MULTIFUNCTION INFORMATION DISTRIBUTION SYSTEM (MIDS)
FIGHTER DATA LINK (FDL)

Joint ACAT ID Program (Navy Lead):

| Total Number of Systems: | 551 |
| Total Program Cost (TY$): | $162M |
| Average Unit Cost (TY$): | $150K |
| Full-rate production: | 4QFY99 |

Prime Contractor

- Data Link Solutions (Terminal Developer)
- Boeing (F-15 Integration)
- Service Certified Y2K Compliant
- Not Completed

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The Multifunction Information Distribution System Fighter Data Link (MIDS FDL) is a terminal that provides communications, navigation, and identification capabilities to host platforms in support of key theater functions such as surveillance, identification, air control, weapons engagement, coordination, and direction for all Services, NATO forces, and selected other allies. The system is to provide a high throughput (115+ kilobits per second) robust line-of-sight jam-resistant communications to host platforms. The FDL integrated into the F-15C/D and F-15E will support the air superiority and air interdiction mission areas by providing highly reliable real-time information into the cockpit. It will support exchange of flight member sensor contacts, tasking, and positioning data. In addition to the F-15 common air superiority messages, the F-15E implementation also contains messages to support tasking and execution of the air interdiction mission. These messages include air-to-ground ordnance status, target identification, threat location, selection of Desired Mean Points of Impact, Battle Damage
Assessment, and bailout/downed aircrew indications. The implementation also plans to employ FDL to exchange imagery of target and threat areas.

FDL (integrated into the F-15 fighter) will improve joint and coalition force interoperability through adoption of Link-16 (or TADIL J) message standard and waveform. MIDS FDL will enhance battlefield situation awareness through the automatic exchange of position and identification messages as well as on-and off-board sensor data, complement precision engagement capabilities through targeting coordination, and support information superiority employing Link-16’s anti-jam and secure waveform for communications.

BACKGROUND INFORMATION

The FDL is part of the MIDS family of Link-16 terminals. It contains less capability (no digitized voice, lower output power, and, no TACAN) than the MIDS Low Volume Terminal (LVT) as a trade-off for lower unit cost and improved reliability. Because of the Air Force’s expressed urgent need for the terminals and earlier successful Class 2 Joint Tactical Information Distribution System (JTIDS) terminal integration into the F-15C, the FDL is the first MIDS variant to enter flight test. The fielding objective is to equip all active F-15C/D/E aircraft with a common configuration terminal. The Air National Guard has indicated a desire to equip their approximately 115+ F-15 aircraft with the FDL. There is interest (funded studies) by Japan and Greece to equip their F-15 aircraft (and the Japanese F-1 fighter) with the FDL.

The FDL terminal is composed of common components (approximately 70 percent) from the MIDS LVT being developed by the MIDS Consortium. Software includes a core of MIDS common terminal software, unique FDL terminal software, and unique F-15 host integration software. Boeing, the prime F-15 integration contractor is producing a special mounting and airflow tray for the FDL and is designing the supporting antenna and cockpit interface and displays.

TEST & EVALUATION ACTIVITY

F-15C Link-16 message implementation interoperability testing using laboratory Hardware-in-the-Loop (HWIL) was conducted between January and February 1998. The F-15C passed USAF Combat Air Forces interoperability testing. MIDS did not complete its initial Link-16 joint interoperability certification on the F-15C because of the limitations of MIDS host integration software and possible test tool limitations. The primary issue surrounding this issue was the inability to control F-15s via Link-16. (This is also a limitation of E-3 Link-16 software.) This was retested in August with satisfactory results. A separate Link-16 joint interoperability certification test for F-15E is planned for FY99.

The developer conducted an Early Assessment (EA) on pre-production FDL terminals during 1QFY98 and 2QFY98. AFOTEC conducted an Early Operational Assessment (EOA) including an over-the-shoulder assessment of the developer EA, confirmation, during developer EA, of Year 2000 transition compatibility, and evaluation of contractor software development maturity. The EA/EOA evaluated the terminals on a bench and in-flight on a specially configured C-130 aircraft. The results of the EA/EOA supported the decision for pilot production of 50 common configuration FDL terminals. Additionally, a limited-scope DT/OT of the terminal’s transmit range was conducted in June 1998 using two F-15s with modified Class 2 terminals flying in the Eglin AFB ranges. This test was conducted.
because of concerns that reduced power output of the FDL terminal as compared to the MIDS LVT might result in significantly reduced communication ranges for F-15s.

Operational Test and Multi-Service Operational Testing (MS-OT) plans for FDL have been incorporated into the draft Joint MIDS TEMP, and MIDS FDL Annex. The TEMP for the MIDS-FDL is current. Testing will include evaluation of Link-16 contributions to F-15 air superiority and air interdiction mission effectiveness in a networked multi-unit simulation and during live flight missions. The MS-OT will focus on operational joint interoperability with Army and Navy Link-16 equipped systems during dedicated events and leveraging exercises ASCIET 99 and Roving Sands 99. Reliability testing will be conducted in sustained and accelerated bench testing, flight-testing, and in a FOT&E period to confirm the system meets the requirement.

**TEST & EVALUATION ASSESSMENT**

The HWIL interoperability testing indicated some difficulty in exchanging engagement messages between participating command and control (C2) and the F-15C. Data analysis also indicates some anomalous message errors. The problems are thought to have resulted in part from the MIDS FDL integration software as well as from errors in test bed software. Successful completion of joint interoperability testing between the Air Force and other Service C2 and the F-15 air superiority message implementation presents moderate risk. More will be known upon completion and reporting of the October 1998 joint interoperability tests. Certain control functions are known problem areas that will not be fixed in the near term. In particular, the control request/control vector messages are not properly implemented in the F-15C. This makes E-3A control of the F-15C via Link16 problematic. The loss of this function is rated moderate by JITC; i.e., the performance of a mission critical function is degraded but a reasonable work around solution is available.

The EA/EOA indicated that the FDL terminal experienced some difficulty in conducting relative navigation and retaining crypto-variable codes. A number of the problems were traced to boards inside the terminal that are common with other MIDS LVT terminals; two boards will be redesigned and retested. These tests were generally successful given the early stage in the program. However, these early hardware problems and continued contractor delays (in providing key hardware) suggest the need for increased focus on reliability in future tests.

Completion of the range test was postponed until FY99. The portions of the test that were accomplished indicated that the terminal would meet all F-15 transmit range requirements except for communications at the nose-to-nose aspect where the F-15’s MIDS antenna patterns are the weakest. Even at this aspect, the FDL still meets 90 percent of the required range requirement.

DOT&E’s identification of joint test opportunities and recommendations to combine FDL with Army MIDS variant MS-OT, as well as leverage ASCIET and Roving Sands resources, will realize a savings of $1 million (in operational assets to test support, shared data collection, and analysis costs).

**LESSONS LEARNED**

Early involvement by DTSE&E, DOT&E, AFOTEC and the government/contractor developer team identified key test objectives, timeline and data requirements early to support this accelerated development program. Test requirements have remained consistent largely because of open sharing of evolving FDL capabilities and user participation in the identification of key parameter needs. The open
team approach allowed for flexibility from all parties to ensure that testing is conducted as early as possible in support of the fielding objective. The EA/EOA provided engineering and test risk reduction for the FDL and the overall U.S. and International MIDS development program through the early identification of hardware/software problems in a rigorous test supported by OTA and DOT&E. The redesigned boards and common software will shorten the DT and OT of the remaining MIDS variants. Early certification of Year 2000 compatibility reduced developmental and production approval risks for all MIDS terminal variants.