

REI Systems, Inc.

Business space that  
nurtures **innovation**

## 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

Reliable . Effective . Innovative



- **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

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*Maintenance Max  
Maintainer Console*



AP

*PC Card*

*Work Orders*

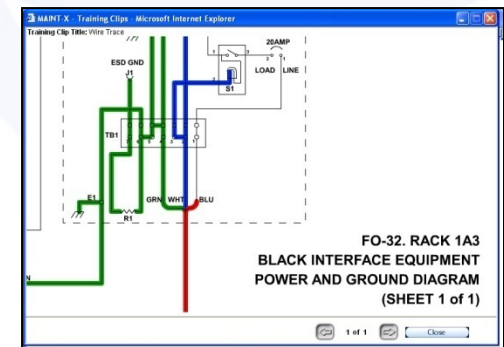
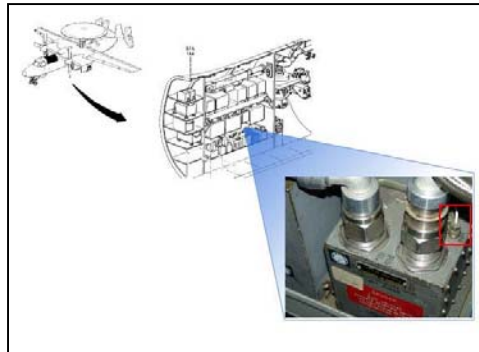


*IMD-HUMS +  
MaintenanceMax Maintenance Control Console  
+ NALCOMIS*

# What is EPSS?

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- 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

