



# Evaluation of Human Performance Design for a Task-Based Training Support System

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# Presentation Overview



- **Introduction to Human Performance Design**
  - What is the goal?
  - How do we achieve it?
- **Introduction to ASM v2**
  - What is it?
  - Who uses it?
- **Human Performance Design applied to ASM v2**
  - What approach was taken?
  - What was learned?
- **Evaluation of the Outcome**
  - What did we accomplish?
  - Is the design successful?

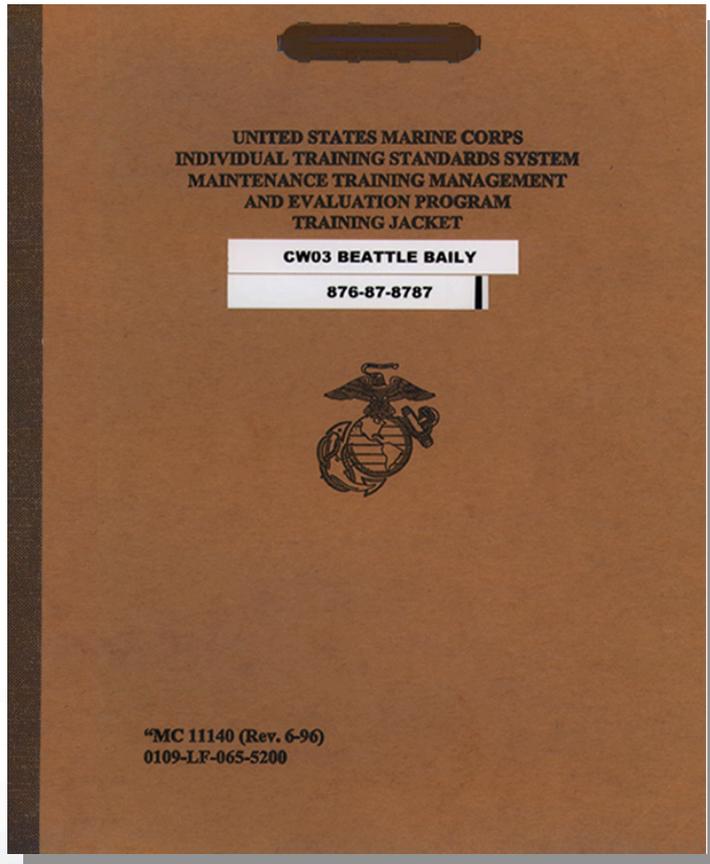
# Fleet Aircraft Maintenance Overview



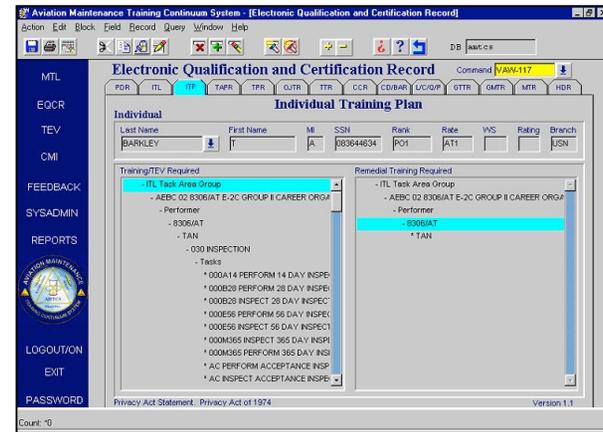
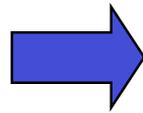




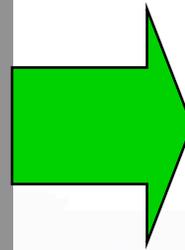
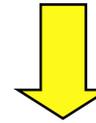
# Transition From Paper Records to Software Databases



PAPER TRAINING JACKET



ASM VERSION 1



ASM VERSION 2

# Introduction to Human Performance Design



## **Usability AND Performance...**

- Humans and Computers
- Humans and Job Performance

## **...Drive System Interaction Design**

***Human Performance Design Aligns Automated Systems with the Humans Who Use Them to Achieve High Performance***

# Human Performance Design Goal



- **Reduce time to better performance by helping workers quickly achieve consistent and high levels of job performance regardless of their varied or limited prior knowledge and skills.**

***Day-One Performance***

# Misalignment - Our First Challenge

## *Traditional IT*

## *HPD*

### Goals

- **On time, on budget executable software**
- **Day-one user performance**

### Focus

- **System performance**
- **Human performance**

### Design Emphasis

- **Design of data structures and functional components**
- **Design of user interface and interaction methods**

### Design Approach

- **Up-front, thorough design  
Limit user interaction**
- **Iterative design/validation  
Users are vital to process**

