

Multi-functional Information Distribution System (MIDS) Joint Tactical Radio System (JTRS)

Executive Summary

- The Navy completed IOT&E of the Multi-functional Information Distribution System – Joint Tactical Radio System (MIDS JTRS) core terminal integrated into the F/A-18E/F in November 2010.
- DOT&E published a Beyond Low-Rate Initial Production Report in April 2011.
- DOT&E determined that the testing was adequate to indicate that the MIDS JTRS, integrated into the F/A-18E/F, was not operationally effective and not operationally suitable.
- Major deficiencies included ineffective Link 16 message exchanges of position, close air support information, and poor terminal/host system integration reliability.
- In August 2011, the Navy commenced a Verification of Correction of Deficiencies test of the MIDS JTRS integration into the F/A-18E/F to assess fixes implemented as a result of IOT&E, as well as to reevaluate reliability.
- The Air Force conducted developmental and operational testing of the integration of the MIDS JTRS into the E-8 Joint Surveillance Target Attack Radar System (JSTARS).
- Currently, not all MIDS JTRS core terminal capabilities, such as Link 16 enhanced data throughput, and instantiation of additional JTRS Software Communications Architecture waveforms, can be operationally tested because of host aircraft configurations and funding availability.

System

- When integrated into a host platform, MIDS JTRS provides Link 16 digital datalink, Link 16 digital voice communications, and Tactical Air Navigation capabilities, plus three additional programmable channels capable of hosting additional JTRS Software Communications Architecture-compliant waveforms in the 2 to 2,000 megahertz radio frequency bandwidth. In addition, MIDS JTRS will provide the capability for enhanced Link 16 throughput and Link 16 frequency re-mapping.
- Link 16 digital datalink is a joint and allied secure anti-jam high speed datalink that uses standard messages to exchange information among flight or battle-group host platforms or between combat platforms and command and control systems. Link 16 digital voice provides host platforms a secure anti-jam voice line-of-sight communications capability. Tactical Air Navigation is a legacy aircraft navigation system used in many



- military aircraft with air-to-air as well as air-to-ground modes of operation.
- The system includes the MIDS JTRS terminals and the host platform components and interfaces such as controls, displays, antennas, high power amplifiers, and any radio frequency notch filters.

Mission

- U.S. Services and many allied nations will deploy MIDS JTRS-equipped aircraft, ships, and ground units in order to provide military commanders with the ability to communicate with their forces by voice, video, and data during all aspects of military operations. MIDS JTRS networking capability and multiple waveforms (including new waveforms such as the Tactical Targeting Network Technology and Mobile User Objective System) are intended to allow collaboration despite geographical and organizational boundaries.
- MIDS JTRS-equipped units should be able to exchange information including air and surface tracks, identification, host platform fuel, weapons, mission status, engagement orders, and engagement results.

Major Contractors

- ViaSat – Carlsbad, California
- Data Link Solutions – Wayne, New Jersey, and Cedar Rapids, Iowa

Activity

- The Navy Commander, Operational Test and Evaluation Force (COTF) completed the IOT&E of the MIDS JTRS as integrated on the F/A-18E/F at the Naval Air Warfare Center China Lake, California, and during detachments to Naval Air Station Fallon, Nevada, and Nellis AFB, Nevada, in November 2010.
- DOT&E published a Beyond Low-Rate Initial Production Report in April 2011.
- The Air Force's Detachment 2, 605th Test and Evaluation Squadron completed integrated and dedicated operational testing of the MIDS JTRS as integrated into the E-8 JSTARS aircraft in July 2011 in Melbourne, Florida.
- COTF commenced the F/A-18E/F MIDS JTRS Verification of Correction of Deficiencies on August 15, 2011, at Naval Air Station China Lake, California. Testing should conclude in December 2011.
- All testing was conducted in accordance with DOT&E-approved Test and Evaluation Master Plans and operational test plans.