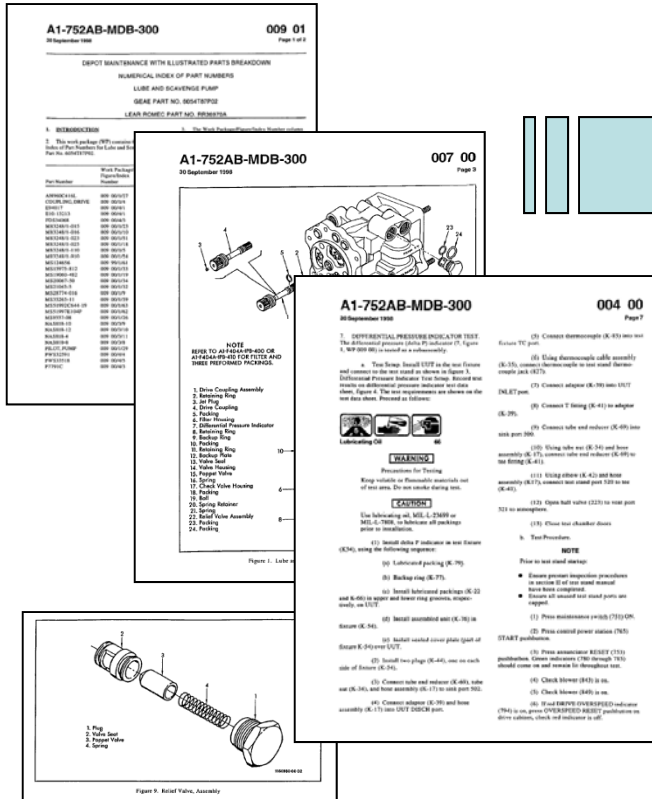


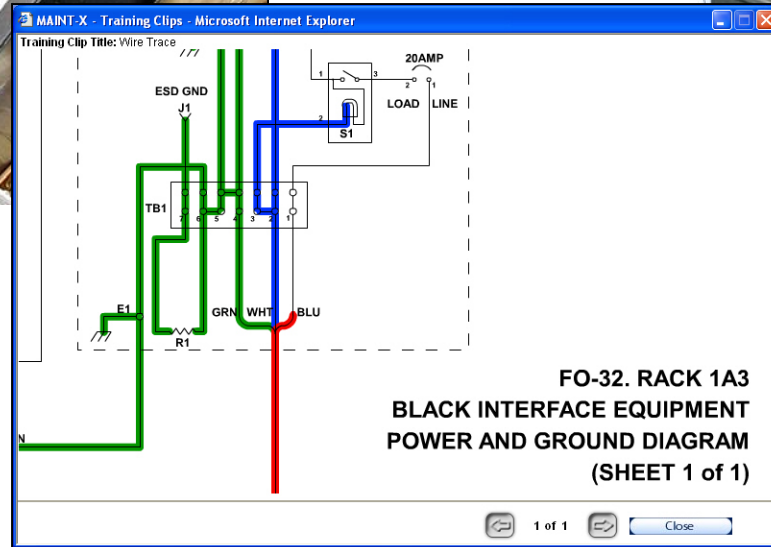
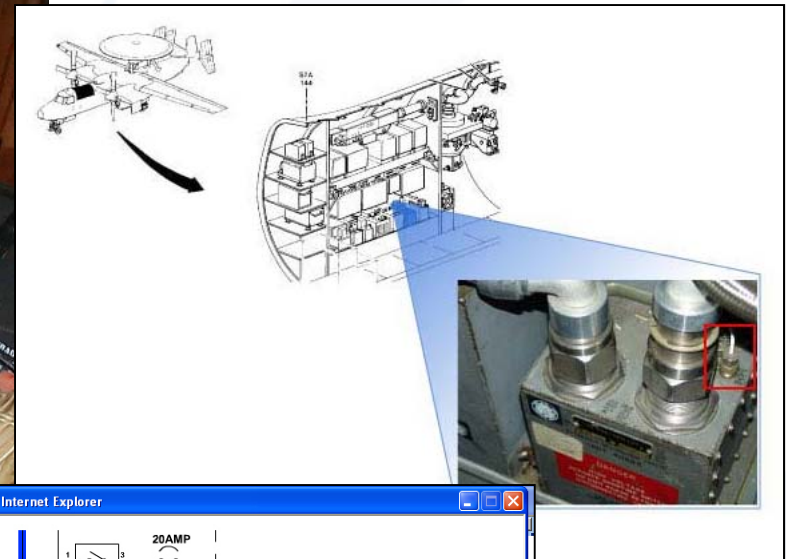
***“Innovative, Effective and Reliable”***

# Combined Development of EPSS Family of Support Tools

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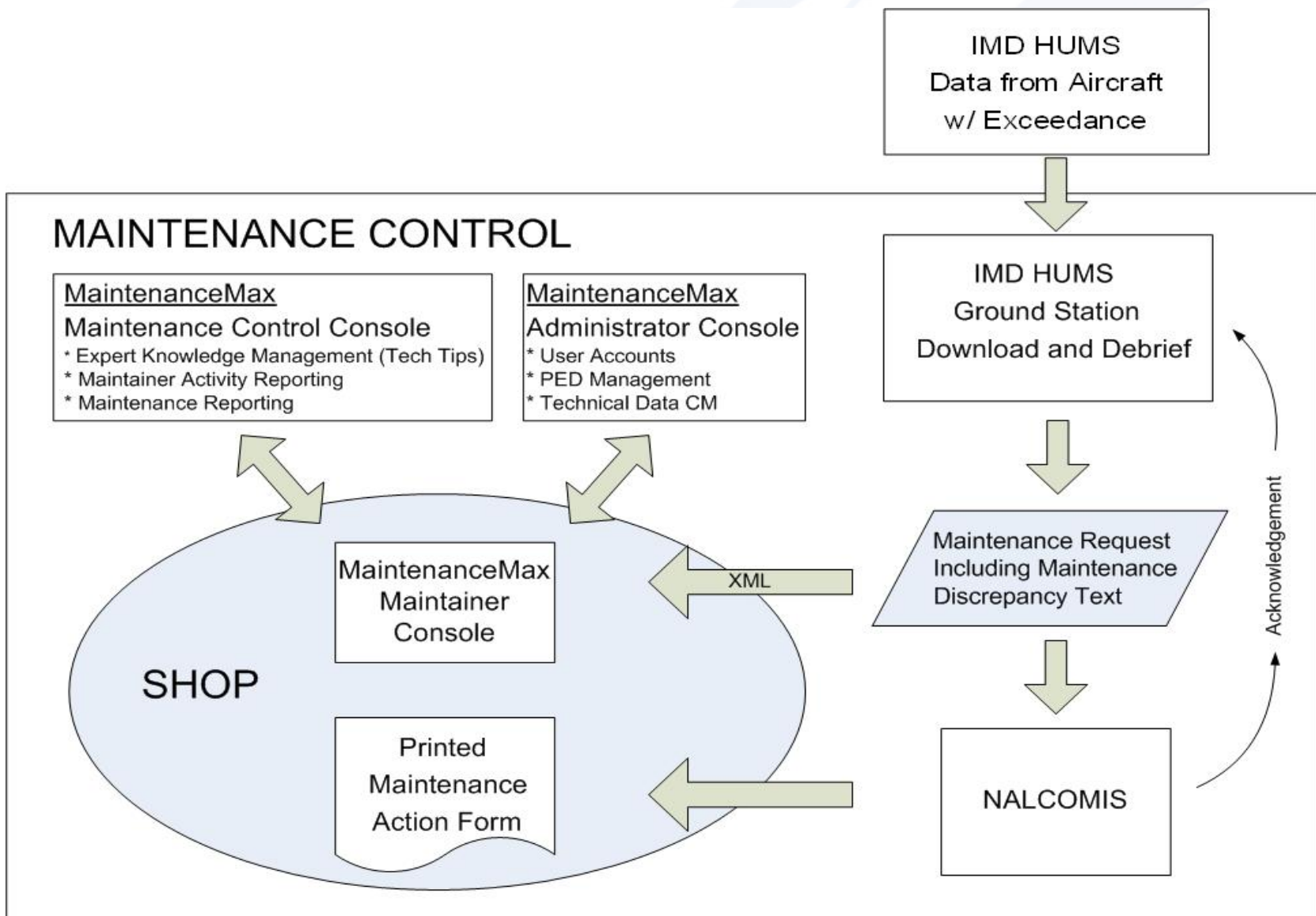
Combines legacy technical maintenance support products with state of the art technology in user friendly laptop computer application.





