Reliability, Maintainability, and Availability in Life Cycle Maintenance Management

A Re-Focus on Maintenance Engineering and Planning

DoD Maintenance Symposium
16 November 2010
The PEO (The “A” in A-L-T) is the single focal point for issues affecting product lines.

The ILSC (The “L” in A-L-T) assists by providing supporting logistics manpower, expertise, and advice. The ILSC executes sustainment strategies.

The RDECs (The “T” in A-L-T) assist by providing full life cycle engineering support.

*These are not members of the TACOM LCMC but the partnerships are the same
This is Why Maintenance Engineering and Planning is Essential to Combat Superiority of our Warfighters
Definition of Maintenance Engineering and Maintenance Planning

**Maintenance Engineering:** The activity of analyzing and influencing the design of an end-item or component to ensure it can be successfully repaired within a given time.

**Maintenance Planning:** Maintenance planning is the translation of engineering data and analysis into executable maintenance actions and the identification of the required logistics support elements required to conduct maintenance.
Maintenance Engineering and Maintenance Planning

Maintenance Engineering
- What's Going to Break
- Why is it Going to Break
- When is it Going to Break
- How Does it get “Unbroken”
- Can the Break be Prevented and How

Maintenance Planning
- How is it Fixed
- How Long will it Take to Fix
- What is Needed to Fix
- Who Should Fix it
- Where Should it be Fixed
- When Should it be Fixed

Effects of
- Operating Environment
- Operating Tempo
- User Skills
- Enemy

On
- Maintenance Plans
New Challenges
- “Off the shelf” and putting in war
- Integration efforts
  - Overhead gunner protection
  - Gunner restraint systems
- Rapidly evolving changing threat
  - Drives rapid counter measure “updates” to equipment
Legacy – Where We Went

- Acquisition Reform
  - Drove diminishing tech data
  - Reduced Logistics analysis
    - FMECA
    - Supportability

- Building Reliability into the Design of Equipment is Often Very Costly

- Why:
  - Expensive to buy
  - No access beyond contract if allowed to use

- So What: Don’t Know What we Don’t Know
  - Lack of maintenance metrics
  - Discovery learning
  - Greater risk in avoiding obsolescence
  - Longer downtime
  - Inadequate training materials
Highly Stressed Equipment
- Multiple rotations
- Operation Outside Design Envelope
- Different Missions
- Increased Weight from Armor Add-on’s

Without Adequate Maintenance Planning Upfront, Maintenance will Inhibit Combat Capability and Readiness

Affect on Maintenance Requirements

This is Going to be Constant
AMSA SDC Sample Fleet Vehicles, 2002-2009 Data

<table>
<thead>
<tr>
<th>Replacements</th>
<th>No. Replaced</th>
<th>Gear Cost</th>
<th>Total Spent</th>
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<tbody>
<tr>
<td>A Steering Gear</td>
<td>65</td>
<td>$905.00</td>
<td>$58,825.00</td>
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<tr>
<td>B Steering Gear Front</td>
<td>82</td>
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<td>C Steering Gear Rear</td>
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<tr>
<td>F Steering Gear Rear</td>
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<td>$43,586.00</td>
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<tr>
<td><strong>Actual Totals:</strong></td>
<td><strong>728</strong></td>
<td><strong>$1,036,748.98</strong></td>
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</tbody>
</table>

**Filters v. Steering Gear Comparison:**
$4.25 each x 1/mo x 7 yr x (728 vehicles x 62%) = $ 64,246

Potential savings: $972,503
Nature of the Fight Will Change

Equipment Will Change

Need Maintenance Requirements Well Defined in Acquisition Programs

Must Meet Maintenance Challenges of Meeting the Warfighter’s Ever Changing Needs and the Environment They Operate In
What Should We Be Doing About It

Apply Lessons Learned to our Acquisition Methods

Matteriel Engineering Analysis Performed and Quantified

- Data Material Accessible and Delivered
  - Quality of the Data
  - Comprehensive Analysis
  - Implementing Solutions
- Measuring Our Plan

Baseline Maintenance Requirements

Leverage Technology

Condition Based Maintenance

- Strives to optimize key performance measures of materiel readiness

  - Materiel Availability
  - Materiel Reliability
  - Mean Downtime
  - Ownership Costs

On-Board Diagnosis

During Operation Phase

Challenge

Reduce Ownership Costs

Influence Design

Reliability
Maintainability
Availability
Sustainability
Cost
Schedule
Performance

FY05 FY06 FY07 FY08 FY09 FY10

$0 $50 $100 $150 $200 $250 $300 $350 $400

2005 2006 2007 2008 2009 2010

32 35 45 50 62 75

M109 M109A2 M109A5 M109A6 M109A6+ w/Armor Paladin Next

Track Width Req. Actual Track Width

215 250 380 274 380 329

FY05 FY06 FY07 FY08 FY09 FY10

30 40 50 60 70 80