**Others?**

# An Inside-Out Approach



- **Typical Software Systems Design Methods focus on:**

- Functional Requirements
- Business Requirements
- Data Requirements

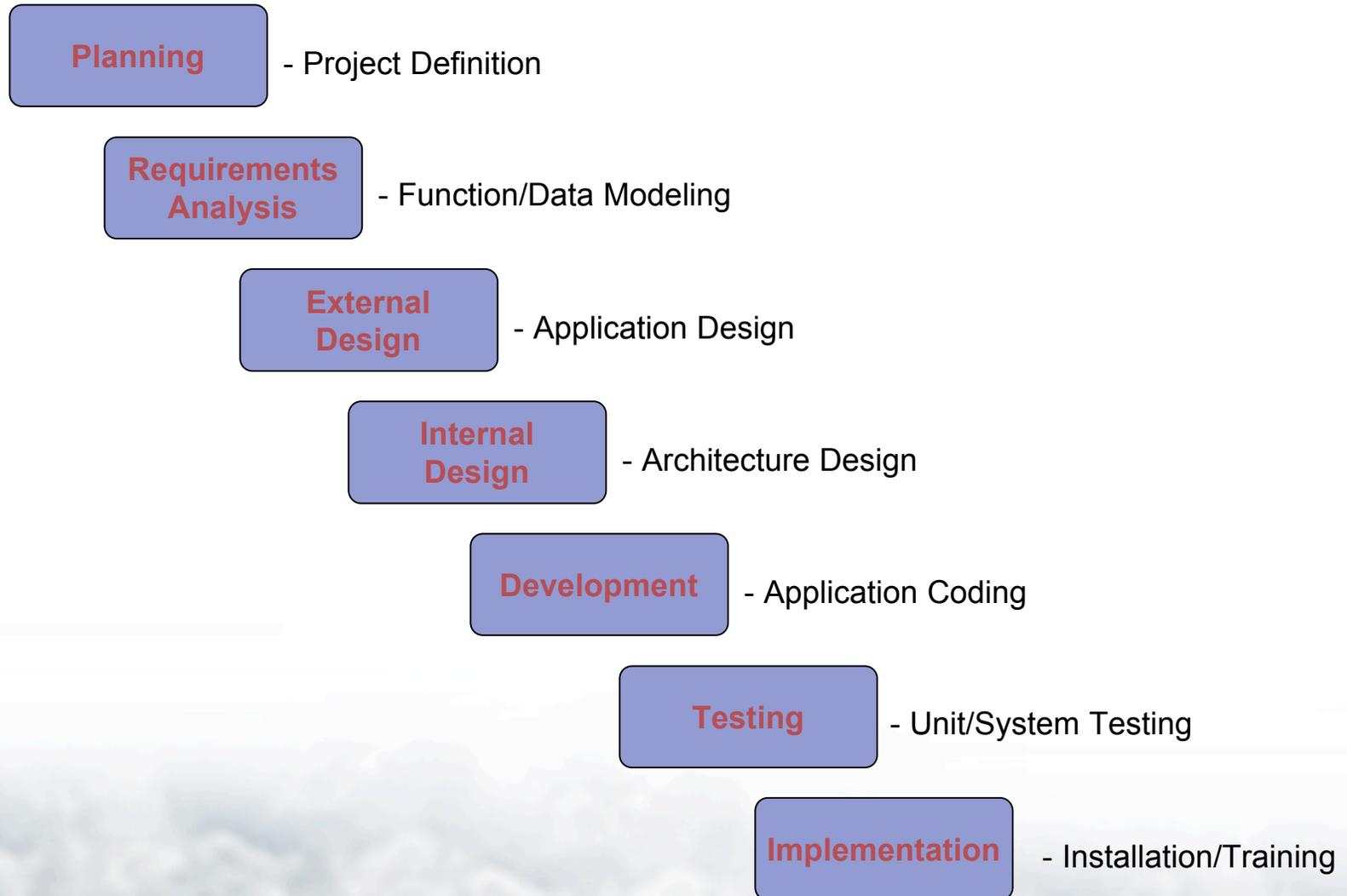


**What's Missing?**

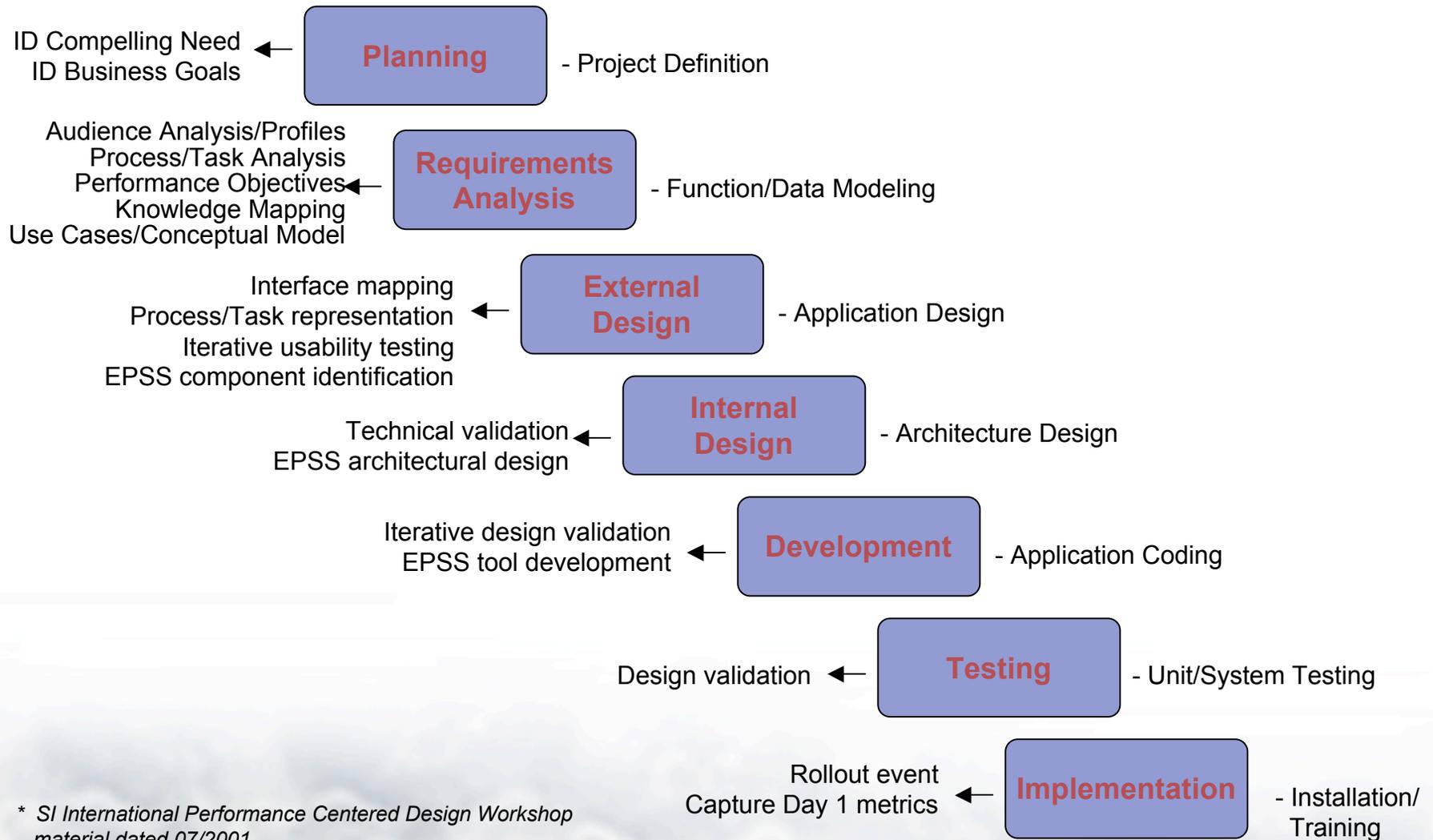
# Designing Systems for the User Population



# A Software Process



# An HPD-Enhanced Process\*



\* SI International Performance Centered Design Workshop material dated 07/2001

# Introduction to ASM : A Task Based Training Support System

- **Aviation Maintenance Training Continuum System (AMTCS):**
  - Hardware and software infrastructure to support task based naval aviation maintenance training
- **AMTCS Software Module, Version 2.0 (ASM v2):**
  - Second-generation performance support application
  - Sponsored by OPNAV
  - Managed by the Naval Air Systems Command
- **ASM v2 employed a Human Performance Design (HPD) methodology:**
  - Supports task-based training requirements outlined in the Executive Review of Naval Training (ERNT)
  - Supports the 5-vector model currently the principal focus of Task Force Excel

# Human Performance Design applied to ASM v2

## Human Performance Design in Practice

- **Goals:**

- Reduce Initial Training Required
- Achieve Day One Performance
- Improve Decision-making Support
- Increase User Satisfaction

- **Approach:**

- Joint Application Development (JAD) Team
- Contextual Observation
- Process/Task Analysis
- Paper Prototyping and Testing
- Validation



# The JAD Team



- **Composition of Representatives**

- Active Duty:

- Fleet: VFA-106, CVWP WING AIR PAC, MCCDC Activating Branch, VAW78 (Reserves)
- Schoolhouse: NAMTG Pt Mugu, NAMTG Norfolk, FASO

- Software System:

- Government: NAVAIR PMA205, NUWC DK
- Design Contractor: SI International
- Development Contractor: Paladin Data

# The JAD Team



- **Activities**

- (3) Week-long Group Meetings
  - 1 Planning
  - 2 In-Progress Design Reviews
- Weekly Teleconference Calls
  - Progress Review
  - “Homework”: Answer questions, validate working products, etc.
- “On Call” Responsiveness
- Site Visit Coordination
  - 1 or more to each represented Fleet/Schoolhouse organization

- **Lessons**

- Process is collaborative, iterative and can be time-consuming – Plan for it!
- Design team must both Lead and Listen – Be flexible and adapt!
- Commitment and Continuity of representation are key

