

# **Sustaining Materiel Readiness**

## **Technology Insertion: A Key Enabler**

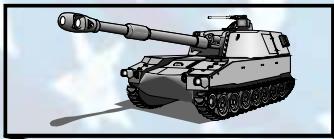


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# DoD Maintenance Enterprise

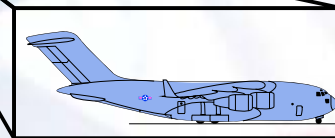
~ 330,000 Vehicles



~ 900 Strategic Missiles



~ 280 Ships



~ 14,000 Aircraft/Helicopters

- + Communications/Electronics Equipment
- + Support Equipment
- + Other Systems

*Maintained by:*

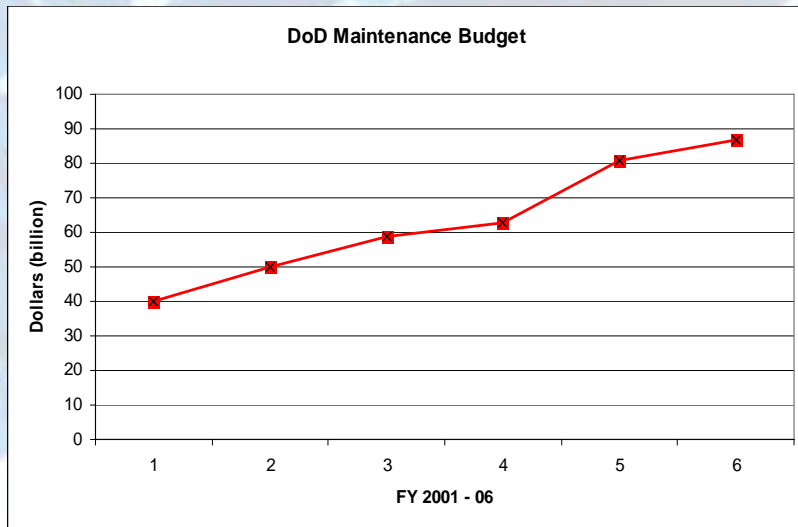
- 654,000 DoD personnel
- Private sector companies

***Maintenance cost:  
~ \$87 billion per year***

***National Defense Inventory is valued at ~ \$700B***

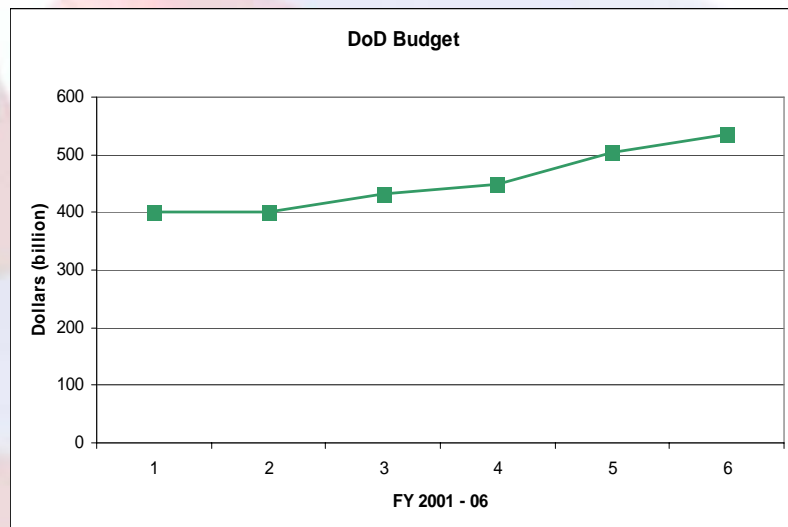
Source: LMI analysis of DoD data

# DoD Maintenance Cost Trends



## Maintenance costs are escalating!

- **\$40** billion in FY-01 to **\$87** billion in FY-06
- **25% increase in maintenance budget from FY-01 to FY-08** (*constant FY 08 dollars*)



