



## **MARINE CORPS SYSTEMS COMMAND**

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Automatic Test Equipment Team Lead

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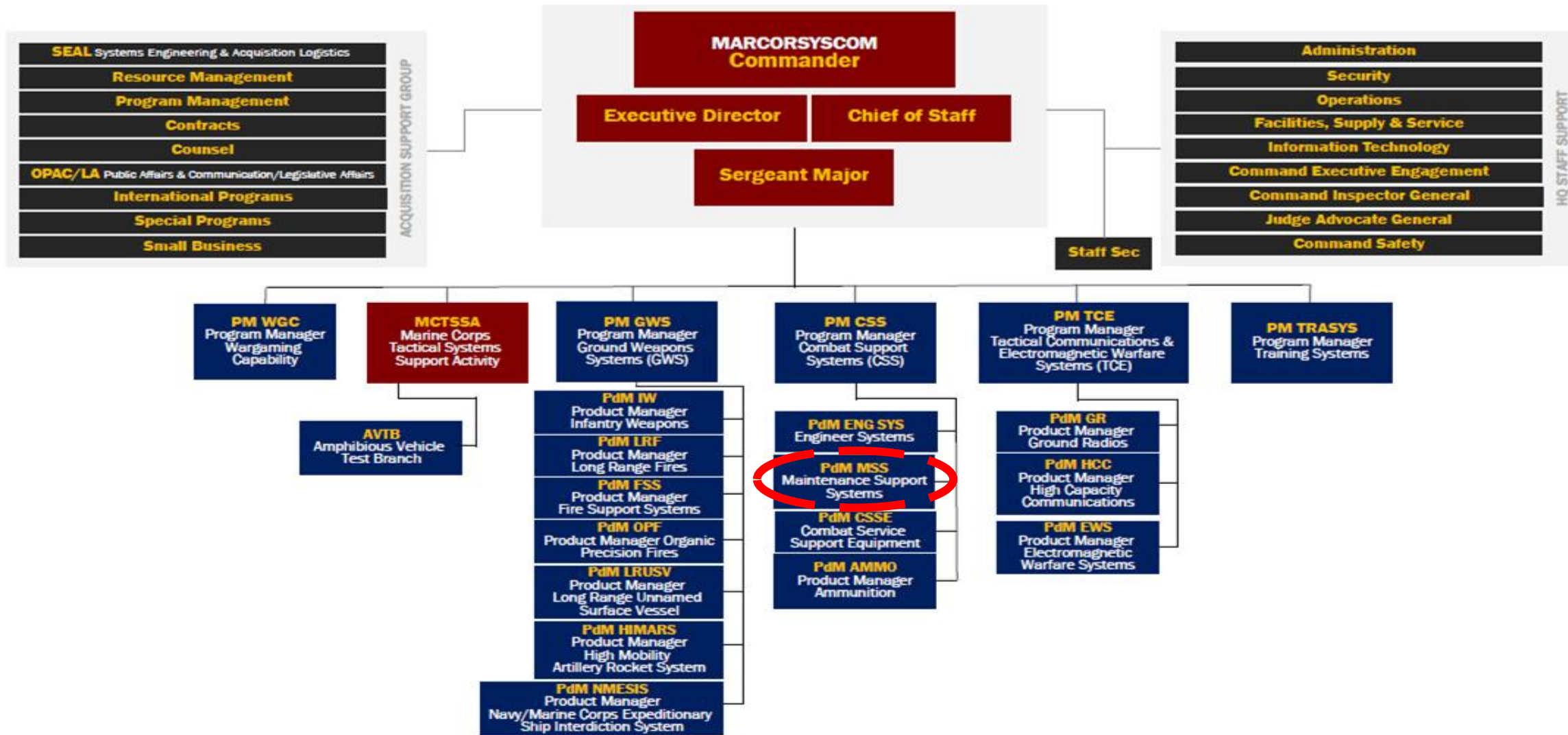


# **NATIONAL DEFENSE INDUSTRIAL ASSOCIATION (NDIA) UNITED STATES MARINE CORPS SERVICE UPDATE**

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# MARINE CORPS SYSTEMS COMMAND ORGANIZATIONAL CHART





# AUTOMATIC TEST SYSTEMS (ATS) PORTFOLIO OVERVIEW

## 5 Teams Pressing Forward:

- General Purpose Automatic Test Systems (GPATS)
- Circuit Card Assembly Test Station (CCATS)
- Ground Electronics Maintenance (HHRTS) (GRMATS/TRIAPS/TRITS)
- Electronic Maintenance Support System (EMSS)
- Condition Based Maintenance Plus (CBM+)

