REI Systems, Inc.

Commercial Technologies for Maintenance Activities

“Integrated Sensors and Predictive Maintenance Systems with Performance Support Technology to Achieve Increased CH-53E Readiness and Reliability”
Project Partners
CBM Technology Demonstration Based on a combined IMDS/EPSS Solution

- Integrated Mechanical Diagnostic System (IMDS)
  - CH-53E helicopters have been outfitted with sensors that monitor heat, vibration, fluid level and flow, etc.
  - Prognostic analysis of mission data using Goodrich “Ground Station” software.

- Electronic Performance Support System (EPSS)
  - Provide maintainers with point-of-maintenance access to tailored technical data.
  - Provide maintenance technicians with refresher training clips to supplement their existing knowledge, skills, and abilities and enable multi-skilling.
  - Track and report on maintenance activities for management purposes.
Condition Based Maintenance System

Reliable. Effective. Innovative

Maintenance Max Maintainer Console

Work Orders

IMD-HUMS + MaintenanceMax Maintenance Control Console + NALCOMIS

PC Card
What is EPSS?

• Comprehensive point-of-maintenance tool that allows Sailors to troubleshoot, repair and maintain equipment via an interactive maintenance support system.
• Leverages legacy technical data, training courseware, IETMs and ILS management systems into efficient, effective way to perform maintenance tasks.
• Data presented in logical, easily comprehensible format with on-demand backup tutorial information available at each step

“Innovative, Effective and Reliable”
Combined Development of EPSS Family of Support Tools

Combines legacy technical maintenance support products with state of the art technology in user friendly laptop computer application.
Integrated Mechanical Diagnostic System (IMDS)

MAINTENANCE CONTROL
- MaintenanceMax
  - Maintenance Control Console
    * Expert Knowledge Management (Tech Tips)
    * Maintainer Activity Reporting
    * Maintenance Reporting
- MaintenanceMax Administrator Console
  * User Accounts
  * PED Management
  * Technical Data CM

SHOP
- MaintenanceMax Maintainer Console

IMD HUMS
- Data from Aircraft w/ Exceedance
  - Ground Station Download and Debrief
    - Maintenance Request Including Maintenance Discrepancy Text
    - NALCOMIS

XML

Acknowledgement
Portable IMDS/EPSS Hardware
Objective
Evaluate the troubleshooting performance of maintainers

Location
Marine Aviation Training Systems Squadron (MATSS)
MCAS New River, North Carolina

Training Device – Fuel System Part Task Trainer

Evaluation Exercise
Observe and measure the time required for students and instructors to identify and troubleshoot fuel system faults.

Test Participant EPSS Training Time – 10 minutes.
CH-53: IMDS / EPSS Results

Average troubleshooting speed improvement: 46.5%

Students are 56% faster using EPSS
  • Students average time to complete using TMs 22:41
  • Students average time to complete using EPSS 10:06

Instructors are 37% faster using EPSS
  • Instructors average time to complete using TMs 11:50
  • Instructors average time to complete using EPSS 7:30

100% user acceptance
CH-53: HUMS / EPSS Results (continued)

![Chart showing troubleshooting times for Technical Manual and EPSS]

- Technical Manual Troubleshooting time
- EPSS Troubleshooting Time
Test Participants Comments

- “I like having all the information that was relevant to the task at hand to be right there without having to search for it.”

- “I like the availability and convenience of having the information at your immediate disposal.”

- “You can navigate rather easily and mark your place if you leave. You can find the location without having to flip pages.”

- “I like the fact that you don’t have to carry individual pubs with you when you have every single one at your fingertips.”

- “I liked the fact that on the troubleshooting tree [on] every step that you were on, the other relevant information related was easily accessible with the push of a button. All the parts, component locations, and schematics were all in concert with each step.”
Return on Investment

- The CH-53E costs approximately $20,000 per flight hour.

- 400+ maintenance labor hours per flight hour to operate.

- There are approximately 160 operational CH-53 helicopters.

- PMA-261 spends $512M per year on maintenance.
– Cost to deploy the NCMS sponsored CBM technology across all 12 CH-53 squadrons is $6M with an annual sustainment cost of $700K.

– For example, a 3% reduction in maintenance costs achieved through improved troubleshooting accuracy would represent a $15.3M annual cost avoidance.

– $50M annual cost avoidance possible
Phased Technology Proof of Concept Approach

• Phase I – NCMS / Commercial Teaming Agreement and Test of a Condition Based Maintenance Technology.
  – NCMS, PMA-261, Goodrich, REI Systems and Camber team
  – Develop CBM Technology – completed
  – Test CBM technology – completed

• Phase II – Program Office (PMA-261) CBM Deployment
  – PMA-261 assumes sponsor role from NCMS – completed
  – Broad-scale development of CBM technology – underway
  – Deploy to entire CH-53 platform – underway

• Phase III – Broad DoD Deployment of CBM Technology.
  – Promote the broad use of CBM technologies - TBD
  – Move CBM technology to other platforms - TBD
Questions?