## Maintenance is increasing as a percentage of the total DoD budget!

- **14%** in FY-03 to **16 %** in FY-06

Source: LMI analysis of DoD data

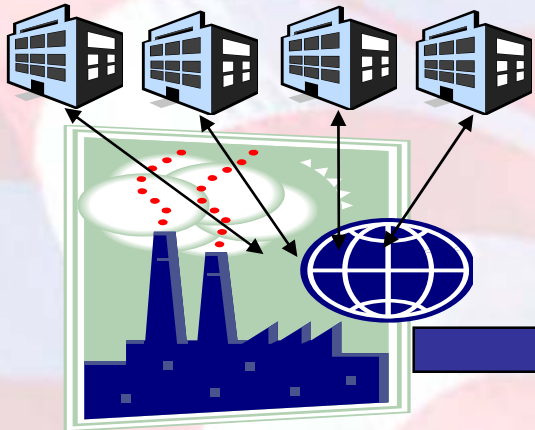
# Matériel Readiness Life Cycle Framework



## Operations & Support

**65-80% of the Life Cycle Cost**

### Multiple Sources of Supply



### Transformation



### Sustaining the System

#### *Ready Safe Assets with 24/7 Availability*

- Reliability & Maintainability
- Affordable Weapon Systems
- Obsolescence/Tech Refresh
- Reduced Footprint
- Logistics Chain Reliability
- Logistics Chain Effectiveness
- Logistics Chain Cycle Time
- Retrograde Management
- Production Flexibility
- Supply Chain Agility

# Maintenance Needs to Transform!

## OSD Strategy:

- **Promote End-to-End (E2E) Materiel Readiness Value Chain Perspective across DoD**
  - **Balance Safety, Reliability, Maintenance and Supply Distribution activities to achieve optimal materiel readiness at best cost.**
  - **Optimize “TIME-ON-WING” and “TURN AROUND TIME”**
  
- **TLCSM**
  - **Sustain Optimal Materiel Condition & Reliability**
  - **Sustain Optimal Support Cost & Cycle Time**

**Sustainment  
Technology is Key**

# “Prime Movers”

## Requirements:

- JROC approved sustainment KPP for “Availability”
  - 2 KSAs – Life Cycle Cost, Reliability
- CJCSI 3170.01F, *Joint Capabilities Integration and Development System (JCIDS)*
- CJCSM 3170.01C, *Operation of the JCIDS*

## Integrated Policies:

- DoDI 5000.2 - Life Cycle Acquisition/Support
- DoDI 4151.19 - Serialized Item Management
- DoDI 8320.3 - Unique Identification (UID) Standards for a Net-Centric Department of Defense
- DAG/Supportability Guide (DAU)

## Governance/Oversight:

- DAB, DAES, MRSSG/MRU, GAO, BTA-IRB, DLB

# Material Readiness Sustainment Technologies

- AIT
  - RFID/IUID (and associated infrastructure)
- On-board/Off-board diagnostics & prognostics (CBM+): Reactive to Proactive
  - IETMS/RCM/Information Technology
- Advanced materials, MRO processes and technology

# Sustainment Technology Insertion Best Practices

- Tech Insertion as CPI initiative
- Solid Sustainment Technology Requirements
- Enterprise buy-in – include all stake holders
- Plan and budget for success
- Technology adoption vice technology development
- Beg...Borrow...Steal: Exercise ALL options
- Colaborate....Collaborate....Collaborate!!

