



A wheeled-vehicle mechanic uses the Maintenance Support Device version 2 to diagnose vehicle faults. (Photo by Daniel R. Moody)

# Modernizing Automatic Test Systems for Force 2025 and Beyond

■ By Daniel R. Moody

For over 35 years, Army weapon systems have relied on automatic test systems to diagnose and isolate platform failures. Two kinds of systems, at-platform automatic test systems (APATS) and off-platform automatic test systems (OPATS), diagnose maintenance issues for all levels of weapon systems.

Air and ground weapons systems are not fail proof; they require regular maintenance to ensure their readiness. As the Army transforms to Force 2025 and Beyond, materiel modernization of automatic test sys-

tems must keep pace so that the force can shoot, move, and communicate on demand.

## APATS

APATS provide platform-level diagnostics on air and ground systems. They give the maintainer the ability to identify line replaceable module (LRM) faults.

**Contact Test Set.** The first generation of APATS, the Contact Test Set, was fielded in the late 1980s. The set provided electronic interaction with weapon systems and limited di-

agnostic ability. It was considered a momentum builder for the automatic test system initiative.

**SPORT.** In the 1990s, the Product Director for Test, Measurement, and Diagnostic Equipment (PD TMDE) developed the next generation of APATS. The Soldier Portable On-System Repair Tool (SPORT) gave the maintainer the ability to diagnose and repair various weapon systems using electronic technical manuals (ETMs) on a controller diagnostic aid.

The controller diagnostic aid was a

lightweight portable computer with an Intel processor chip, hard drive, CD-ROM drive, and Microsoft Windows 95. The device allowed for the upload and download of weapon systems data using military standard vehicle data bus technology.

In the late 1990s, SPORT was obsolete, and PD TMDE fielded the next generation of APATS: the Maintenance Support Device (MSD).

**MSD.** The MSD was identified as the Army's preferred APATS and ETM reader. The MSD made use of the latest technology from commercial industries and featured a clamshell design, increased processor speed, and greater storage capabilities than its predecessors.

Its ruggedized design and automated capabilities resulted in increased customer demand. By 2006, with the fielding of MSD version 2, the Army had 40,000 devices that supported over 50 weapons systems, including some in the tactical wheeled vehicle fleet.

The increased demands for graphics, ETMs, and user versatility resulted in an MSD redesign. In December 2011, the MSD version 3 was fielded as a smaller, more capable APATS netbook. It has the same ruggedized shell as the previous MSD, but it can be configured to have a clamshell or tablet design. The multicore processor speed, expandable RAM, large removable hard drive, and Windows 7 operating system improved its diagnostic test capability.

MSD version 3 is a ruggedized, self-contained, portable system that Army maintainers use in harsh field environments and at all maintenance levels to test, diagnose, and repair complex electronics in missile, aviation, and vehicular weapons systems. It is the primary reader of ETMs and platform-specific applications used to upload and download mission data.

MSD version 3 has been tentatively identified to host the Unit Level Logistics System-Aviation Enhanced, which will enable field-level avia-

tion maintenance personnel to track rotary-wing aircraft maintenance and preventive maintenance checks and services and to manage prescribed load lists. These innovative changes within APATS have kept pace with the Army's emerging requirements and have supported weapons system readiness.

## OPATS

Unlike APATS, OPATS have no single source of procurement and management. A maintainer uses the OPATS to diagnose defective LRMs and to conduct fault isolation tasks that may involve schematic or diagram analysis to accurately diagnose the fault.

**DSESTS.** The Direct Support Electrical Systems Test Set (DSESTS), fielded in the early 1980s, is the Army's first OPATS. The DSESTS consists of an M900 series 5-ton truck, an expansion shelter, automated test equipment (ATE), and additional hardware and software components that together make up a test program set for each LRM.

Military occupational specialty (MOS) 91G (fire control repairer) Soldiers use the DSESTS to run off-system diagnostic tests and isolate faults on the M1A1 Abrams tanks and M2 Bradley fighting vehicle LRMs. The DSESTS continues to provide an OPATS capability for Abrams and Bradley platforms.

**BSTF.** In the early 1990's, PD TMDE fielded the integrated family of test equipment Base Shop Test Facility (BSTF) version 3. This version of BSTF consisted of a prime mover from the family of medium tactical vehicles, an S-250 shelter, ATE, and assorted test program sets to support each LRM. This equipment aided MOS 94Y (integrated family of test equipment operator/maintainer) Soldiers in diagnosing and repairing electronic LRMs for aviation and missile weapon systems.

PD TMDE fielded a new OPATS, BSTF version 5, in 2002 to provide LRM support of the OH-58D Kiowa helicopter optical system. This

version was fielded to aviation support battalions.

## Standardization

In 2004, multiple policies were established to standardize and downsize automatic test systems. In a July 28, 2004, memorandum on Department of Defense policy for automatic test systems, the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics directed the Army to standardize and downsize its automatic test systems.

The Army directed compliance with the policy and implemented regulations to support its own policy in Army Regulation 750-43, Army Test, Measurement, and Diagnostic Equipment.

## Test Systems for the Future

In 2015, Combined Arms Support Command TMDE capability developers completed the requirements analysis for the future APATS to support the Force 2025 and Beyond platform diagnostics mission.

**MSD version 4.** The latest version of MSD is being considered as the data collection source for condition-based maintenance plus initiatives for future weapon systems. The update will also allow MSD to communicate with Global Combat Support System-Army.

MSD version 4 will consist of two models: a ruggedized tablet and a clamshell laptop. Each model will have a line item number and separate basis of issue plan for easier property book accountability and maintenance.

PD TMDE's two-pronged acquisition approach for the fourth version of MSD will potentially result in overall lower program cost, improved fielding time lines, and increased procurement quantities. The MSD version 4 fielding is expected to begin in 2016.

**NGATS.** The Combined Arms Support Command developed the requirements for the Next Generation Automated Test System (NGATS) in an effort to address the



*The Direct Support Electrical System Test Set, the Army's first off-platform automatic test system, is still in use today.*

obsolescence and redundancy of previous OPATS. The capabilities production document was approved in April 2007, and NGATS was selected as the Army's replacement for DSESTS and BSTF (versions 3 and 5).

The NGATS capabilities production document was coded as a joint interest requirement, so PD TMDE leveraged Navy and Marine Corps automatic test system architecture to develop some of the NGATS hardware solutions.

The NGATS configuration consists of two heavy expanded-mobility tactical trucks, two 20-foot shelters, one 60-kilowatt generator, ATE, and multiple test program sets to perform diagnostic support for all variants of the Abrams tank, Bradley fighting vehicle, Paladin artillery system,

Avenger air defense system, and future weapons system platforms.

The open architecture design and use of commercial technology enable NGATS to be a general purpose OPATS focusing on increasing diagnostic capabilities, lowering no evidence of failure rates for weapon system LRMs, and improving readiness.

The NGATS aligns with the Army's two levels of maintenance and will be operationally assigned to field and sustainment maintenance organizations. PD TMDE plans to begin fielding NGATS in 2017 to brigade combat teams, Training and Doctrine Command schoolhouses, and depots.

Designated as the Army's preferred automatic test systems, the MSD version 4 and NGATS will provide

weapon systems with technologically advanced diagnostic tools by fielding a single source of ATE. This single-source method will reduce logistics costs, enable faster diagnoses, and provide precise measurement capability for increased fault isolation accuracy rates well beyond 2025.

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