# Approach



- **Contextual Observation**
  - Understand user goals, tasks and priorities, working environment, obstacles and solutions
  - Tour facilities and observe users performing roles, capture environment, watch the work, ask questions
- **Process/Task Analysis**
  - Account for all required goals, tasks & steps and identify process improvements
  - Job/Task Analysis, Goals Hierarchies, Process Maps
- **Paper Prototyping and Testing**
  - Design and refine before you build
  - Focus on roles and goals, in a top-down approach
  - Iterate creative sessions, JAD review sessions and user testing
- **Validation**
  - Assess the impact of Human Performance Design on the performance of task-based training activities
  - Task-based usability testing in a controlled environment

# The Result: ASM v2



- **Design based upon Roles**

- Each role has one or more actual job associated with it, that share characteristics of goals and responsibilities
- A set of views is associated with each role, with each view supporting specific appropriate goals/ responsibilities



- **Design differentiates between Fleet and Schoolhouse needs**

- **Design reflects and supports current and planned task-based training activities**

- **Design reflects user's goals and framework for the domain**

# Some HPD Elements of ASM v2

Entry displays focus on high priority tasks for the user's role, and organize these tasks at the highest level. Sufficient information is provided to differentiate items for attention, further detail is readily accessible.

## SCREEN PRIORITY TAILORED TO THE USER

The screenshot displays the 'To Do List' interface within the ASM v2 system. The interface is organized into several sections: 'Training Actions', 'Tests', and 'Upcoming Expirations'. Each section contains a table of items with various attributes and sorting options.

**Training Actions:**

View Details	Sort by: Training Action	Sort by: Occupation	Sort by: Percent Complete	Sort by: Last Update	Sort by: Last Task Area Updated
View Details	E2-C N-2 Cylinder SE License	8803/AM	50.0%	20 NOV 01	SE Licence On Job Training
View Details	E2-C N-2 Cylinder SE License	8802/AM	25.0%	20 NOV 01	SE Licence On Job Training
View Details	E2-C Tire & Wheel Qualification	8803/AM	85.2%	14 DEC 01	Required Test

**Tests:**

Review Test	Sort by: Training Action	Sort by: Occupation	Sort by: Test Subject	Sort by: Last Update	Sort by: Test Status	Sort by: Generated By
Review Test	E1/C1 Tire & Wheel Qualification	8803/AM	Tire & Wheel Written Exam1	01 NOV 01	Successful	Lagerski
Take Test	E2/C2 Tire & Wheel Qualification	8803/AM	Tire & Wheel Written Exam	14 DEC 01	Ready To Take	Lagerski

**Upcoming Expirations:**

View Details	Sort by: Type	Sort by: Licenses/Certifications/Qualifications/Physicals:	Sort by: Expires On
View Details	License	10 Ton Truck License	15 MAR 02
View Details	Physical	Audiogram	30 MAR 02

# Some HPD Elements of ASM v2

Roles are associated with Views, which provide and organize tools appropriate to the tasks and goals. Users may have access to one or more Views.

RELATE ORGANIZATION OF EACH SCREEN TO THE GOALS OF THE USER.

The screenshot displays the ASMOnline web application interface. A yellow callout box highlights the 'Current View: Personal' dropdown menu. The main content area shows a 'Training Action Plan' with sections for 'To Do List', 'Training Actions', 'Tests', and 'Upcoming Expirations'. The 'To Do List' section contains a table of training actions:

View Details	Sort by: Training Action	Sort by: Occupation	Sort by: Percent Complete	Sort by: Last Update	Sort by: Last Task Area Updated
View Details	E2-C N-2 Cylinder SE License	8803JAM	50.0%	20 NOV 01	SE Licence On Job Training
View Details	E2-C N-2 Cylinder SE License	8802JAM	25.0%	20 NOV 01	SE Licence On Job Training
View Details	E2-C Tire & Wheel Qualification	8803JAM	85.2%	14 DEC 01	Required Test

The 'Tests' section contains a table of tests:

Review Test	Sort by: Training Action	Sort by: Occupation	Sort by: Test Subject	Sort by: Last Update	Sort by: Test Status	Sort by: Generated By
Take Test	E1/C1 Tire & Wheel Qualification	8803JAM	Tire & Wheel Written Exam	01 NOV 01	Successful	Lagerski
Take Test	E2/C2 Tire & Wheel Qualification	8803JAM	Tire & Wheel Written Exam	14 DEC 01	Ready To Take	Lagerski

The 'Upcoming Expirations' section contains a table of expirations:

View Details	Sort by: Type	Sort by: Licenses/Certifications/Qualifications/Physicals	Sort by: Expires On
View Details	License	10 Ton Truck License	15 MAR 02
View Details	Physical	Audiogram	30 MAR 02

# Some HPD Elements of ASM v2

## USE INTUITIVE LANGUAGE

Tools supporting role-specific tasks are organized into logical groupings with familiar titles. The tabs, and tools available vary according to the View selected.

- Training Action Plan
- Training Completion Record
- Qual/Cert Record
- Personal Profile

The screenshot displays the ASMOnline web application. The main content area is titled 'Training Action Plan > To Do List'. It features a 'To Do List' section with a table of training actions and tests. The 'Training Actions' table includes columns for 'Training Action', 'Occupation', 'Percent Complete', 'Last Update', and 'Last Task Area Updated'. The 'Tests' table includes columns for 'Test Subject', 'Last Update', 'Test Status', and 'Generated By'. The 'Upcoming Expirations' table includes columns for 'Type', 'Licenses/Certifications/Qualifications/Physicals', and 'Expires On'.