# Sustainment Technology OSD Funding Sources

- CTMA (Commercial Technology for Maintenance Activities) \$6M/Yr
- DMEA (Defense Micro Electronics Activity) \$12M/Yr
- RTOC (Reduction of Total Ownership Cost) \$25M/Yr
- SERDP (Strategic Environmental R&D Program) \$60M/Yr
- ESTCP (Environmental Security Technology Cert. Program) \$40M/Yr
- CPC Corrosion Prevention and Control \$15M/Yr
- ACTD (Advanced Concept Technology Demonstrator Program) \$160M/Yr
- JCTD (Joint Capability Technology Demonstrator Program) \$40M/Yr
- SBIR (Small Business Innovative Research) \$1B/Yr
- STTR (Small Business Technology Transfer Program) \$125M/Yr
- IR&D (Independent Research and Development) \$B&B/Yr
- CTTO (Commercial Technology Transition Office ONR) \$UKN
- USMC TD (USMC Technology Development) \$UKN

# Proven Collaboration – CTMA

Unique DoD/Industry partnership to bring new technologies/practices into the DoD maintenance community to **increase weapon systems readiness** through:

- Reduced repair cycle time
- Improved reliability
- Improved maintenance and repair operations at all levels
- Reduced sustainment cost



# CTMA Basics

- Cooperative Agreement between NCMS and the Office of the Secretary of Defense [ADUSD (MR&MP)]
- Industry co-funding on a 2:1 match basis
  - In-kind and/or cost share
- Historical funding average - \$6 million/yr.
- No fixed solicitation schedule
- Must have at least 2 DoD entities indicating strong support via a commitment letter from their base commander or the person responsible for implementation
- Projects generally 18 months or less in duration



# Impact on DoD to Date

- 45 Completed Projects with 25 distinct DoD facilities participating
  - DoD funds: \$51 million
  - Industry In-kind: \$108 million

- Project lead by Service



16 Projects



19 projects



19 projects



8 projects

- **Annual** cost benefit to DoD: \$130 million, ROI=20X
- Current project portfolio – **21 projects**
  - **Forming an additional 15 projects**
  - **Current project backlog – 43 projects**
    - **Estimated additional annual cost benefit potential to DoD: \$120 million**

# Reducing Costs and Cycle Time



◀ Enhanced Wiring Integrity System (USA, USAF, USN, USMC, USCG)

- ◀ F-15 wiring faults--\$49M/yr cost avoidance and 120 lost a/c days recouped
- ◀ Submarine Overhaul delays due to crane wiring problems - - \$60K/day cost avoidance
- ◀ EA-6B Circuit Breaker Panel -- \$842K
- ◀ Multi-year, multi-million dollar joint service acquisition of analyzer technology

▶ Rapid Manufacturing and Repair (USAF, USN, USMC, NASA, DoE)

- ▶ \$4.5 M cost avoidance
- ▶ 280 Weeks saved on non-availability of parts



◀ ATE Synthetic Instrumentation (USAF, all Avionics Applications)

- ◀ \$49M Cost avoidance in legacy



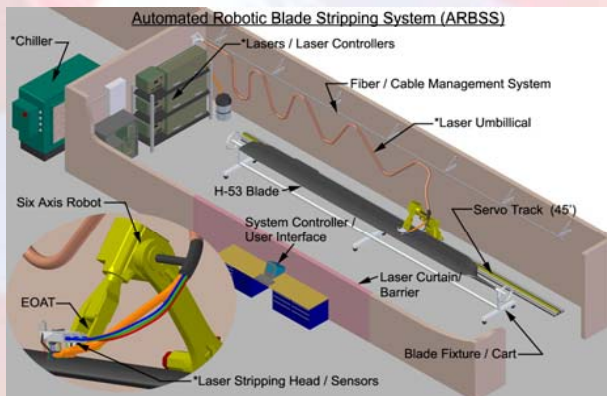
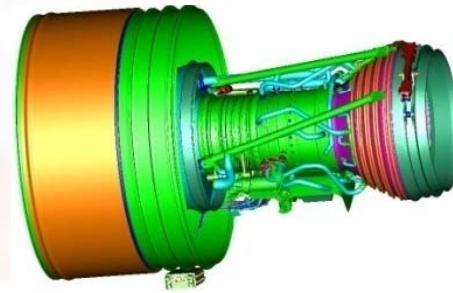
# Reducing Costs and Cycle Time



- ◀ Portable Large Shape Inspection System
  - ◀ \$1.5M/year savings/avoidance
  - ◀ Significant Cycle time reduction and improved capacity

## ▶ Assembly Design and Documentation

- ▶ Reduces disassembly/assembly planning time by up to 33% – promises to reduce aircraft battle damage assessment time
- ▶ Reduces opportunity for human error in work instruction creation and use



## ◀ Laser Coating Removal for Helicopter Blades

- ◀ Repair cost reduced from \$1,188.14 per blade to \$222.53 per blade.
- ◀ Total annual cost avoidance of \$908,000 at Cherry Point alone.

