

Product Director Test, Measurement & Diagnostic Equipment Update to NDIA-ATC



Mr. Gerry Cox, PD TMDE

Mr. Clay Haney, DPD TMDE

PD-TMDE Portfolio



At-Platform Automatic Test Systems (APATS). DOD designated the Integrated Family of Test Equipment (IFTE) as the Army standard family of ATS. The Army's standard general purpose rugged and non-rugged compact, lightweight, man-portable at platform tester. Performs quick diagnoses and fault isolation on the Army's fleet of Electronic, Tactical Wheeled, Armored Fighting, Aviation & Missile weapon systems.

Maintenance Support Device (MSD): MSD is the Army's standard, general-purpose, at-platform tester used at all maintenance levels. More than 30 different Military Occupational Specialties (MOS) employ the MSD, providing field level support to more than 50 weapon systems.



Off-Platform Automatic Test System (OPATS). DOD designated the Integrated Family of Test Equipment (IFTE) as the Army standard family of ATS; the **Next Generation Automatic Test System (NGATS)** is the latest in the lineage of IFTE ATS.

NGATS is a mobile, rapidly deployable, reconfigurable general-purpose automatic test and diagnostic system which provides field, sustainment, and depot level maintenance testing and screening directly to the Army's major weapons systems in order to maintain the readiness and availability of those combat systems. It is the Army Standard Off-Platform Automatic Test System capable of fault isolation, diagnostics and repair of current and future weapons systems.



Calibration Set and Precision Instrumentation Program (CALSETS). Provides precision maintenance for accuracy/repair quality assurance of all weapons/TMDE. Procures instruments, standards, and hardware used to test, adjust, synchronize, repair and verify accuracy, using highly precise measurements, across the range of physical/dimensional, radiological, electrical, electronic and electro-optical parameters. Equipment procured by this program is used to ensure the accuracy, readiness and safety of Army weapon systems through a system of mobile and fixed calibration laboratories. Also procures tactical mobile maintenance shelters containing equipment racks and work benches suited to calibrate and repair. The CALSETS platforms are utilized as deployable calibration labs for supporting military calibrations in a tactical environment.



Test Equipment Modernization (TEMOD) Program. An ACAT III program that improves the readiness of Army weapon systems; minimizes **General Purpose Electronic Test Equipment (GPETE)** proliferation and obsolescence and reduces operations and support costs. A continuing requirement exists to maintain a modernized Army inventory of GPETE. Army operators and maintainers at all maintenance levels require GPETE to support current and emerging communications, electronics, biomedical, missile, air defense, aviation, and ground systems. Rapid technology development, obsolescence, and unsupportable test equipment requires the continuous capability to modernize and consolidate GPETE. GPETE is Commercial-Off-The-Shelf (COTS) or Non-Developmental Item (NDI) equipment and routine maintenance is minimal. New GPETE, where possible, will replace several makes and models of older, standard or non-standard, equipment to

Next Generation Automatic Test System (NGATS)



TPS Small Business Innovative Research (SBIR)

Product Director, Test, Measurement and Diagnostic Systems, Projected Start Date of Phase I: Q4FY24

AI-Enhanced TPS Development and Sustainment

Topic Description

This topic represents a paradigm shift in Test Program Set (TPS) development and sustainment across the DOD and Army electronic test domain (see descriptive charts). It has direct relevance to all weapon systems and end items across all Army commodities, ground, air, missile, and CSISR. The topic is to apply Artificial Intelligence (AI) and Model-Based Systems Engineering (MBSE) to improve the development, operation and sustainment of Test Program Sets (TPS) for maintenance of electronic components of weapon systems. The end goal is to achieve faster weapon system repairs, faster component Turn-Around-Times (TAT), high equipment Operational Availability (Ao), and high Unit readiness, all achieved at lower life-cycle costs.