## FY24-25 Focus Areas:

- EMSS Technical Refresh
- Wireless At-Platform Test Set (WATS) used with EMSS
- CBM+ Dashboard release, expansion
- EMSS Amphibious Combat Vehicle (ACV) At Platform Test Equipment (FY24/25)
- Handheld Radio Test Set (HHRTS) (FY25)
- Divesture of Ground Radio Maintenance Automatic Test System (GRMATS)-Tactical Radio Intermediate Maintenance Activity Application Program Set (TRIAPS) (FY25)

## Opportunities:

- Artificial Intelligence in Automatic Test Systems
- Augmented Reality in conjunction with EMSS
- Automated test systems for new platforms: Advanced Reconnaissance Vehicle (ARV), Amphibious Combat Vehicle (ACV), Ground Air Task-Oriented Radar (GATOR), Marine Corps Wideband SATCOM

## Challenges:

- Requirements/Funding to support technology advancements
- Building cybersecurity into legacy and emerging systems



GPATS



CCATS



GRMATS / TRIAPS



HHRTS



TRITS



EMSS



CBM+





# CONCEPTUAL OVERVIEW

## Automatic Test Systems Concept



### Automatic Test System (ATS)

- GPATS/APS
  - Comprised of electronic/electro-optic test instruments, power supplies, and an Instrument Controller
- GRMATS/TRIAPS



### Application Program Set

- Provides the hardware and software required to interface the ATS to specific weapon system components
- \*\* 15 APSs - Ability to perform testing on 83 LRUs for 50 different platforms



**Graphic depicts an example of a GPATS/APS system. Similar constructs apply for GRMATS/TRIAPS and EMSS/WATS**



# GENERAL PURPOSE AUTOMATIC TEST SYSTEM (GPATS)

- The GPATS provides diagnostic testing and fault isolation for communication electronics, electronic systems, electro optic and mechanical systems, and various ordnance vehicles and systems.
- Desired state is one system solution which will replace legacy system(s) in a modular configuration to reduce cost and wasted capability.
- Going after smaller form factor, more power flexibility, modularity, integrated with Hardware Abstraction Layer (HAL) software for flexibility in configuration.
- Incremental approach to integrating Application Program Sets (APS) and evaluating if and where an APS is needed.



## Currently Fielded GPATS APS:

- AN/PSM-115 - AAV MSQ-115 Diagnostics
- AN/PSM-117a - Handheld and Weapon-Mounted Optics/Laser Devices
- AN/PSM-118 - LAV-25 Chain Gun Functional Test
- AN/PSM-119A - LW155 LRU Diagnostics
- AN/PSM-123 - LAV-25A2 LRU Screening/Diagnostics
- AN/PSM-120 - LAV Instrument Panels/Heads-Up Display Diagnostics
- AN/PSM-126 - Very Small Aperture Terminal Diagnostics
- AN/PSM-129 - Saber Anti-Tank Weapon System LRU Diagnostics
- AN/PSM-130 - LAV-25A2 CCA Diagnostics
- AN/TSM-220 - Power Systems (Power Supplies, Conditioners, Chargers)
- AN/TSM-223 - LAV-Anti Tank LRU Diagnostics
- Future- G/ATOR, ACV, and ARV



Virtual Instrument Portable Equipment (VIPER)  
/Tester Electro Optical (VEO-2)



# HANDHELD RADIO TEST SET (HHRTS)

- New Capabilities:
  - Will test up to 6GHz (3515N is only 1 GHz)
  - Gives users ability to create localized custom scripting using Python and Visual Studio Code
  - Compatible with future radios
  - A complete test system combining AM/FM modulation meters, signal generators, spectrum analyzers, power meters, audio meters, tracking generators and more into a single item that can be carried anywhere
  - An intuitive Windows based GUI reduces training time