# Improved Maintenance and Repair Operations

- ▶ Laser Engineered Net Shape (LENS<sup>tm</sup>) (USA, USN)
- ▶ \$6.85M/year reduced maintenance cost
- ▶ Significant cycle time reduction for reengineering

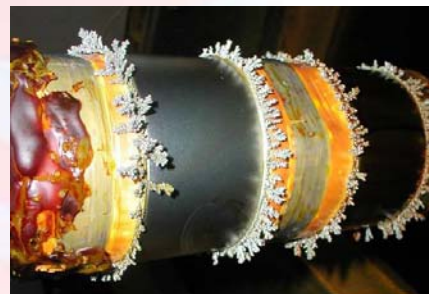


- ◀ Automated Process & Inspection Guide (USAF, USA, widespread application)

- ◀ \$8.55M/year for inspections, training, cycle time and paperwork reduction
- ◀ 2 Flow days saved per aircraft
- ◀ 5 hours per HUMVEE

- ▶ No-Mask Hard Chrome Plating (USA, USN, USAF)

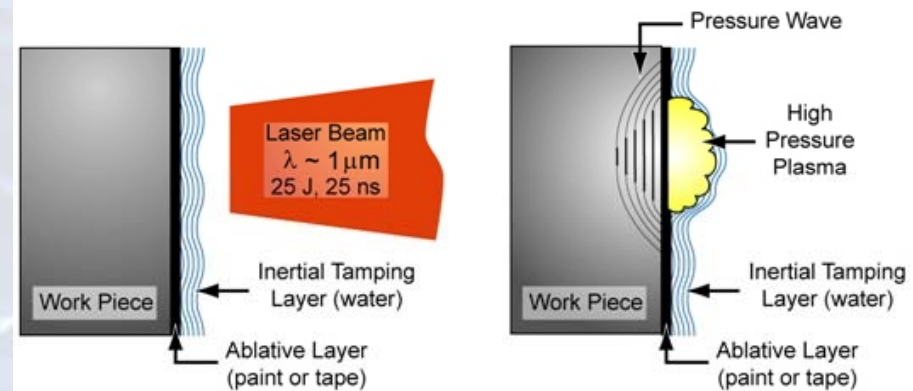
- ▶ \$2.4M/year in decreased labor
- ▶ 200% increase in plating equipment availability
- ▶ 46% reduction in rework
- ▶ 75% reduction in component cycle time



# Improved Reliability

## ▶ Laser Shot Peening

- ▶ \$3.1M maintenance cost reduction to landing gear trunnion
- ▶ 3 year life extension; 50% increase
- ▶ Significantly improved flight safety



## ◀ LAV Sense & Respond

- ◀ \$10M/year cost avoidance
- ◀ 7% increase in availability – 34 additional vehicles
- ◀ 14% increase in MTBF
- ◀ 50% reduction in customer wait time

## ▶ Portable Handheld Oil Analyzer

- ▶ \$828M in increased asset availability
- ▶ \$15M/year in maintenance/shipping/disposal cost avoidance
- ▶ Significantly reduced cycle time and greatly improved soldier safety