Scientific Feasibility

The approach to employing AI in engineering applications is rapidly evolving in virtually every facet of electrical, mechanical, and software engineering. The feasibility of applying AI to TPS development is underpinned by AI applications from OpenAI, Microsoft, Google, Oracle, and others that enable user-defined databases, as well as open-source databases for machine learning from numerous sources.

Innovative Approach

In addition to AI, this topic leverages the tools and processes of Model-Based Systems Engineering (MBSE) and Product Life-Cycle Management (PLM) to create a digital thread for TPS life-cycle management. It begins with a CAD model of electronic components (Line Replaceable Units (LRU)) and uses that digital data as the basis for TPS hardware and software development, run-time optimization and a feedback loop from the physical world to AI –based algorithms to optimize change management.

Dual-Use; Sensor integration in mobile platforms with AI-assisted guided diagnostics.

Industries: Oil & Gas, Mining, Electronics Manufacturing, Automotive, Aviation, Robotics

Companies: Clackamas Calibration, Whisper Aero, Altron Automation,

Scale of Project

This SBIR project will initially be limited to a proof-of concept with a single weapon system electronic Line-Replaceable Unit (LRU). The process can be scaled to all LRUs requiring off-board automatic test system support.

Potential Scale of Impact

The Army is transitioning to a warfighting doctrine of Multi-Domain Operations (MDO) in Large Scale Combat Operations (LSCO). This doctrine emphasizes the vulnerability of contested Logistics supply chains and interdicted network bandwidth in the Tactical Echelon. Both circumstances emphasize the need to have maintenance capability at the point of need on the battlefield without the need for support reachback. This project will significantly facilitate that capability. This organic electronic maintenance capability can be scaled to all Brigade Combat Teams and weapon systems with electronic maintenance requirements.

Transition Partner

The TPS development process will be transitioned to PD TMDE (this SBIR topic originator) who is the Army TPS Manager. The generic LRU CAD modeling process will be provided to Materiel Developers in all PEOs.

Potential Other DOD Use Cases

PD TMDE, as the current leader of the DOD ATS Management Board, which is comprised of Army, Navy, Air Force, Marines and other Joint Programs, will socialize the SBIR process with the other Services. The Navy, with a large TPS inventory and on-going development process, has already expressed interest in the digital engineering

approach to TPS	# Awards	Projected Q & FY	PoP	Amt. per Award	Total Award Amt.
Phase 1	4	Q4FY24	6 months	\$250k	\$1M
Phase 2 / DP2	2	Q2FY25	24 Months	\$2M	\$4M
Phase 2 Seq	1	Q4FY26	12 Months	\$1M	\$1M

Technical Point of Contact (TPOC) Information:
 Steven Butcher, steven.w.butcher.ctr@army.mil

NGATS Ruggedization/Reliability

- Improvements to Bus Types and Instrument Form Factor
 - ✓ VME (BSTF(V)3) to VXI (EOTF/NGATS) – completed. Eliminated “chip creep” and flexing of boards (microchips are now soldered in place and circuit cards are screwed in)
- Improvements to Interface
 - ✓ Upgrade of Ball-Lock Mechanism to Perimeter Engagement (improves pin alignment)
 - ✓ Use of connector savers for signal connectors (mitigates pushed pins)

Opportunities:

- Improvements to Bus types and Instrument Form Factor
 - VXI (NGATS) to PXI (NGATS)
 - High performance with a more rugged, reliable, and maintainable form factor
- Improvements to Interface – connector savers for coax and power connectors
- Maximize Shock/Vibration Isolation Within Shelter
- Analyze Pass/Fail Limits within Self-Test
- More Robust Interface Hardware



Versa Module Europa (VME)

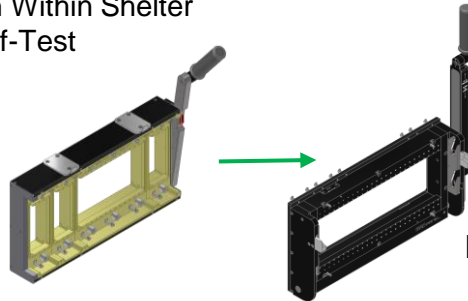


VME eXtensions for Instrumentation (VXI)

