

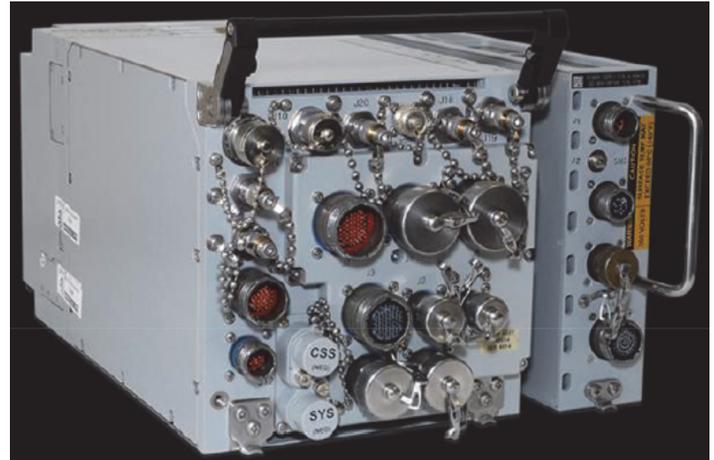
Multi-Functional Information Distribution System (MIDS) Joint Tactical Radio System (JTRS)

Executive Summary

- The Multi-functional Information Distribution System (MIDS) Joint Tactical Radio System (JTRS) provides U.S. and allied land, sea, and air forces with critical flight safety and mission-essential communications, navigation, and identification capabilities. The Navy's MIDS Program Office has planned several parallel development efforts to provide the capabilities needed by Combatant Commanders and host platforms. Because some host platforms have unique mission capability and integration requirements, MIDS JTRS has become a family of terminals and terminal sets.
- FY19 testing informed production and fielding decisions and provided guidance for future operational effectiveness and suitability improvements. The Navy Commander, Operational Test and Evaluation Force (OPTEVFOR) conducted operational testing of the MIDS Concurrent Multi-Net-4 (CMN) communications capability simultaneous with H14 software testing for the F/A-18E/F. The MIDS CMN-4, as integrated into the F/A-18E/F and EA-18G, demonstrated improvements in performance, reliability, and Built-In Test false alarm rates. The testing was insufficient to fully characterize MIDS CMN-4 in an operationally representative environment.
- OPTEVFOR also conducted the Phase I Operational Assessment (OA) of the MIDS Tactical Targeting Networking Technology (TTNT) variant designed for integration into the F/A-18E/F and EA-18G in a laboratory-only environment. The emerging results from the OA concluded that three MIDS TTNT terminals could be networked and exchange TTNT message packets with minor drops of packets. Service post-test analysis was successful in identifying and isolating one of the major contributors to the data loss. DOT&E identified MIDS TTNT terminal reliability and operational availability as potential risks to future testing and fielding although some of the failures and loss of operational availability were later removed by adjustments to the laboratory testbed.

System

- The MIDS JTRS core terminal set provides Link 16 digital datalink, Link 16 digital voice communications, and Tactical Air Navigation (TACAN) capabilities.
- The MIDS JTRS terminals with the CMN reception are designed to have improved digital receivers, improved message buffering, and faster processing to enable host aircraft to simultaneously receive additional Link 16 messages during periods of assured high message exchange mission requirements.
- The MIDS JTRS terminals with TTNT provide the host aircraft with higher-throughput and lower-information latency



Multi-Functional Information Distribution System (MIDS)

communications, supported by applications that enable faster updates of precise target locations and identification data, and use an expanded radio frequency range. The Internet Protocol (IP) design also supports faster routing of messages and balancing of message traffic among the participating nodes.

- The MIDS Program Office is managing the design of a tailored MIDS JTRS CMN-4 system for integration into the Air Force's F-22 fighter aircraft. This design will provide TACAN, legacy Link 16, CMN-4, and Identification Friend or Foe (IFF)/ Selective Identification Feature (SIF) transponder capabilities.
- The system under test includes the MIDS JTRS terminal set and the host platform components, such as controls, displays, antennas, and external power amplifiers that support delivery of the MIDS JTRS communications, navigation, and identification capabilities.

