MATE - Archived 5/97

Orientation

Description. The Modular Automatic Test Equipment (MATE) is a US Air Force test equipment support program.

Sponsor

US Air Force
Aeronautical Systems Center (ASC)
Integrated Diagnostics Division
Wright-Patterson AFB, OH

Contractors

AAI Corp
Baltimore, MD
(C-141 AWLS MATE)

Allied-Signal Aerospace Company
Bendix Test Systems
Teterboro, NJ
(Prime contractor for F-15 AIS Mod and subcontractor for F-111 AIS-R)

ESCO Electronics Corp
St. Louis, MO
(Depot Automatic Test System for Avionics)

General Electric Co
GE Automated Systems
Daytona Beach, FL
(FPS-118 OTH-B MATE Depot Test Station)

Martin Marietta Corp
Electronics, Information, and Missile Group
Orlando, FL
(LANTIRN MATE Test Stations)

SOFTECH
Alexandria, VA
(MATE integrating contractor for new technology insertion)

Unisys Corp
Paramax Systems Corp
Systems Development Div
Great Neck, NY
(A-10 INS ATE)

Westinghouse Electric Corp
Electronic Systems Group
Integrated Logistics Support Divisions
Hunt Valley, MD
(F-111 AIS-R)

Status. Program terminated.

Total Produced. Not applicable.

Application. MATE was a management framework encompassing the development, acquisition and support of modular automatic test equipment; design standards and guidelines for architecture, interoperability and performance of MATE hardware and software; and verification testing of MATE modules and software. It was designed to improve force readiness by providing a coherent support infrastructure of Automatic Test System (ATS) equipment with improved reliability and supportability aimed at reducing life-cycle costs.

Price Range. Indeterminate.

Technical Data

Design Features. The primary mission objective for MATE was to improve force readiness by increasing aircraft availability. The Air Force felt that a proliferation of unsuitable or unreliable special purpose Automatic Test Equipment (ATE) at all organizational levels had been a major cause of limited aircraft availability. Consequently, the secondary objectives of the MATE program were to create more general purpose, adaptable, and reliable ATE and to focus cost accounting on reduced weapon system life-cycle costs.

The problem that MATE addressed is neither new nor unique, but the MATE approach to solving it was. The MATE program was not an RDT&E cocoon in which specific new hardware is developed. Rather, MATE was a metasystem: not a system, but a framework for creating

systems. MATE guides established design standards for system architecture, interface and performance. MATE procedures ensured that a MATE application baseline is established at the time of RFPs for a new system, so that planning for weapon system testing is concurrent with planning for the weapon itself. MATE qualification procedures were designed to police the standards and certify equipment for service.

MATE mandated that systems be highly modular and thus highly interfaceable. Key interface and language standards included the controller interface intermediate language (specifies command and data language formats for all bus communication between the computer and test modules); communications bus (IEEE-488); instruction set architecture for the central computer (MIL-STD-1750A); test program language (IEEE-STD-716 ATLAS); language for control and support software (MIL-STD-1589B JOVIAL); controller translator card (interface between test station computer and communication bus); and test module adapter (interfaces off-the-shelf modules with the standard bus).

Variants/Upgrades

No known variants or upgrades were identified.

Program Review

Background. The need for ATE became more important as the complexity of weapons systems grew. As much as 20 percent of the cost of a modern weapon system can be attributed to its associated ATE equipment; therefore, building custom ATE systems became less and less viable. During the 1970s, the DoD and its contractors came to the realization that commercially available ATE equipment offered cost savings. However, the equipment did not always completely suit specified requirements. This deficiency was addressed by setting up common guidelines for a new class of ATE, with each service to develop an ATE system that complied with common guidelines. The result was the MATE for the Air Force, the Consolidated Automated Information Support System (CASS) for the Navy, and the Integrated Family of Test Equipment (IFTE) for the Army. A focus on off-the-shelf components (in subsystems especially), and compliance with commercial standards eased the task of deploying these common families, although in the early 1980s the indiscriminate buying of commercial ATE products that did not comply with the common standards caused problems. A driving factor in ATE development was the fact that ATE was no longer confined to intermediate or depot levels. The small, mobile test systems became increasingly deployed at or near the Forward Edge of Battle (FEBA).

The genesis of MATE came some 15 years ago when the Air Force decided to regulate the nearly 500 different ATE hardware configurations and 50 software languages because of equipment incompatibility and training problems. It was found that aircraft availability (force readiness) was often below desired levels because of malfunctioning and unsupportable ATE at all levels of maintenance.

In 1976, the Air Force awarded Sperry Rand a contract for concept studies and engineering development of ATE. MATE was first funded as a program under that acronym in 1978, when the Air Force selected Sperry and Westinghouse to develop modular concepts for MATE equipment, conduct survey studies and verify concepts. By July 1981 the Air Force had chosen Sperry for both full-scale development of the MATE concept and the first MATE application program, the Intermediate Automatic Test System (IATS) for the A-10 INS (Inertial Navigation System). In 1983, Sperry completed the first MATE guidebooks under the system definition contracts, and delivered the first of 26 A-10 INS systems. In May 1982, Emerson Electric was awarded a contract to develop Depot Automatic Test System for Avionics (DATSA), replacing General Purpose Automatic Test System (GPATS) for depot maintenance of C-141, F-111, F-4, F-105 and F-106 avionics. Sperry, with Low Altitude Navigation and Targeting (LANTIRN) contractor Martin Marietta, won a contract to produce the LANTIRN MATE equipment; AAI was awarded a contract to provide a MATE system for the C-141 All Weather Landing System (AWLS).