# DoD Participants

- Marine Corps Maintenance Center Albany
- Marine Corps Maintenance Center Barstow
- Light Armored Vehicle PM
- Camp Pendleton
- Corpus Christi Army Depot (AD)
- Tobyhanna AD
- Red River AD
- Anniston AD
- Letterkenny AD
- Sierra AD
- Army Oil Analysis Program
- Oklahoma City Air Logistics Center (ALC)
- Ogden (ALC)
- Warner Robins (ALC)
- Elmendorf AFB
- B-2 Program Office
- Seymour Johnson AFB
- Wright Patterson AFB
- Air Force Advanced Composites Office
- Fleet Readiness Center East
- Fleet Readiness Center Southeast
- Fleet Readiness Center Southwest
- Naval Air Systems Command
- Norfolk Naval Shipyard (NSY)
- Portsmouth NSY
- Pearl Harbor NSY
- Puget Sound NSY
- Naval Sea Systems Command
- Naval Submarine Base- Kings Bay
- Naval Undersea Warfare Center, Keyport
- Naval Surface Warfare Center, Crane
- Naval Air Warfare Center, China Lake
- Defense Logistics Agency
- Joint Oil Analysis Program

# Active CTMA Projects

1. LAV II Sense and Respond
2. Predictive Maintenance Systems  
CH-53E Helicopters
3. Ultrasonic Consolidation of Titanium  
Alloys
4. Assembly Design and  
Documentation
5. Implementing Hard Chrome Plating  
at CCAD
6. Heat Transfer Classification for  
Production Tooling and Composite  
Repair
7. Laser Coating Removal Systems  
Phase II
8. Advanced Digital Fabrication &  
Repair, A Rapid Manufacturing and  
Repair Program (RM&R)
9. Automated Test Equipment (ATE)  
Synthetic Instrumentation
10. Legacy Test Program Set (TPS)  
Migration System
11. Portable Large Shape Inspection  
System (PLSIS)
12. Durable Non-Skid Coating
13. OptiCAM III
14. Portable/Hand-Held Oil Analysis  
Device(s)
15. Legacy Lifecycle Management
16. Casting Knowledge Reuse-Based  
Cost Advisor
17. Smart Machine Pilot Project - Phase II  
(SMPP II)
18. Six Sigma for Lifecycle Data  
Management, Phase II
19. SED Device Detection
20. Laser Engineered Net Shaping  
Solutions II (LENS II) for Commercial  
and Defense Manufacturing Repair  
and Overhaul Applications - Phase II

# Current Forming CTMA Projects

1. Centralized Fleet Automated Management System (CFAMS)
2. Assembly Design and Documentation, Phase II
3. Configuration Change Management
4. Sense and Respond Logistics Development of Comprehensive Secondary Repairable Legacy Platform Readiness Capability (Light Armored Vehicle), Phase III
5. Inspection and Repair Preparation Cell (IRPC)
6. Automated Process and Inspection Guide (AP & IG)
7. Oil Assessment Devices, Phase II

# Current Forming CTMA Projects

8. Replacement for Hexavalent Chromium in Surface Finishing Process Phase II
9. Modernization of Nickel Electroplating at Depots
10. Enhanced Wiring Integrity System Phase II
11. Laser Projection of Camouflage and Stencil Patterns
12. Smart Machine Phase III
13. Metal Finishing Development Program
14. Erosion Corrosion Resistant Coatings for Gas Turbine Engine Compressor Airfoils
15. Conversion of 2D Raster Images into 3D CAD Models



# Shameless Plug

USMC Land Systems Sustainment  
Technology Workshop

February 26-27 at Quantico

Register:

**<https://www.ncms.org/SSL/08CTMA-Quantico/08-registration.htm>**

# Online Resources

- UID Website
  - <http://www.acq.osd.mil/dpap/uid>
- IUID Toolkit
  - <http://www.iuidtoolkit.com>
  - Four tracks: PMs, Suppliers, Depot, Warfighter
- CTMA Website
  - <http://ctma.ncms.org>
- MR&MP (Maintenance IUID CONOPS & Depot Implementation Guide/Template, CBM+)
  - <http://www.acq.osd.mil/log/mrmp>



Questions?