# Integrated Mechanical Diagnostic System (IMDS)

Reliable . Effective . Innovative



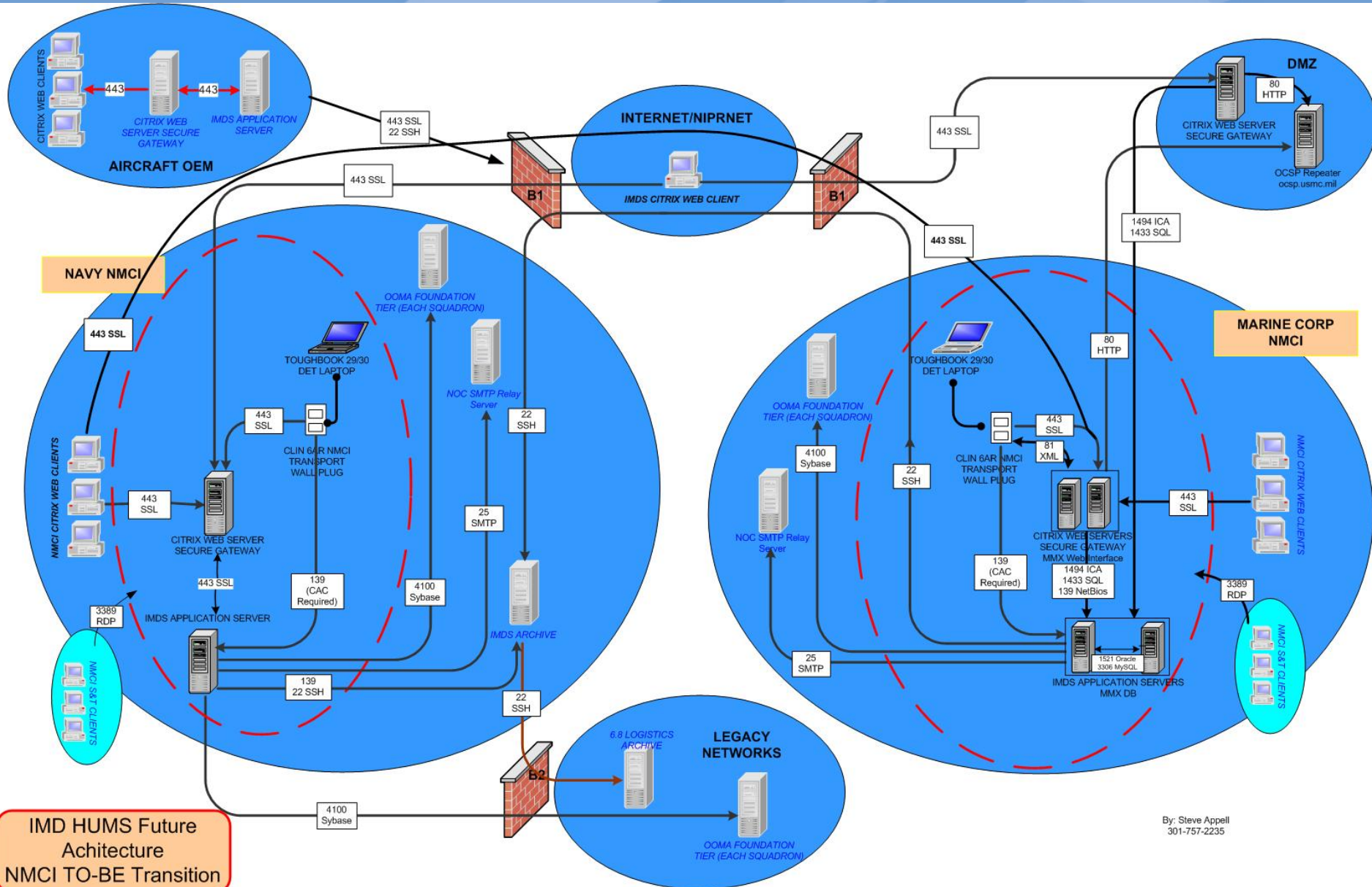
# Portable IMDS/EPSS Hardware

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# EPSS / IMDS NMCI Architecture

