

Human Error Investigation for Overhaul and Repair Operations



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Recent Trends in Naval Aviation

- Aircraft Procurements: Quantity & Rate ↓
- Aging Aircraft & Service Life Extensions
- Increased Inspection Requirements
- Increased Maintenance Requirements
- Greater Need for Preventive Maintenance
- Greater Demands on Overhaul & Repair



NADEP Cherry Point employs over 3,000 personnel & supports aircraft, engine, and component overhaul

ADDED NADEP CHALLENGES

- **Related Staffing Concerns:**
 - Aging Workforce - Retention & Retirement
 - Worker Attrition & Replacement
 - Worker Qualifications & Certifications
- **Qualified Personnel Shortage Implications:**
 - Overtime (Productivity, Quality, Work-life, Cost, & Scheduling)
 - Shift-Work (Productivity, Quality, Work-life, Cost, & Scheduling)
 - Short-Run Staffing (Qualification, Certification & Experience)
 - Cross-Training/Multi-roles (Productivity, Quality, & Work-life)
 - OJT/Mentoring (Standards, Resources, & Timeliness)
 - Outsourcing (Control, Procedures, Standards, & Timeliness)

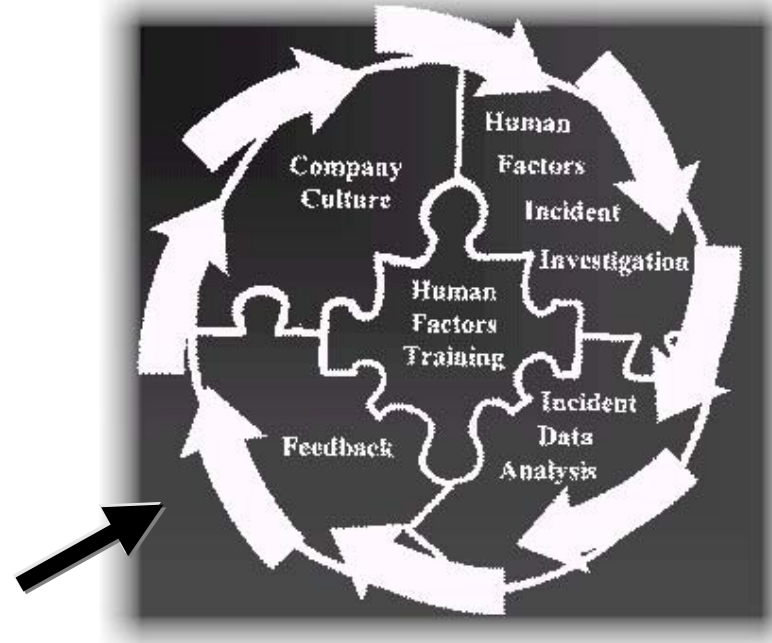
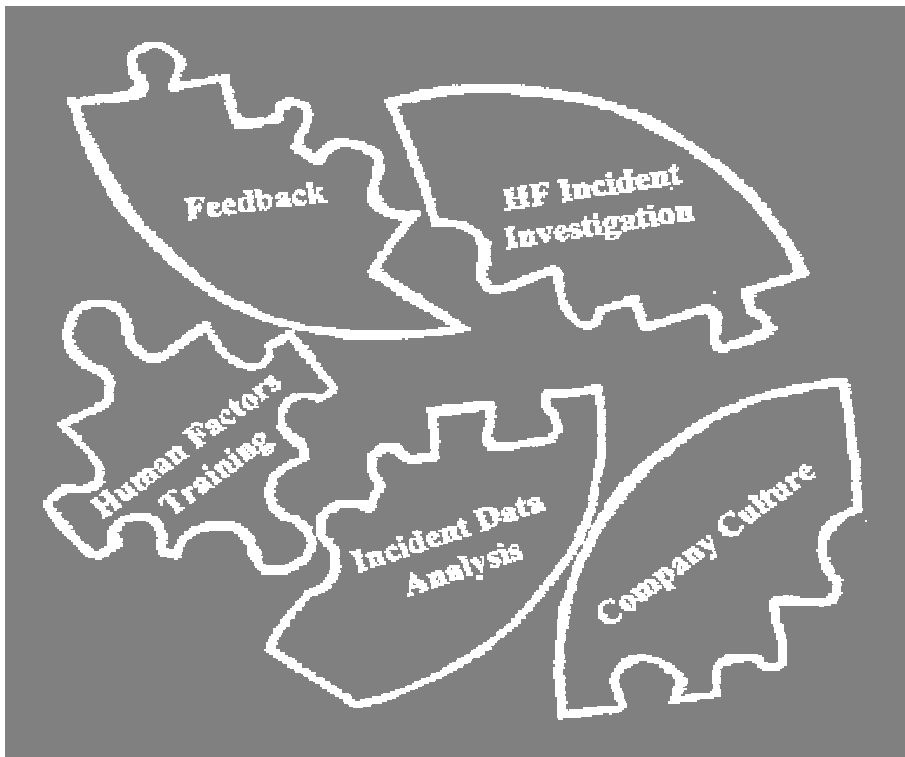
F-402 ENGINE LINE