Training Action	Occupation	Percent Complete	Last Update	Last Task Area Updated
E2-C-N-2 Cylinder SE License	8803IAM	50.0%	20 NOV 01	SE Licence On Job Training
E2-C-N-2 Cylinder SE License	8802IAM	25.0%	20 NOV 01	SE Licence On Job Training
E2-C Tire & Wheel Qualification	8803IAM	85.2%	14 DEC 01	Required Test

Test	Test Subject	Last Update	Test Status	Generated By
E1C1 Tire & Wheel Qualification	Tire & Wheel Written Exam	01 NOV 01	Successful	Lagerski
E2C2 Tire & Wheel Qualification	Tire & Wheel Written Exam	14 DEC 01	Ready To Take	Lagerski

Type	Licenses/Certifications/Qualifications/Physicals	Expires On
License	10 Ton Truck License	15 MAR 02
Physical	Audiogram	30 MAR 02

# Some HPD Elements of ASM v2

## CONTEXT SENSITIVE HELP

Each screen is supplemented by context sensitive tips and common questions to aid learning and memory.

The screenshot shows the ASM Online web application. The main content area displays a 'Training Action Plan' for user Mary Keilthor. It includes a 'To Do List' with a table of training actions and tests, and a 'Context Sensitive Help' panel on the right.

Training Actions:				
E2-C N-2 Cylinder SE License	8803IAM	50.0%	20 NOV 01	SE Licence On Job Training
E2-C N-2 Cylinder SE License	8802IAM	25.0%	20 NOV 01	SE Licence On Job Training
E2-C Tire & Wheel Qualification	8803IAM	85.2%	14 DEC 01	Required Test

Tests:					
E1C1 Tire & Wheel Qualification	8803IAM	Tire & Wheel Written Exam1	01 NOV 01	Successful	Lagerski
E2C2 Tire & Wheel Qualification	8803IAM	Tire & Wheel Written Exam	14 DEC 01	Ready To Take	Lagerski

Upcoming Expirations:		
License	10 Ton Truck License	15 MAR 02
Physical	Audiogram	30 MAR 02

### Welcome to ASM Online!

This personalized Training Action Plan has been carefully created to help you track and monitor training actions you need to complete.

This Plan allows you to:

- check your progress towards a qualification
- monitor your upcoming expirations
- increase skills and confidence in maintenance areas

All training actions currently assigned by your supervisor are displayed.

### Common Questions

- ▶ [Who created my training action plan?](#)
- ▶ [Are tests and reading material available online?](#)
- ▶ [How up-to-date is the information displayed here?](#)

\* [More Questions](#)

# The Difference: ASM V1 and V2

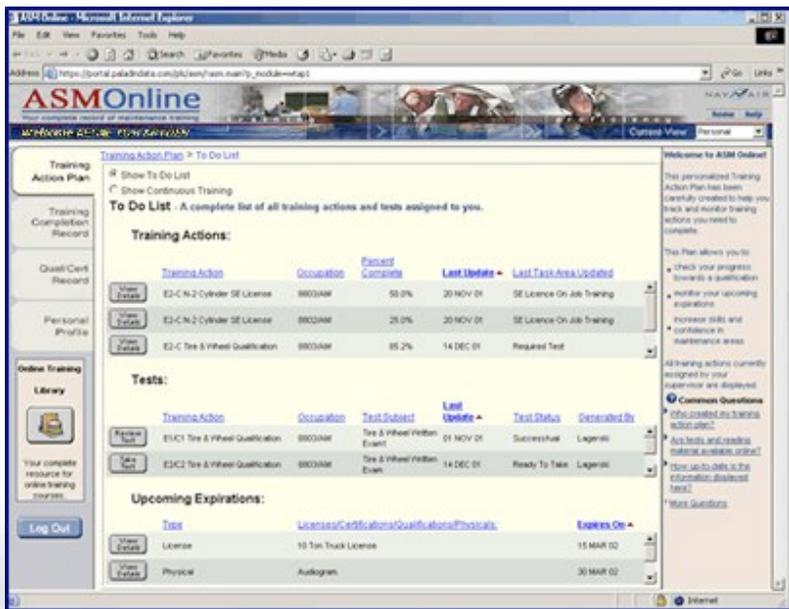


- **ASM v1 resulted from a typical software system design effort**
- **ASM v2 resulted from an HPD effort**
- **Many of the same tasks are supported in both**
- **Comparing the interaction designs to support these tasks in both is illustrative**