Assessment

- The MIDS JTRS IOT&E data indicated significant performance shortfalls. Link 16 messages that provide situational awareness of friendly force positions and intentions were consistently exchanged during 90 percent of the F/A-18E/F sorties flown, compared to the Key Performance Parameter threshold requirement of 98 percent. Link 16 close air support messages were successfully exchanged only 26 percent of attempts. Poor system reliability during start-up prevented timely mission launch during 16 percent of sorties.
- The MIDS JTRS, as integrated into the F/A-18E/F, demonstrated an operational availability of 68 percent compared to the Key Performance Parameter threshold requirement of greater than 90 percent.
- Terminal reliability was 63.8 hours mean time between operational mission failure compared to a threshold requirement of greater than 220 hours, and system integration reliability was 8.1 hours, compared to the threshold requirement of greater than 25 hours. Terminal reliability deficiencies were primarily found on ViaSat Terminals, as Data Link Solutions Terminals met the threshold requirement of 220 hours, although with a low (<50 percent) confidence level.
- The Built-In Test false alarm rate was one false alarm every 4.8 flight hours compared to the requirement of no more than one false alarm every 113 flight hours.
- Post-test causality analysis indicated that manufacturing and quality control problems with ViaSat-produced MIDS JTRS terminals led to new failure modes discovered during IOT&E. Other deficiencies were traced to errors in the Link 16 waveform software code and inadequate aircrew and maintenance personnel training.
- Problems discovered during the IOT&E will, if not corrected, significantly reduce the utility of this system to the aircrew. The MIDS Program Office must correct the new failure modes discovered during the IOT&E to improve the mission

effectiveness and reliability of the MIDS JTRS terminal and F/A-18E/F integration. All real-world F/A-18 missions require, among other onboard systems, an operational Link 16 and Tactical Air Navigation capability to permit launch, entry into threat airspace, and allow for a safe recovery. A high failure rate of the installed MIDS JTRS will adversely affect mission readiness and on-time take-off rates.

- Test data from the integration of the MIDS JTRS into the E-8 JSTARS are still being analyzed; however, emerging results from IOT&E and Joint Interoperability Test Command interoperability testing indicate potential deficiencies with the exchange of imagery and attack aircrew-initiated acknowledgements in response to command messages. Emerging results indicate the system was effective in transmitting Link 16 datalink and voice communications. Completion and reporting of service Link 16 interoperability testing in December 2011 should clarify these potential problems.
- The integration of the MIDS JTRS into the E-8 aircraft appears to be reliable at the system level; however, prior to operational testing, two MIDS JTRS terminals failed and were returned to the vendor for hardware repair. Further reliability data collection in FY12 will provide clarification and confidence in data collected during the operational test.

Recommendations

- Status of Previous Recommendations. The Navy and the MIDS Program Office made satisfactory progress on the previous recommendations related to the integration of MIDS JTRS into the F/A-18E/F.
- FY11 Recommendations. The Navy should:
 1. Work with the MIDS Program Office to continue with the implementation of corrections to the MIDS JTRS system, terminal performance, and suitability shortfalls identified in past and current operational testing.
 2. Work with the MIDS Program Office to develop more fidelity and better discrimination for the Built-in-Test system to improve detection and reduce false alarm rates, specifically for the F/A-18E/F MIDS JTRS integration.
 3. Work with the MIDS Program Office to continue aggressively monitoring and engaging with prime terminal vendors to improve terminal quality and system-level reliability requirements. The Navy and Air Force should continue data collection of MIDS JTRS as integrated into their host platforms to confirm to at least 80 percent confidence that the MIDS JTRS terminal and host platform integration meet reliability requirements.
 4. Identify host platform integration candidates to test future JTRS waveforms and Link 16 enhanced throughput capabilities.
 5. Provide improved maintenance training, checklists, and fault diagnostics tools to reduce the quantity of MIDS JTRS terminals returned to flight because the avionics maintenance team could not duplicate reported faults. In addition, the Navy should provide a checklist for cryptographic key loading procedures.