Objective: Trial Effort to Apply Human Factors in Maintenance Error Investigation Processes and Associated Interventions to Tackle Quality Issues in DEPOT Overhaul and Repair Operations

Maintenance Human Factors Program Elements*

Elements:



Synergy

*Meets ATA SPEC 113 Maintenance Human Factors Program Guidelines

Actions Taken



- F-402 Engine Area Pilot Study
 - ✓ Maintenance Error Investigation Training (QA, Safety, Engineering, ISO 9000, & Management)
 - ✓ QA Adoption of HFACS-ME & Implementation
 - ✓ Post Hoc Analysis of F-402 Incidents
 - ✓ MCAS Adaptation for NADEP Workforce
 - ✓ MCAS Administration to F-402 Personnel
 - ✓ Development of Tailored MRM Training
 - ✓ Trained All SBU Associated Personnel

DEFENCES

Serviceable AME

Incorrect screw fitted causing restriction

Safety Indicator

**False lock indication -
Actuator out of adjustment**

Redesigned bellcrank

Bellcrank not procured by RAAF

Accurate Procedures

**Procedures deficient
or ambiguous**

Training

**Deficient training/
inadequate OJE**

Authorisation

**Tradesman not authorised
to complete task**

**Culture - Adherence to policy/
procedure**

**Violation of policy
and procedure**

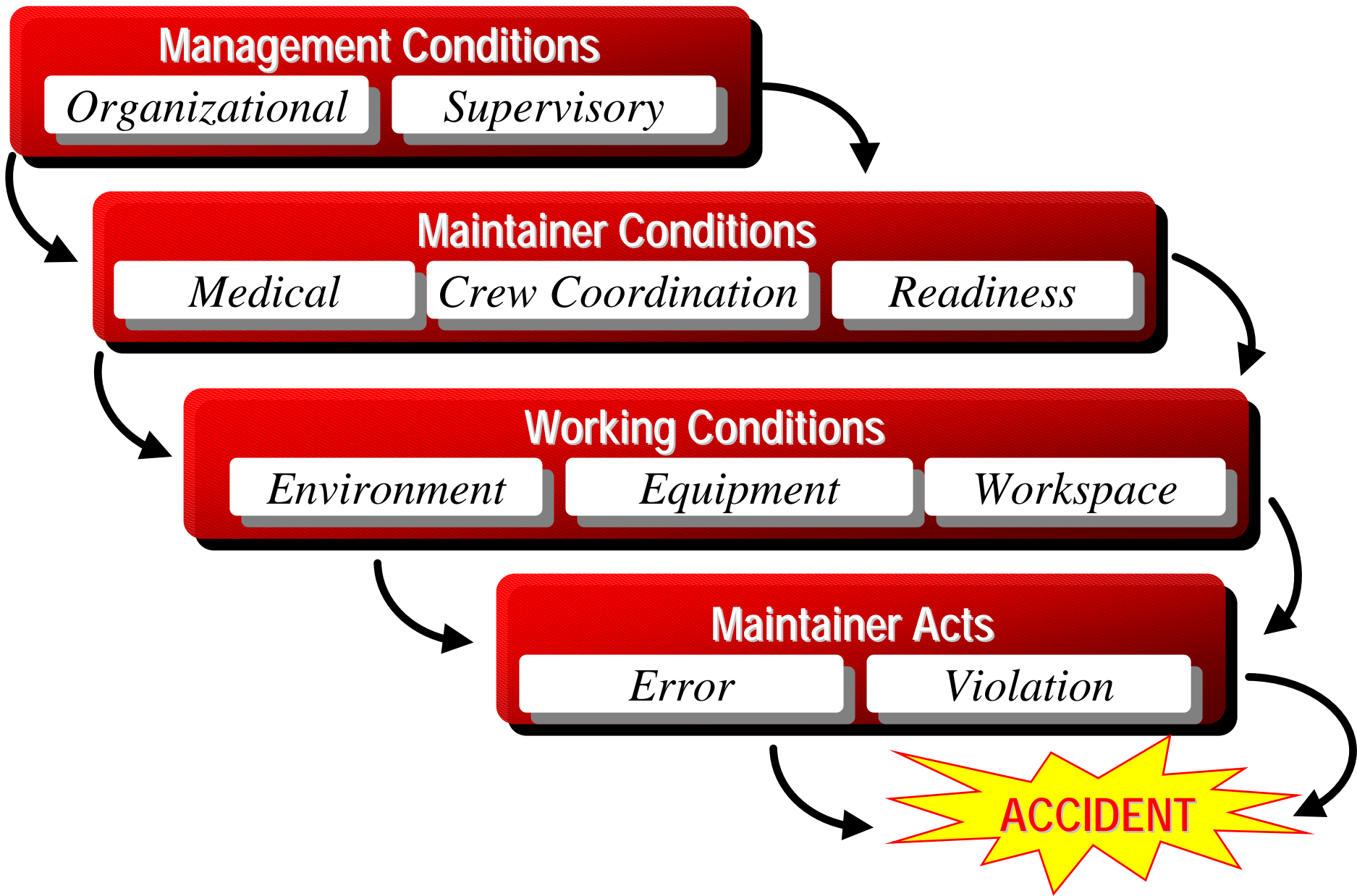
Supervision & Inspection

**Inadequate
supervision and
inspection provided**

INCIDENT

BREACHES

HFACS- *Maintenance Extension*





Heinrich Ratio Adapted

Major Quality Escape/Severe Injury

The way to manage this risk:

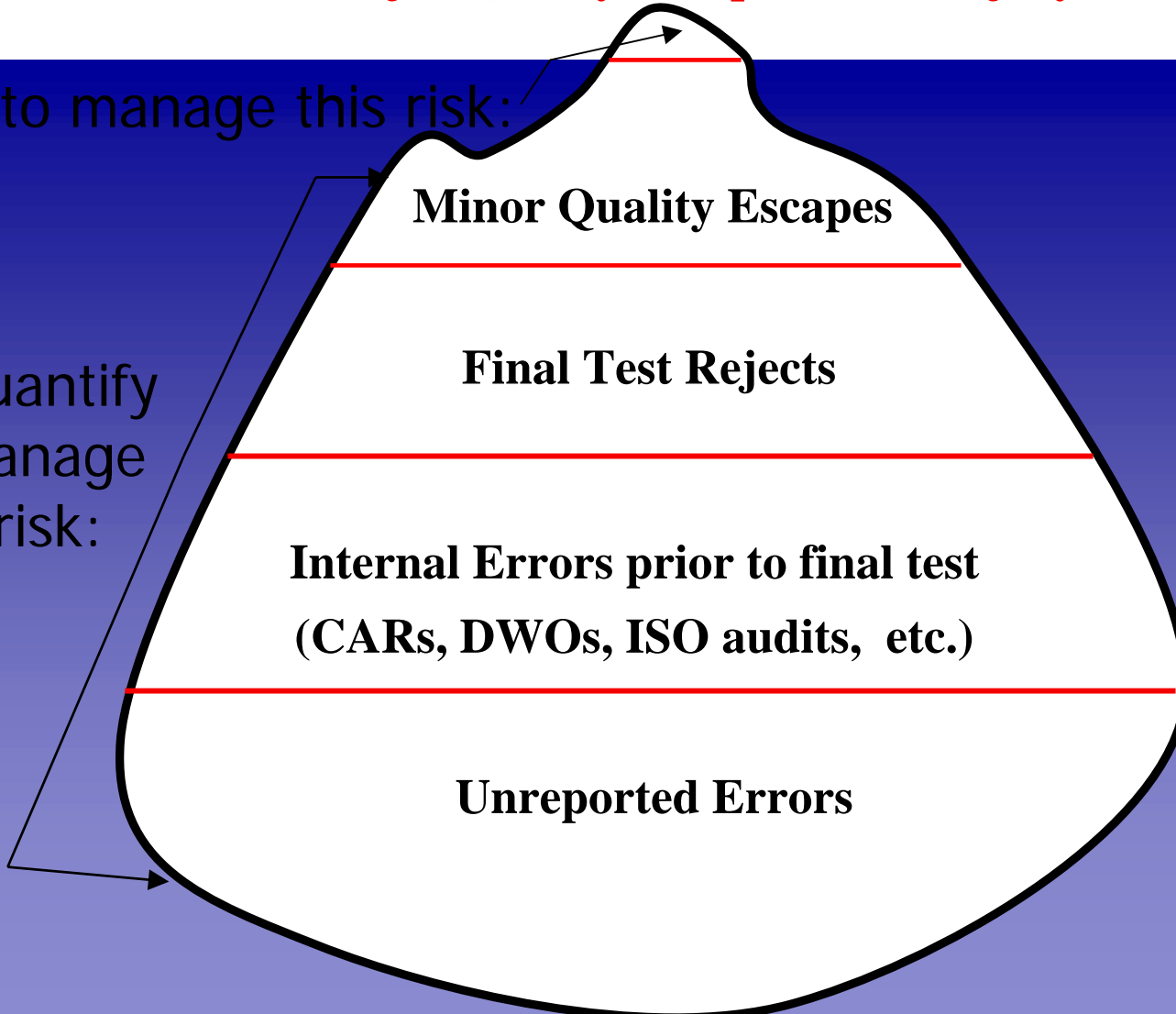
Minor Quality Escapes

Final Test Rejects

**Internal Errors prior to final test
(CARs, DWOs, ISO audits, etc.)**

Unreported Errors

Is to quantify
and manage
This risk:

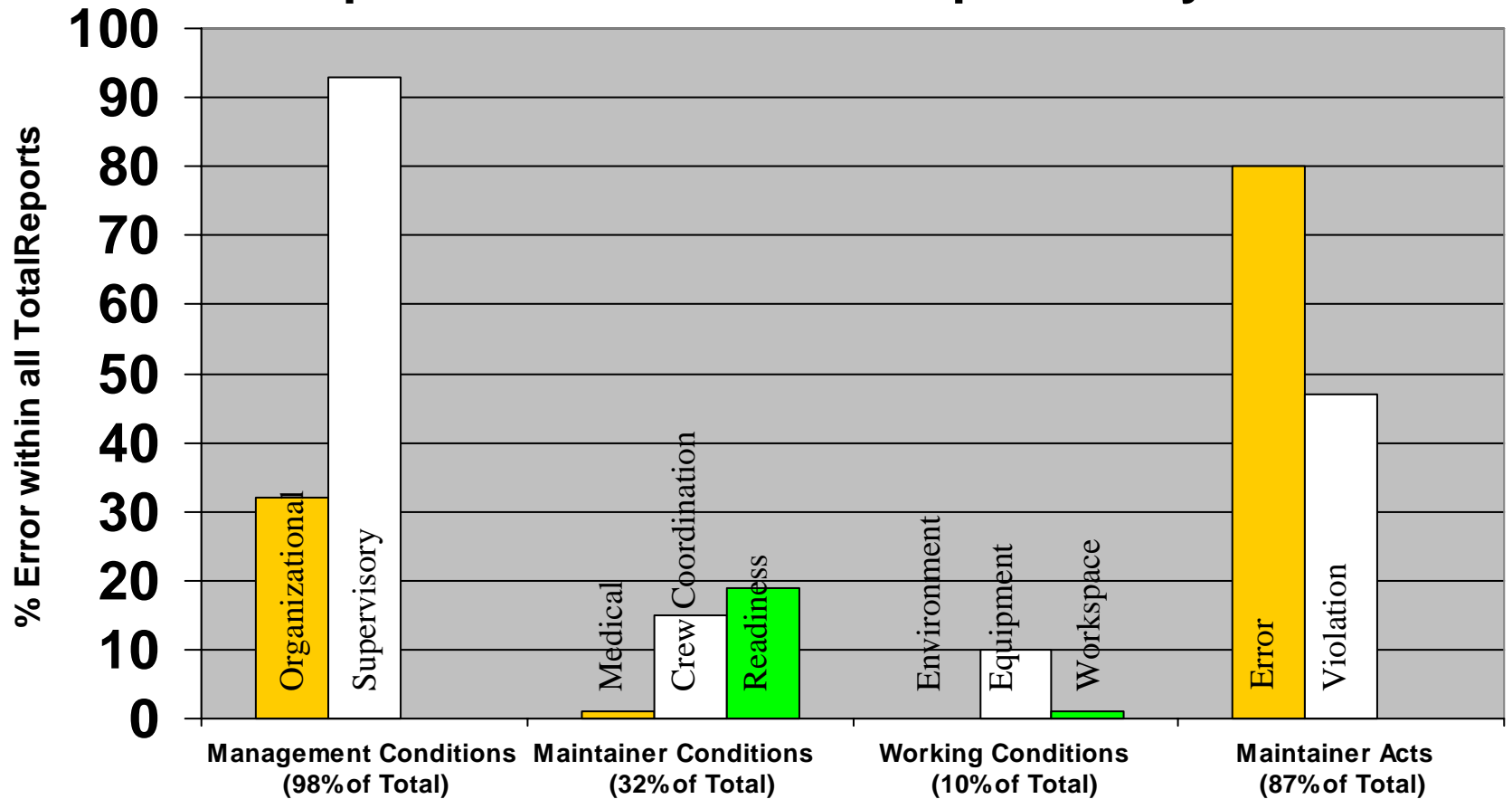


HFACS-ME-Framework

..HFACS-Investigation-on-00000

Error Categories of HFACS-Framework				
First Order	Second Order	Third Order		
<input type="checkbox"/> Management Conditions	<input type="checkbox"/> Organizational <input type="checkbox"/> Supervisory	<input type="checkbox"/> Inadequate Processes <input type="checkbox"/> Inadequate Resources <input type="checkbox"/> Inadequate Supervision <input type="checkbox"/> Supervisory Misconduct	<input type="checkbox"/> Inadequate Documentation <input type="checkbox"/> Inappropriate Operations	<input type="checkbox"/> Inadequate Design <input type="checkbox"/> Uncorrected Problem
<input type="checkbox"/> Maintainer Conditions	<input type="checkbox"/> Medical <input type="checkbox"/> Crew Coordination <input type="checkbox"/> Readiness	<input type="checkbox"/> Mental State <input type="checkbox"/> Communication <input type="checkbox"/> Training/Preparation	<input type="checkbox"/> Physical State <input type="checkbox"/> Assertiveness <input type="checkbox"/> Certification/Qualification	<input type="checkbox"/> Limitation <input type="checkbox"/> Adaptability/Flexibility <input type="checkbox"/> Infringement