# The Difference: An Example

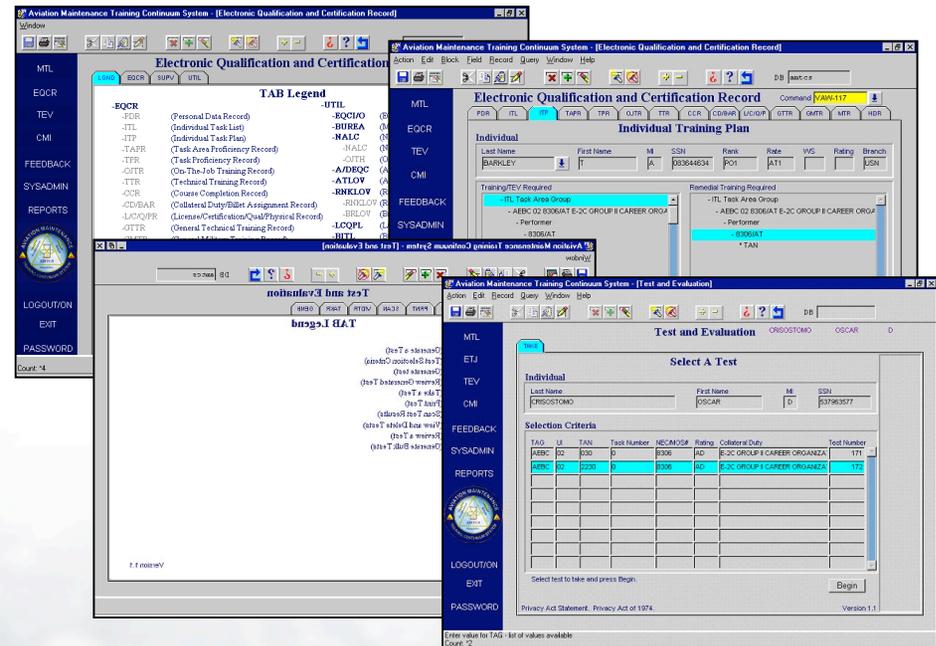
- **ASM v2:**

- Assigned training and tests are organized into a 'To Do' list, located on the entry screen for each user



- **ASM v1:**

- Assigned training is located on the EQCR/ITP tab
- Assigned tests are located on the TEV/ITP tab



# ASM v2 and Task Based Training



- **Task Based Training:**

- Learning centered around mastery of the tasks required for job performance
- Assessment based upon measurement of task performance and mastery of the competencies associated with a task

- **ASM v2 provides a “One Stop Shop” for task based training:**

- Training action plans centered around the tasks associated with a job or required skill
- Access to training resources organized by tasks within Training Actions
- Continuous automated tracking of task performance (regardless of whether training on the task has been assigned)
- Test generation (and administration) based upon measuring task proficiency

# Evaluation of the Outcome



- **Purpose**

- Assess the impact of HPD on meeting the overall goals of ASM v2

- **Method**

- Task-based usability testing in a controlled environment:
  - Representative users for each identified role
  - Defined repeatable task scenarios for each role
  - Live beta-version software, including data
  - Standardized data collection, both quantitative and qualitative

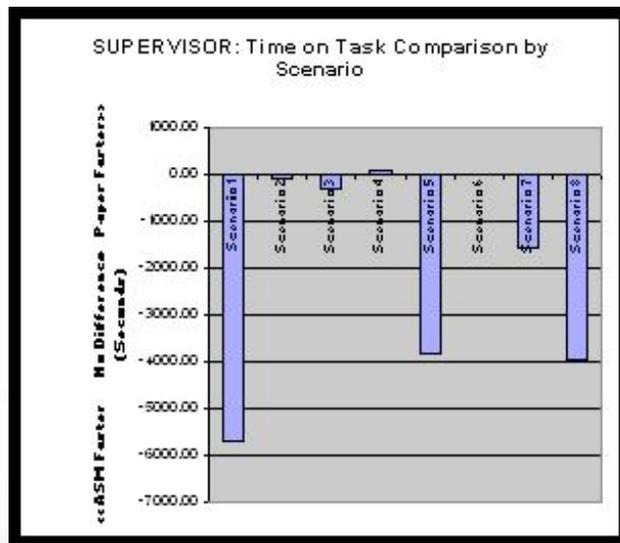
- **Measures of Success**

- Initial Training Reduction
  - ASM version 2 user training requires 2 hours vice 2 days for version 1
- Day One Performance
- Improved Decision-making Support
- Increased User Satisfaction

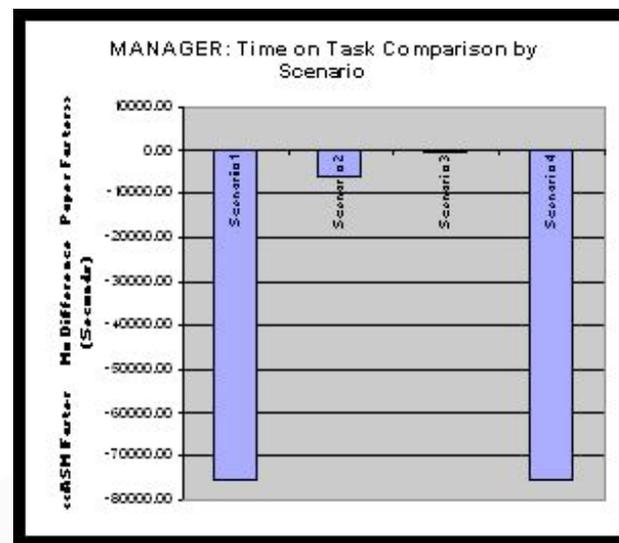
# Day One Performance



- **Participants, with few exceptions, immediately achieved comparable or better performance to that of manual methods with no training.**
  - Measured by Time on Task results for scenarios, as compared to manual methods with which participants were very familiar
    - Supervisor and Manager participants achieved significantly improved Time on Task