Mission

- U.S. military commanders and allied nations use MIDS terminal variants on aircraft, ships, and ground units to communicate with their forces by secure and jam-resistant Link 16 voice and datalinks and IP-based TTNT communications through the entire range of military operations.
- MIDS JTRS-equipped units rapidly exchange information, including air and surface tracks, identification, host platform fuel, weapons, cooperative integrated fire control, mission status, engagement orders, targeting data, and engagement results.
- MIDS TACAN supports aircraft navigation, aircraft-to-aircraft station-keeping, aircraft carrier recovery marshalling, and airfield approaches.
- MIDS JTRS IFF/SIF supports commercial airspace transit and safety, as well as secure, jam-resistant combat identification.

Major Contractors

- Via Sat, Inc. – Carlsbad, California
- Data Link Solutions – Wayne, New Jersey, and Cedar Rapids, Iowa
- Boeing – St. Louis, Missouri

Activity

MIDS JTRS CMN-4

- From August through December 2018, the Navy's Air Test and Evaluation Squadron Nine conducted an operational test (OT) of the MIDS CMN-4 terminal as integrated into the F/A-18E/F and EA-18G. This test leveraged developmental test (DT) flight sorties, Operational Flight Program H-14 OT flights, deployed live exercise events, as well as dedicated CMN-4 OT flights to gather the needed test data. The Navy conducted testing in accordance with the DOT&E-approved Test and Evaluation Master Plan (TEMP).
- The Program Office is developing the MIDS Block Upgrade 3, which updates the CMN-4 Link 16 transceiver to improve computing processing power, correct previously identified deficiencies, and deliver new capabilities.

MIDS JTRS TTNT

- OPTEVFOR conducted the Phase 1 OA of the MIDS TTNT terminal in the Naval Information Systems Warfare Command's Waveform Test Laboratory from July 8 – 12, 2019. OPTEVFOR conducted testing in accordance with the DOT&E-approved MIDS TTNT TEMP and OA test plan. The system under test was the MIDS TTNT and TTNT external power amplifier set, designed for integration into the F/A-18E/F and EA-18G aircraft. The results of this test help inform the Navy's decision to approve low-rate initial production of MIDS TTNT terminal sets to support host platform integration, future OT, and early fielding.

Assessment

MIDS JTRS CMN-4

- The F/A-18E/F and EA-18G MIDS CMN-4 OT demonstrated that many of the operational effectiveness and suitability deficiencies discovered during DT have been corrected. MIDS CMN-4 terminal and integrated system reliability improved to within threshold requirements. Built-In Test false alarms now meet the threshold requirement. Link 16 message completion rates appeared to meet requirements; however, Link 16 data recorders were not available on most test flights, and experienced

high failure rates when they were available. Consequently, testers could not collect meaningful data for analysis in all operational scenarios.

- There were two key OT limitations of the MIDS CMN-4 capability. The Link-16 network was not designed to operationally stress the CMN-4 capability and there were not enough MIDS CMN-4 Link-16 participants available to operationally stress the network. DOT&E will work with the Navy and the Air Force to develop an adequate OT for the MIDS CMN-4 when the appropriate network design is available and the number of CMN-4-configured participants increases.

MIDS JTRS TTNT

- MIDS JTRS TTNT Phase 1 OA emerging results indicated that the three MIDS JTRS terminals participating in this laboratory test could exchange TTNT data packets while simultaneously operating Link 16 on an adjacent communications channel. Emerging results also indicate that message completion rates were within or very close to threshold requirements. A critical limitation to the MIDS JTRS TTNT Phase I OA was the immaturity of the host platform integration efforts.

Recommendations

The Navy should:

1. Develop an adequate OT plan for the MIDS CMN-4 capability. This test must include a relevant CMN-4 network design and MIDS CMN-4-equipped command and control host platforms.
2. Improve operational availability and reliability of MIDS Link 16 data recorders for testing to accurately record message completion rates, which is a key element of all communications systems testing.
3. Conduct another OA or Integrated Test of MIDS TTNT integrated onto the EA-18G, F/A-18E/F, and E-2D to further define the risks to early operational fielding. Also, conduct a Reliability Growth Test of the MIDS TTNT, which should be completed before entry into OT.