<input type="checkbox"/> Working Conditions	<input type="checkbox"/> Environment <input type="checkbox"/> Equipment <input type="checkbox"/> Workspace	<input type="checkbox"/> Lighting/Light <input type="checkbox"/> Damaged/Unserviced <input type="checkbox"/> Confining	<input type="checkbox"/> Weather/Exposure <input type="checkbox"/> Unavailable/Inappropriate <input type="checkbox"/> Obstructed	<input type="checkbox"/> Environmental Hazards <input type="checkbox"/> Dated/Un-certified <input type="checkbox"/> Inaccessible
<input type="checkbox"/> Maintainer Acts	<input type="checkbox"/> Error <input type="checkbox"/> Violation	<input type="checkbox"/> Attention/Memory <input type="checkbox"/> Skill/Technique <input type="checkbox"/> Routine <input type="checkbox"/> Flagrant	<input type="checkbox"/> Judgment/Decision-Making <input type="checkbox"/> Infraction	<input type="checkbox"/> Knowledge/Rule-Based <input type="checkbox"/> Exceptional

Example Corrective Action Report Analysis



First and Second Order Analysis

SAMPLE SURVEY (MCASNADEP)

PART I. DEMOGRAPHIC INFORMATION

The following survey is a SAMPLE. No actual responses will be recorded.
For the actual survey, no individual's demographic data will be made available to any CO.