For supervisors, out of 8 tasks, 3 showed reduction of effort of over 1 hour and 1 showed improvement of over 30 minutes

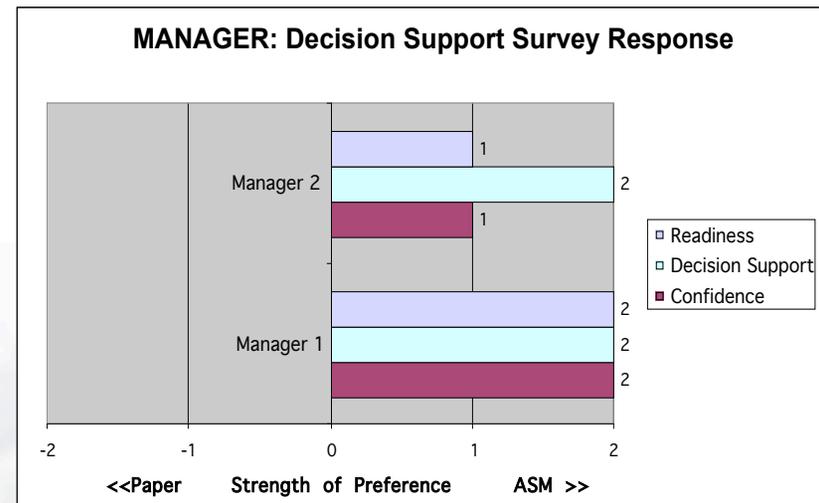
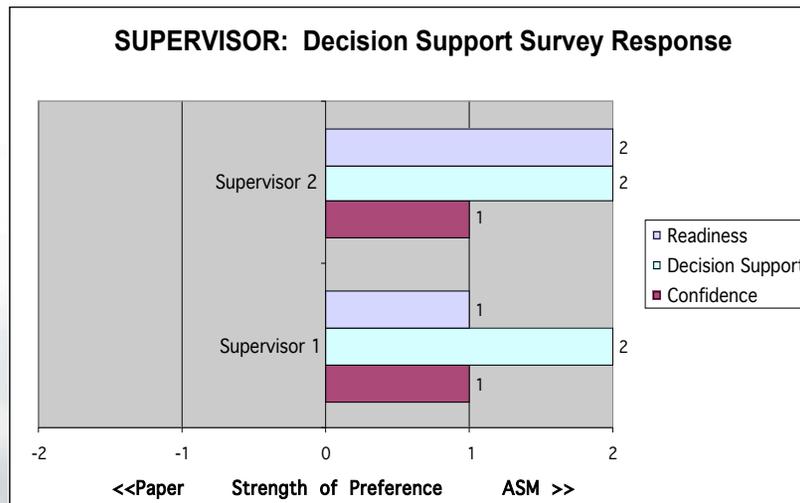


For managers results were significant.

- Task 1 saved 2.5 days per quarter
- Task 4 saved 2.5 days per month

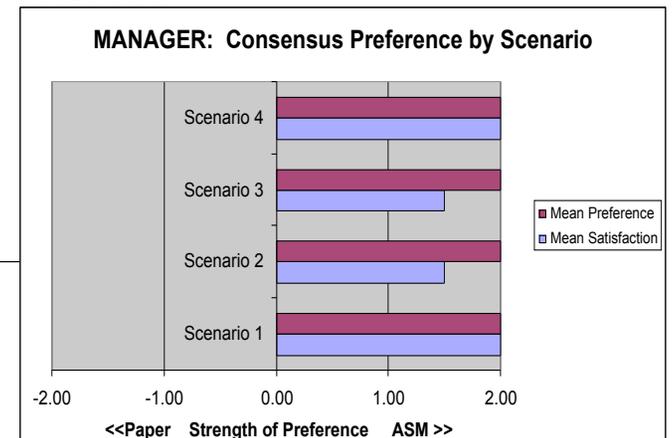
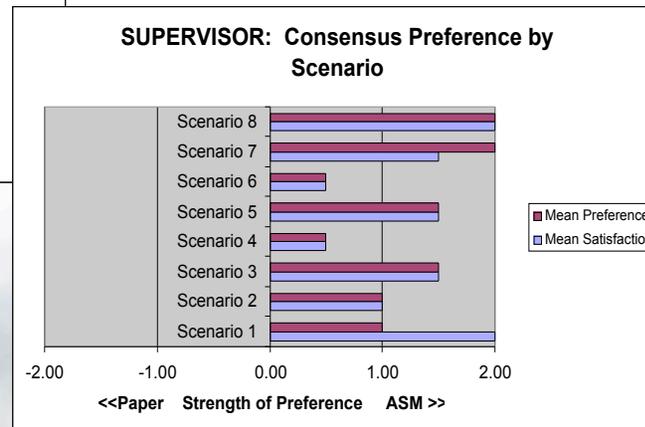
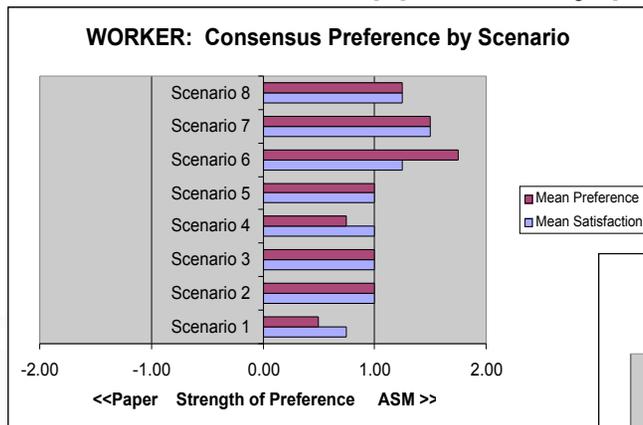
# Improved Decision-making Support