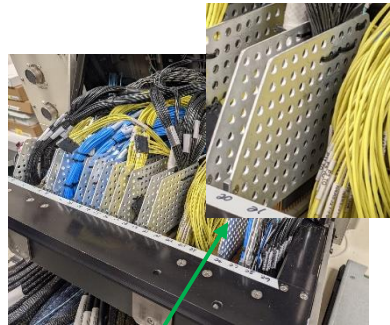


Peripheral Component Interconnect (PCI) eXtensions for Instrumentation (PXI)

Ball Lock Mechanism



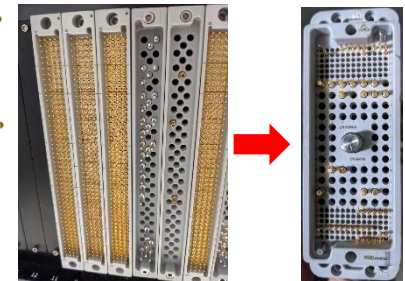
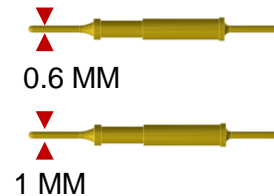
Perimeter Engagement



With Connector Savers

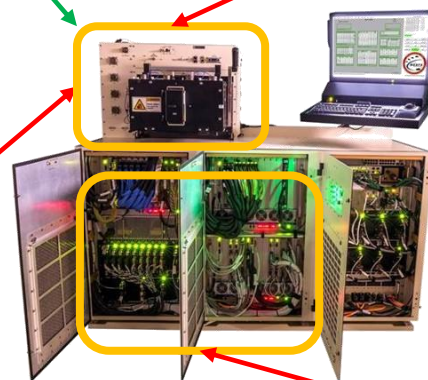
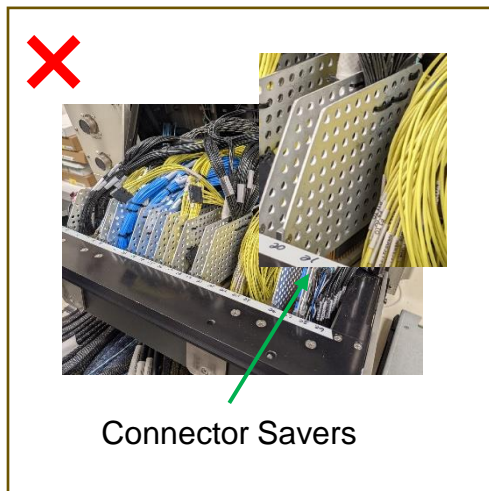
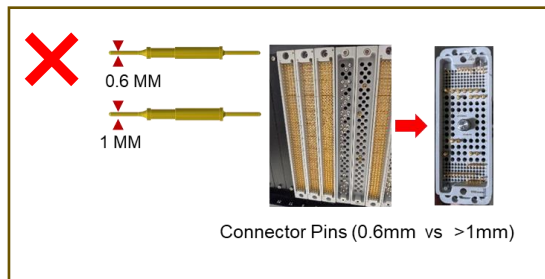
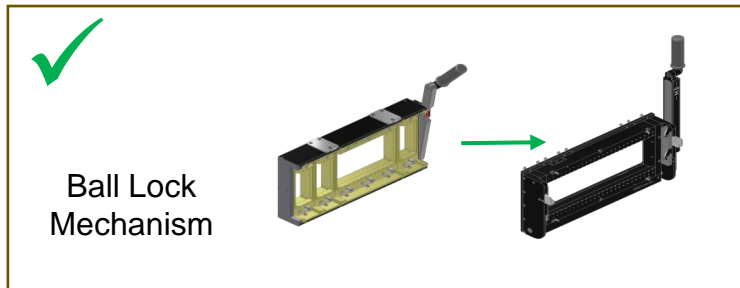