Your Grade/Rank:

Total years aviation maintenance experience:

Total years Naval Aviation Depot experience:

Your current job/trade:

Total years in your current job/trade:

Your primary shift:

Your primary program:
(Select all that apply)

Your status:

Your Service:

Your parent command:

Your unit's location:



The following survey is a SAMPLE. No actual responses will be recorded!

1. The NADEP adequately reviews and updates safety procedures.

Strongly Disagree Disagree Neutral Agree Strongly Agree N/A
 Don't Know

2. The chain of command monitors artisan qualifications and has a program that targets training deficiencies.

Strongly Disagree Disagree Neutral Agree Strongly Agree N/A
 Don't Know

3. Supervisors use safety and medical staff to identify/manage personnel at risk.

Strongly Disagree Disagree Neutral Agree Strongly Agree N/A
 Don't Know

4. Quality Assurance routinely monitors rework/repair/maintenance tasks.

Strongly Disagree Disagree Neutral Agree Strongly Agree N/A
 Don't Know

5. Tool Control and support equipment licensing are closely monitored.

44. The next quality defect will be caused by.... (200 words max.)

No comment My response is:

45. The next quality defect can be prevented by (200 words max.)

No comment My response is:



Maintenance Resource Management (MRM) Training Fundamentals

“Dupont’s Dirty Dozen”

Lack of:

- Communication
- Resources
- Assertiveness
- Awareness
- Teamwork
- Knowledge

Abundance of:

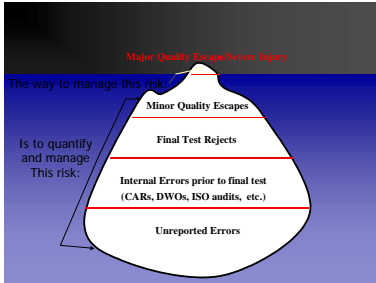
- Pressure
- Stress
- Norms
- Fatigue
- Distraction
- Complacency



Early Results

- Increased Quality in CARs, DWOs, & QDRs
- Significant Decrease in Quality Departures
- External NAVAIR Process Audit Noted Significant Reduction in “High Risk” Areas
- Engine Overhaul Manager Desire to Expand

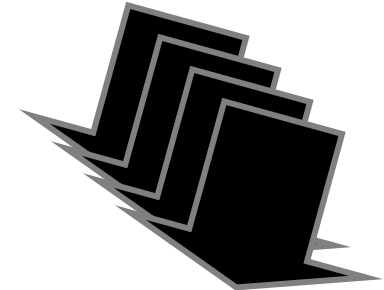
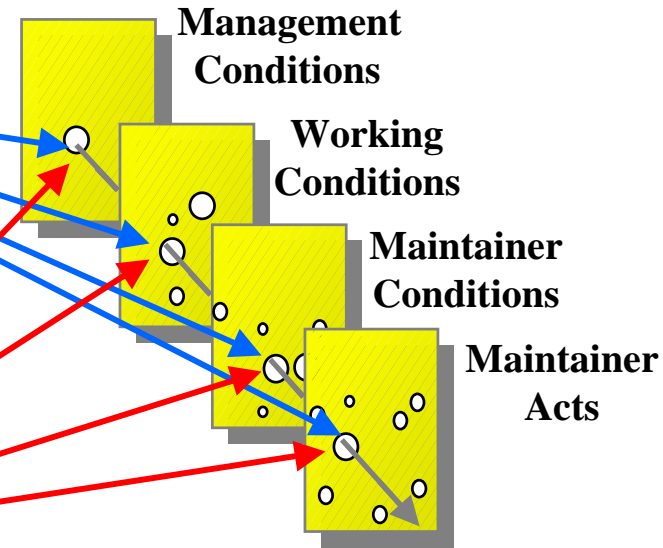
NEXT STEP: Form a MGMT, ENG, QA, ISO9000, & Artisan focus groups to “triangulate” HFACS-ME analysis, MCAS results, and work experience to develop tailored intervention strategies



- ID Causal Factors (Hazards)
- Risk Assessment/Prioritization
- Target Intervention Areas
- Safety Performance Metric



- ID Potential Factors (Hazards)
- Risk Assessment/Prioritization
- Target Potential Risk Areas
- Safety Performance Metric



INTERVENTION

-How close are we to an HRO?

Questions?



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