- **Participants consider ASM v2 to be a more effective tool for making decisions than current manual methods.**
  - Measured by Participant Survey Confidence, Decision Support, and Readiness responses
    - All but 1 of 8 participants expressed greater confidence in ASM v2 than manual methods
    - All participants believed it would improve Decision-making
    - Supervisors and Managers believed it would enhance the Readiness of their squadron

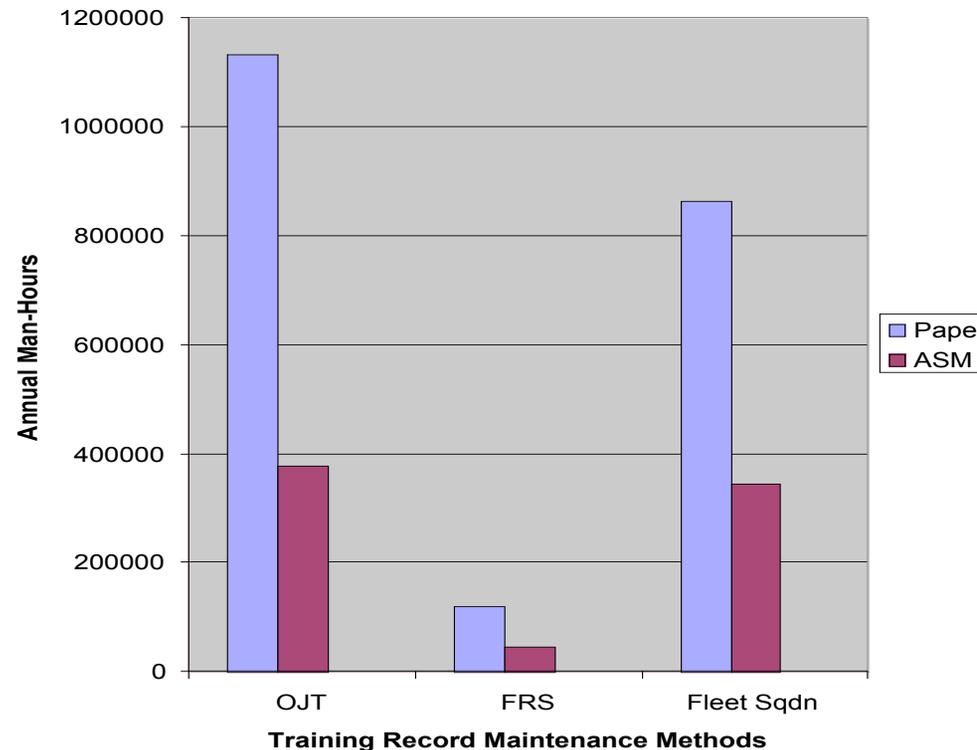


# Increased User Satisfaction

- **Participant Survey results show marked satisfaction with and preference for ASM v2 over manual methods**
  - Measured by participant survey Satisfaction and Preference responses
    - For all scenarios and roles, participants expressed increased satisfaction and a preference for ASM v2 over manual methods
  - Supported by participant comments and anecdotes



# Potential Man-hour Reductions Fleet-wide



Projected Annual Fleet-Wide Cost Avoidance with ASM = 1,349,280 hrs

Assumes Full Rollout to 300 Squadrons and 26 FRS (Approximately 85,000 Maintenance Personnel)

# Conclusions



- **Significant performance gains can be realized through the application of the HPD methodology to systems like ASM v2**
  - Reducing the time to attain competency,
  - Improving efficiency of work,
  - Increasing worker satisfaction
- **ASM v2 and other systems employing HPD will be intuitive and usable by individuals with a variety of roles and responsibilities without extensive training.**
- **HPD can effectively support staff training activities and help motivate career progression**
  - Support task based training requirements
  - Consistent with the Navy's 5-Vector Model