Without Connector Saver

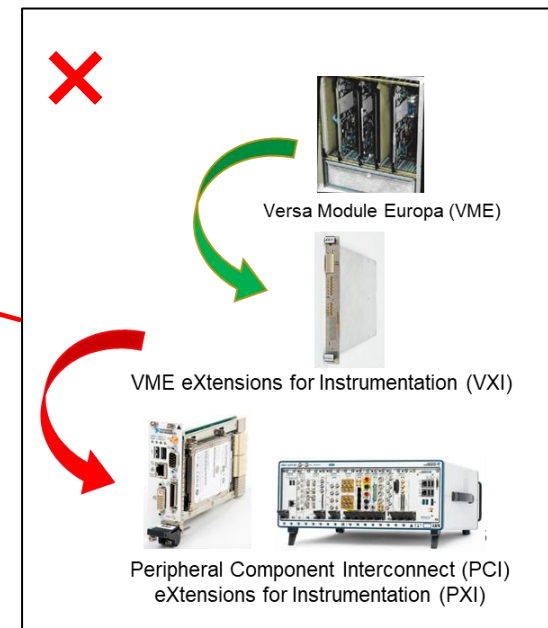


Connector Pins (0.6mm vs >1mm)

NGATS Ruggedization/Reliability Status



- NGATS**
- Upgraded Instrumentation (PXI)
 - Ruggedized
 - Scalable
 - Mobility (NGATS Light/Forward)
 - Affordability
- \$3.5M**



Maintenance Support Device (MSD)



Maintenance Support Device (MSD)



MSD-V4 AAO: 36,522 APO: 31,101 POM Qty: 5,416 MSD-V3 On-Hand: 16,277 MSD-V4 On-Hand: 24,831
WATS AAO: 10,386

Program Description

The Army's standard general-purpose compact, lightweight, man-portable, at platform tester in rugged or non-rugged configuration. Performs quick diagnoses and fault isolation on the Army's fleet of Electronic, Tactical Wheeled, Armored Fighting, Aviation & Missile weapon systems. Hosts Interactive Electronic Technical Manuals; intrusively tests and diagnoses Weapon Systems to the Line Replaceable Unit level; reduces Mean Time To Repair through automation of manual troubleshooting steps. Hosts GCSS-A software to provide the maintainer an information entry point into the Logistics enterprise. Provides a standard software loader/verifier capability.



Recent Milestones or Events As of: 01 Aug 2024

- APATS Fielding team fielded 55 MSD-V4R's, 24WATS, and 4 MSD-V4L's completing Total Package Fielding at Fort FT Sill, OK , 24 June 2024 thru 28 June 2024
- APATS Fielding team fielded 180 MSD-V4R's, 144 WATS, and 245 MSD-V4L's Total Package Fielding at Joint Base Lewis McChord, WA , 15-19 July 2024.
- APATS team received the Health Hazard Assessment Report from the Defense Centers of Public Health for the MSD-V4R and MSD-V4L on 8 July 2024.
- APATS team received the Safety Confirmation for the MSD-V4R and MSD-V4L TYPE II's from ATEC on July 25, 2024.

Recent Milestones or Events Continued

- Completed the WATS E-ATE Technical Manual Verification
- Completed the market research and engineering analysis for the WATS redesign to resolve the Wi-Fi obsolescence
- Completed MSD-V4 Rugged Engineering Change Proposal due to obsolescence and incorporated into contract
- Completed Predictive Logistics Data Source Collector Preliminary Design Review (PDR) 15 Aug 24.