In 1984, the Air Force acted to institutionalize MATE, requiring under new Air Force Systems Command/Air Force Logistics Command regulations that after initial MATE development is complete, new weapon systems entering full-scale development shall be in compliance with MATE guidelines unless a waiver is obtained. A MATE baseline was provided for all new acquisition and modification programs. Efforts were begun to provide organic Air Force capability to certify MATE hardware and software for future Air Force ATS. Delivery and testing of the A-10 INS was delayed six months in FY84 to add increased capability to the test system. The MATE program entered full-scale engineering development in

August 1985. The Air Force continued efforts to locate the MATE Operations Center at San Antonio Air Logistics Center, Kelly AFB, TX, moving it from a leased facility at Sperry Systems Management, Great Neck, NY.

In FY88 MATE Abbreviated Test Language for All Systems (ATLAS) compiler improvements were implemented and expanded. MATE guides were restructured into a more usable/readable format. The MATE Unit Under Test (UUT) Simulator for use in developing software test programs was completed. The Full Operational Capability of the MATE Operations Center was established. New technology was inserted into MATE architecture, including pin electronics, fiber optics, man-portable testers, and Very High Speed Integrated Circuits (VHSIC).

In FY89 the following was accomplished: development and release of a downsized tester guide; completion of FCA/PCA of the MATE Control & Support Software (MCSS) 5.1; completion of CDR for the MATE Test Executive and ATLAS Compiler; release of the new MATE standard for the digital Simulation Data Format; release of compact versions of the MATE guides; provision of Instrumentation-on-a-Card (IAC) verification procedures to the MATE Operations Center; completion of support to the A-7 CAST and B-52 MIDATS programs; and release of the MCSS version 6.0 for initial site testing.

In late 1989 the Air Force announced its decision to form a centralized Integrated Diagnostics Office at Wright-Patterson AFB to take over the MATE program. This new office included the merging of the MATE System Project Office with that of the Generic Integrated Maintenance and Diagnostics Office (GIMADS). The focus of the new office was to shift from ATE to integrated diagnostics, with less emphasis on the specific solution.

FY90 accomplishments included the following: PCA of MCSS version 5.1 completed; RF testing trade study completed; ATLAS/CIIL tracking microtool completed; MCSS version 5.1 CIIL standard completed; MCSS 7.0 CDR completed; and MATE effectiveness study completed.

The FY91 program accomplishments included: established preliminary ABET interface standards for instrument control; established preliminary ABET test description language standard; OSIM version 6.0 MCSS released; OSIM specification completed; CIIL specification for MCSS versions 6.0 and 7.0 completed; SAC standard updated to VXI 1.3; completed OSIM application handbook; continued application support; developed 2167 documentation for MCSS versions 6.0 & 7.0; release MCSS versions 5.2 & 7.0; and completed application tracking microtool.

MATE Full-Scale Development Projects. In March 1988, SOFTEC, Inc (Alexandria, VA) was awarded a $24.9 million contract for MATE full-scale development projects by ASD (now known as ASC), Wright- Patterson AFB, OH. Work was to be done in Alexandria and Dayton, OH, and take approximately 60 months. SOFTECH was working in four major areas: developing a master plan to drive MATE program development toward Air Force objectives; developing MATE products (improving the MATE guides and standards, developing new software tools, studying Ada language conversion); evaluating applications effectiveness to provide feedback for master plan development; and providing product support as necessary, including educational efforts for new products or program improvements if required.

Funding

The last funding devoted to Program Element 0604247F - Project 2503 MATE was a $9.4 million outlay in FY91.

Analysis MATE was envisioned in the late 1980s as a family of design standards for system architecture, interface and performance from which weapon system-unique ATE could be developed and fielded. This differed from the Army's Integrated Family of Test Equipment (IFTE) and the Navy's Consolidated Automated Support System (CASS) program which were oriented to fielding common hardware ATE systems so that every aircraft, armored vehicle, weapons system and its related electronics would use the same test system throughout its life cycle.

While USAF had restructured MATE in FY91 to be more responsive to insertion of new technologies and software concepts, the service suspended R&D funding in FY92 for the MATE program element (PE#0604247F). A total of $177 million was allocated to PE#0604247F through FY91. This has effectively terminated MATE as a program. As part of the FY93 defense act, Congress has directed the Secretary of Defense to develop a DoD-wide policy requiring ATE commonality along with an oversight system to ensure compliance. As a result, CASS and similar technology appears poised to become even more broadly used than anticipated.

Timetable

	FY78	RFP to industry; two contractors selected (Sperry, Westinghouse)
	FY82	Sperry selected as prime contractor
	FY85	First DATSA delivery
Sep	1985	FSD Phase I completed
Sep	1986	A-10 IATS OT&E completed
Dec	1987	MATE Operations Center Full Operational Capability
Jun	1988	Release of Instrument-on-a-Card standard
Nov	1988	Unit Under Test (UUT) Simulator completed
Dec	1988	Program management transfer of MATE 5.0 software
Jun	1989	Downsized Tester Guidance completed
Jul	1989	Restructured MATE Guides completed (reduced an 18-volume, 5,000 page guide down to 1,000 pages)
Aug	1989	Ada design activity began
Oct	1989	Development of Automated MATE guides began
Sep	1990	Released MATE Software Version 5.1
		Released MATE Control & Support Software (MCSS) Versions 5.2, 6.0 & 7.0
	FY91	Initiated development of Test Program Set (TPS) development environment
	FY92	RDT&E funding suspended
	FY93	RDT&E funding suspended; program terminated
	FY94	No further activity reported

Worldwide Distribution

This was US Air Force program only.

Forecast Rationale

Despite what were coined "suspensions of funds" in the early 1990s, this program's demise was never as certain as it appears to be now. As such, barring any activity toward its resurrection this year, it will be omitted from future supplements.

Ten-Year Outlook

Due to the termination of the MATE program, the forecast funding line has been omitted.