Old: 3515N



New: HHRTS



# TACTICAL RADIO INTERMEDIATE TEST SYSTEM (TRITS)

- Divestiture of GRMATS-TRIAPS to invest in TRITS
  - Combines two systems into a single, smaller package which greatly reduces space and logistical requirements
  - Sustainment and upgrade cost significantly reduced
  - Shares software, script development, and intuitive GUI with HHRTS
  - Compatible with all future radios
  - Easy to access and LRUs with expansion room for future requirements
- Program Status
  - Working directly with the U.S. Army's Test Equipment Modernization (TEMOD) team
  - Pending funding



GRMATS / TRIAPS



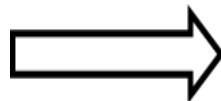
TRITS



# CIRCUIT CARD ASSEMBLY TEST STATION (CCATS)

- The CCATS is a shelter mountable unit that provides the capability to capture, digitize, and store signatures of known good components for reference with the test of similar CCAs and electronic modules for out of tolerance, deteriorating, or defective components on a wide variety of weapon systems. The CCATS consists of the Huntron Tester, PC Controller (Win 10 compliant), and accessories.

## Current CCATS(AN/USM-726) and GD test Routines



- CCATS is a passive, power-off tester that uses low voltage and ultra low current to create and measure component signatures.
- The CCATS is used to collect data by measuring electronic parameters of electronic components using manual methods.
- Marines had created a total of 596 GD routines
- Over the past FDYP, the CCATS enabled the Ground USMC Maintenance force to avert over \$15.2M in direct replacement costs with the limited amount of technical data on-hand.
- The CCATS, when coupled with the Gold Disk Development efforts at Electronics Maintenance Companies (ELMACOs), Keyport, WA, the Defense Microelectronics Activity (DMEA), and the Miniature/Micro-Miniature (2M) programs, represents the core of the ELMACOs maintenance concept in support of the Expeditionary Advanced Base Operations (EABO) principle.

## Future Automated Circuit Card Test System (ACCTS)



- The ACCTS will be Commercial Off-the-Shelf flying probe test systems solution with AI/ML capabilities.
- Planned during FY27. Anticipate Navy as the PICA for the contract.
- The ACCTS must be able to test digital and analog circuits and possess a software Graphical User Interface (GUI).
- Robotic data collection reduces testing variations and dramatically increases speed and precision resulting in increased maintenance throughput capacity.
- The ACCTS will support FMF operations and will enhance Naval Integration while underway on surface vessels and while conducting expeditionary operations. The capability can address readiness and cost drivers, aging and obsolescence issues, and reduce the effects of diminishing sources of manufacturers.
- The ACCTS's software initiates automated carriage motors, which are tied to optical cameras and high-intensity lighting, to control dual headed diagnostic probes on X, Y, and Z axis to the circuit card Unit Under Test (UUT) within an accuracy of  $\pm 10$  microns .





# ELECTRONIC MAINTENANCE SUPPORT SYSTEM (EMSS)/ VEHICLE AUTOMATED DIAGNOSTIC SYSTEM (VADS)/ WIRELESS AT-PLATFORM TEST SET (WATS)

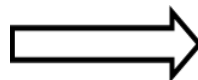
The EMSS is a rugged, lightweight portable maintenance aid that provides diagnostic capabilities, access to technical information, and access to GCSS-MC when connected to the MCEN-N enabling sustained performance and readiness of over 50 ground weapons systems.



## Current EMD-Panasonic CF-20

Facing Obsolescence:

- No longer available for procurement
- CPU not Windows 11 compliant
- Hardware limits technology expansion/enhancements



## Next Gen EMD-Getac B360 Pro

Fielding 4QFY24:

- Windows 11 compliant
- Extended battery life
- Hardware enables technology expansion/enhancements
- Exploring AI/ML and AR/VE



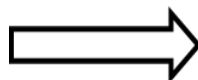
The WATS is a man portable test adapter set developed by the Army that interfaces with the Electronic Maintenance Device (EMD) and the vehicle/equipment under test. WATS equipment is used in conjunction with Equipment Technical Manuals and Marine Diagnostic Software hosted on an EMD to perform field level troubleshooting. The WATS can perform required diagnostics and retrieve analog or digital diagnostic data on most Marine Corps vehicles.