Near Term Milestones or Events

- Continue MSD-V4/WATS Fielding toward achieving AAO
- Request for Proposal release for MSD-V4 Follow-on Production Contract
- Continue collaboration with stakeholders to define Tele-maintenance with Augmented Reality as part of APATS next generation
- WATS ECP to incorporate new Wi-Fi design
- Enable Network Connectivity on MSD-V4 for software update automation
- Windows 11 migration

Test Equipment Modernization (TEMOD)



Radio Test Set: Replace & Modernize

AN/GRM-114B
Entered service ~1995



TS-4317
Entered service ~1989



GROUND SINCGARS
Entered service ~1995



AVIATION Communication
Entered service ~1997



Survivability Communications
Entered service - 2007



NAVIGATION
Entered service ~2007

TS-4549 Prototype
(Astronics Test Systems)



Current State:

- SIX Configurations: four AN/GRM-122s, AN/GRM-114B, & TS-4317
- Managed by Two LCMCs (AMCOM & CECOM)
- No Longer Supported the OEM as of 2017
- Nine hours to calibrate

TS-4549 Features

- One box design, multiple interface
- Synthetic Instrumentation Platform:



- | | |
|-----------------------------------|------------------------------|
| - RF Signal Generator | -Spectrum Analyzer |
| -RF Error Meter | -Wideband Spectrum Analyzer |
| -RF Receiver | -Audio Freq Signal Generator |
| -RF Counter | -Audio Freq Counter |
| -RF Power Meter | -Deviation Meter |
| -Amplitude Modulation Meter | -Distortion Meter |
| -Phase Modulation Deviation Meter | -Audio Frequency Level Meter |
| -Signal-to-Noise Meter | -Oscilloscope |
| -Digital Multimeter | -Bit Error Rate Meter |

- Compatible with ON-373 Ground and AVIM Cable Kits and other existing interface cables using Maintenance Group Adapters (MGA)
- Touch Screen and use of mouse & keyboard (and able to connect to an External Monitor, it does NOT come with the TS-4549)
- Upgradable & expandable to accommodate future radios; supports ~650,000 radios in the Army inventory

TS-4549 Radio Test Set

- **Procurement Status**

- ✓ Other Transaction Authority (OTA) competition and Testing (APR 2019 – JUL 2022)
- ✓ Down selection from OTA competition (AUG 2022)
- ✓ Re-procurement/Type Classification-Limited Procurement approved (25 Jun 2023)
- ✓ Acquisition Plan approved (5 JAN 2024)
- ✓ Determination and Finding Document approved (1 APR 2024)
- ✓ Request for Proposal released for the follow-on FAR-based production contract (10 APR 2024)
- ✓ Vendor proposal submission (24 APR 2024)
- ✓ Negotiation thru ACC-NJ (MAY 2024)
- ✓ Production contract award (17 JUN 2024)
- ✓ First Unit Equipped (est. 4QFY25)

Calibration Sets (CALSETS)



CALSETS Program Details Chart



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Recent Milestones or Events

As of: **01 Aug 2024**

- ACE Operational Assessment Testing at USATA: ACE testing at TSC-RSA started. Three more ACE procedures will be run before testing ends at the TSC-RSA lab is complete. (Jun 2024)
- New NIST Support Agreement; concurred and Signatures in process (Jul 2024)
- RDTE Biosensor Calibrator Prototype: Fully automated prototype CLIN 002 award (Jul 2024)

Recent Milestones or Events Continued

- Approved multiple CALSETS Engineering Change Proposals.
- Collected over 8000 Army calibration reports to use for automated analyzing Army TMDE performance and other applications.
- CALSETS automated calibration data analysis project technical order award (May 24)

