge and evaluate them against expected ballistic threats. The C-5 System Group has stated that they will consider LFT&E recommendations after the conclusion of the LFT&E program.
- FY06 Recommendations.
  1. The Air Force should apply lessons learned from C-5 AMP development to RERP.
  2. The C-5 acquisition strategy should include RERP completion and programmed correction of AMP deficiencies.