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IMD HUMS Future Architecture  
NMCI TO-BE Transition

## **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.

## **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

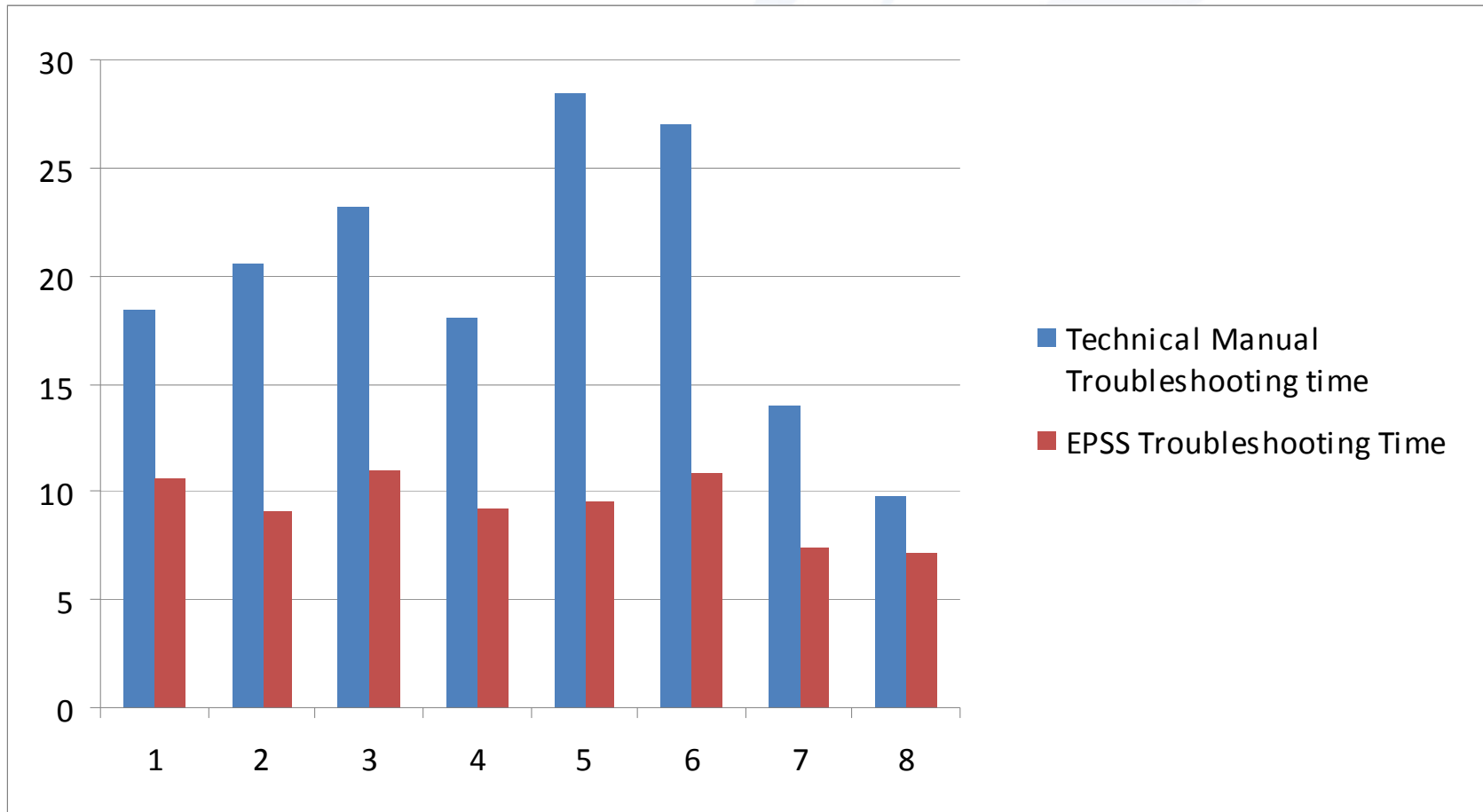
### Instructors are 37% faster using EPSS

- 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)

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# Test Participants Comments

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- “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.”

- 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

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- 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