Near Term Milestones or Events

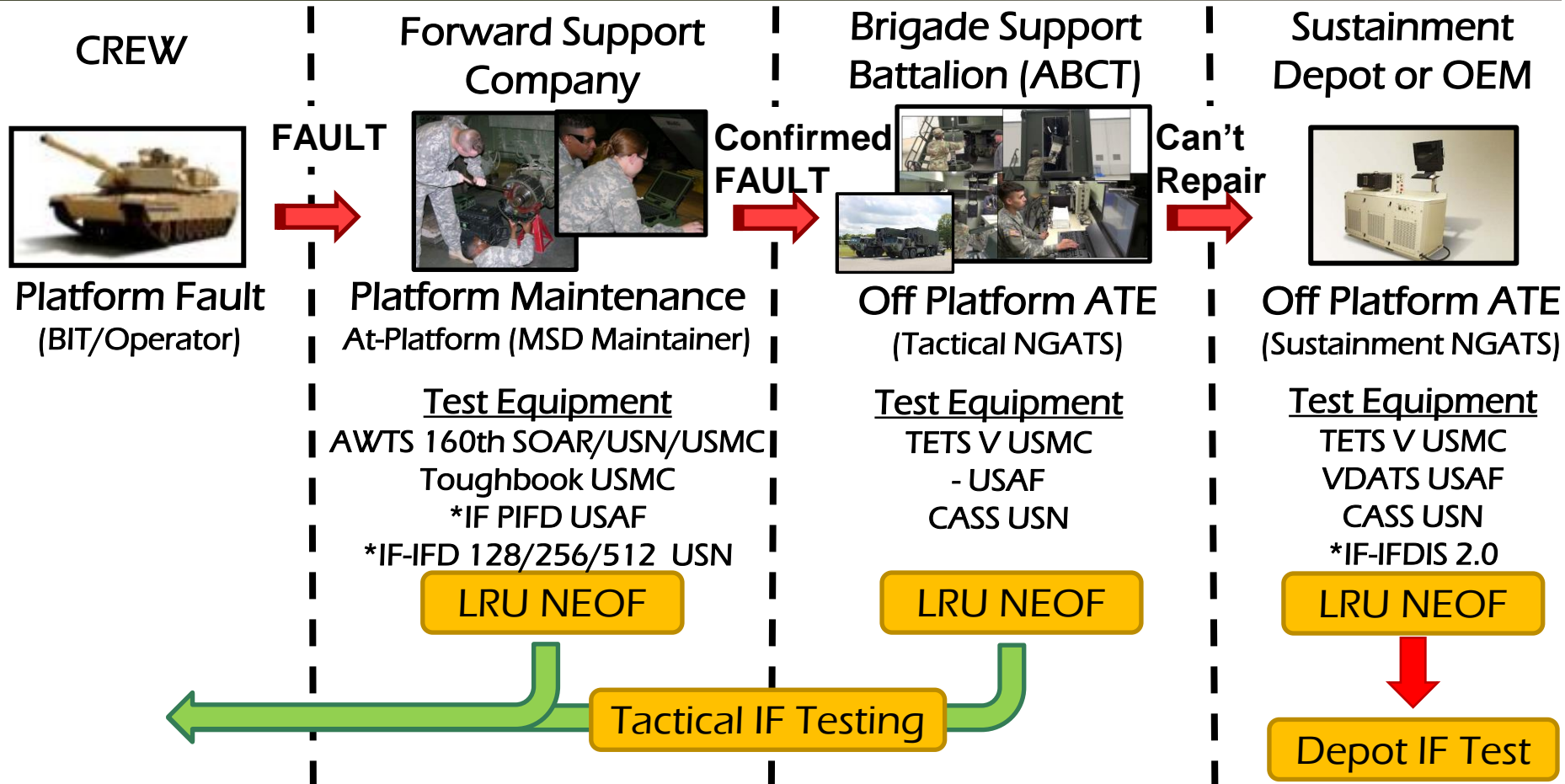
- Delivery or order award for the Torque Indicator (Aug 24)
- CALSETS-C ATO Meeting with the Deputy PEO CSS-CS. (Aug 24)