VADS:

- TAV obsolete and unsustainable
- Large logistics footprint
- CPU not Windows 11 compliant
- Hardware limits technology expansion/enhancements

## Vehicle Automated Diagnostic System (VADS)

System	Weight	Height	Length	Width
VADS	92 Lbs.	14.4 In	37.5 In	27.1 In



WATS:

- Smaller logistics footprint supports EABO
- Uses EMSS as the Controller
- Wireless capability decreases setup time and maintenance turnaround time
- Replaces all 3 VADS variants

## Wireless At-Platform Test Set (WATS)

System	Weight	Height	Length	Width
WATS	20.4 Lbs.	9.1 In	13.9 In	21.7 In

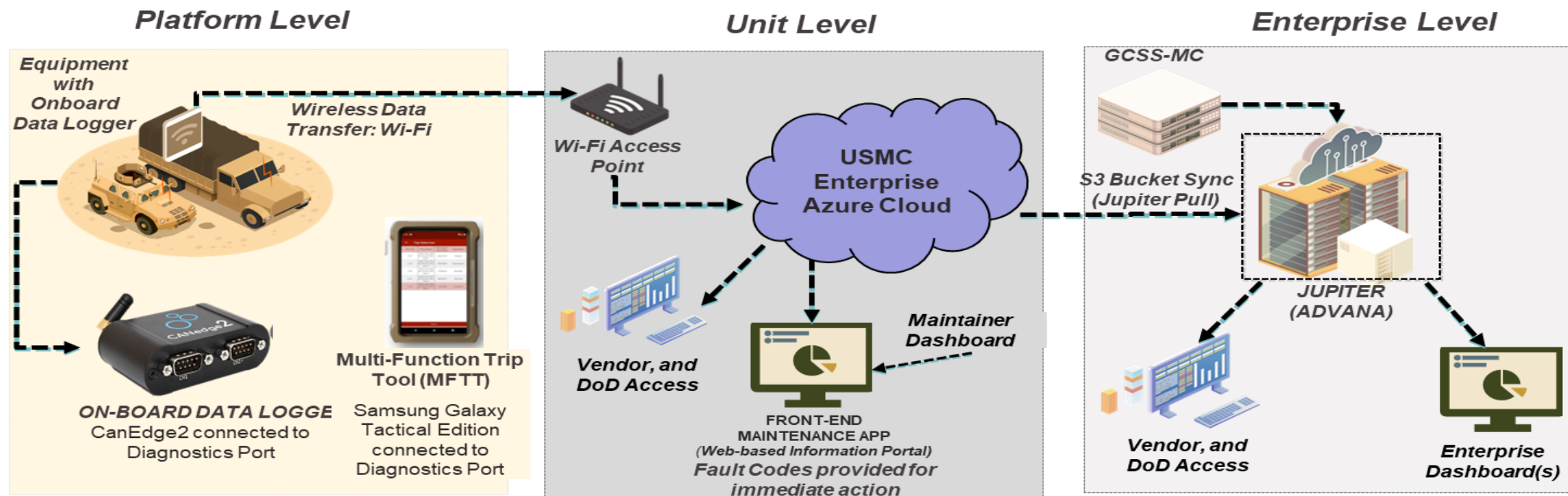
76% Reduction in Size and Weight





# CONDITION BASED MAINTENANCE PLUS (CBM+)

## Network and Cloud Configuration when on Marine Corps Enterprise Network (MCEN)



### Current Platforms

- MTVR=484
- JLTV=254
- LVSR=158
- MCT=2
- TRAM=6
- Excavator=2

906

- Onboard Data Loggers are COTS and acquired from CSS Electronics.
- Loggers can store data, initiate and transmits data into wireless network upon entry into the pre-programmed wireless access points vicinity.
- 150 MFTT installs with 108 MFTT devices

- Aggregated parametric data from multiple trucks is processed and decoded in **Azure on the MCEN** and transmitted over the MCEN to Jupiter.
- Wi-Fi specifications matched to MCSC WLAN installation. Will use existing MCEN Wireless Access Points (WAPS) or will Provision CBM+ Provided WAPS
- Raw data transmitted to and **aggregated** on the MCEN Cloud providing maintainer dashboard for immediate feedback

- DoD and Vendor users have access to data files and GCSS-MC data in Jupiter.
- Data Analytics, Artificial Intelligence, and Machine Learning applied to the data sets on the Jupiter Platform
- Web-Based Enterprise Health Dashboard(s) available to the FMF on Jupiter



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# EQUIPPING OUR



# MARINES