Army Intermittent Fault Detection

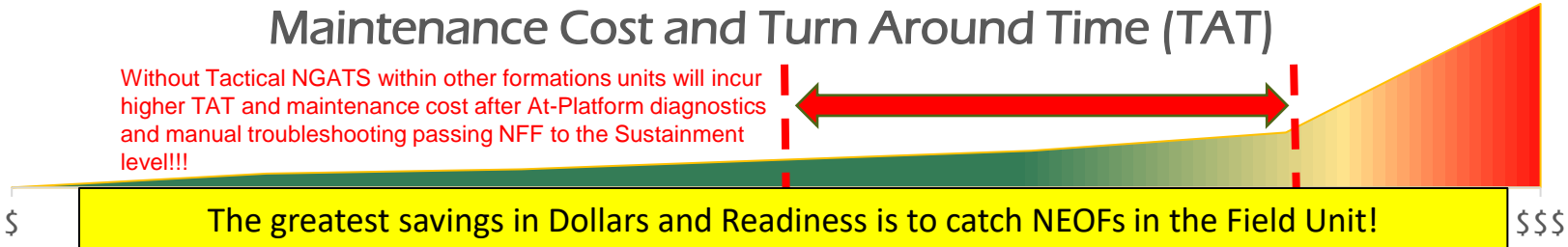


Army Enterprise NFF/NEOF/IF CONOP



Maintenance Cost and Turn Around Time (TAT)

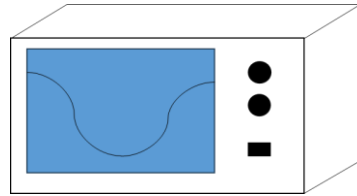
Without Tactical NGATS within other formations units will incur higher TAT and maintenance cost after At-Platform diagnostics and manual troubleshooting passing NFF to the Sustainment level!!!



The greatest savings in Dollars and Readiness is to catch NEOFs in the Field Unit!



Army Intermittent Fault Detection Device



Representative image

- 6 Vendors
- Conducted Industry Day #1 at FT Riley
- Follow Up event 4-8 Dec at FT Riley
- Working acquisition strategy and schedule

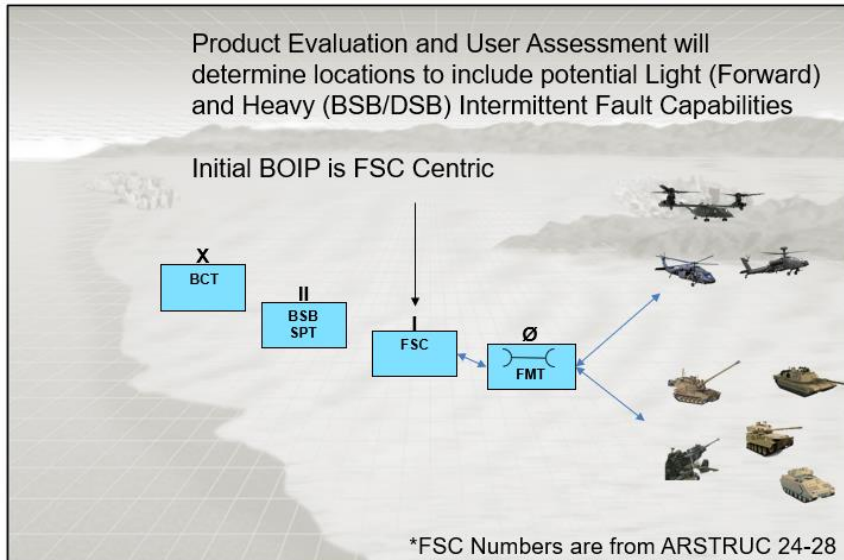
Army Capability Gap / Problem to be solved:

- Intermittent Faults and associated misdiagnosis

Tri-service Capability Gap / Problem to be solved:

- “Intermittent electronics failures continue to be a leading contributor to DoD’s \$3 billion annual No Fault Found (NFF) problem, consuming approximately 25% of the electronics maintenance budget and contributing to weapon system materiel availability issues.” *DoD 2021

Operational View (OV-1)



Technology Description / Product:

- Detects Intermittent Faults
- Improve Operational Readiness fixing forward vs lengthy Supply Chain exchanges
- This will aid the Warfighter who is currently using manual troubleshooting
- Current TRL: 7 Projected FY25 TRL: 9