Assessing Naval Aviation Maintenance Safety: 
Error Reporting, Data Management, and Trend Analysis

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Naval Aviation Flight Mishap Rate

- 776 aircraft destroyed in 1954
- 23 aircraft destroyed in 1999

Key Events:
- Angled Carrier Decks
- Aviation Safety Center
- FRS Concept Initiated
- Naval Aviation Maintenance Program
- Squadron Safety Program
- Designated Aircraft
Engineering & Administrative Controls have Impacted Hardware Reliability, but....

Class A, B, & C Mishaps/100,000 Flight Hours

Material Failure

Human Error

22 Class A FMs in 1999
17 Had Human Error Involvement!
**Human Factors Intervention Strategy Matrix**

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<th>Error Prevention</th>
<th>Engineering Control</th>
<th>Administrative Control</th>
<th>Personnel Control</th>
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*Most Mishap Recommendations Fall into Just Two Categories!!!!!!!
Human Factors

Intervention Strategy Matrix

Error Prevention
Performance Enhancement

Engineering Control
Administrative Control
Personnel Control

X
X

Most Mishap Recommendations Fall into Just Two Categories!!!!!!!
“We Need to Start Thinking Out of the Box”

Most Mishap Recommendations Fall into Just Two Categories!!!!!!
Watershed Event
Naval Aviation Safety Program (OPNAV 3750)

- Specifies Reporting Requirements (3 W’s)
- Covers Major Mishaps to Minor Hazards: Supervisory, Aircrew, Maintenance, Material, & Facility (Focus ENG & ADM, touches HF Issues)

Naval Safety Center Safety Information Management System (SIMS)

- Relational Database Structured IAW 3750.6Q
- Permits Structured Reports & On-line Queries
Mishap Data Analysis:
Reason’s “Swiss Cheese” Model

HFACS-
Human Factors Analysis & Classification System
Mishap Data Analysis: Reason’s “Swiss Cheese” Model

Organizational Factors

Unsafe Supervision

Unsafe Act Preconditions

Unsafe Acts

Failed or Absent Defenses

Active Failure

HFACS-
Human Factors Analysis & Classification System

Mishap
Mishap Data Analysis Focus: Naval Aviation Class A FM Causal Factors

Initial emphasis on “Pilot Error”; but to reach goal of cutting human factors mishaps in half the focus on maintenance.

- 62% Supervisory
- 56% Aircrew
- 39% Material
- 17% Maintenance
- 5% Facilities

Determined Causal Factor
HFACS-ME Model

ORGANIZATIONAL CLIMATE

- Supervisory Conditions
- Maintainer Conditions
- Working Conditions

- Maintainer Actions
- Maintenance Conditions
- Aircrew Actions

MISHAP/INJURY
HFACS- Maintenance Extension

Supervisory Conditions

Working Conditions

Maintainer Conditions

Maintainer Acts

3 ORDERS
470 Maintenance Related Mishaps Were Analyzed For Human Errors

Classification Process Performed by Naval Maintenance Personnel
HFACS-Maintenance Extension Profile: Class A vs. B/C MRMs

Supervisory Conditions
Maintainer Conditions
Working Conditions
Errors
Violations

% Class A & B/C MRMs
General Findings

Poor/Non-existent maintenance procedures
Inadequate/Poor Supervision of Maintenance Evolutions
Miscommunication - supervisor to subordinate, pass-down, or shift turnover
Not using, lack of, or outdated

Violations - not following policy, procedures, checklists, etc.
HFACS-ME Implementation

- HFACS-ME Adopted for Inclusion in 3750.6R
- Results Influencing the Naval Aviation Maintenance Program Policies (4790.2G)
- Tailored Training Materials for Users
- Data Collection/Analysis Tool Development
- Interim Construction of HFACS-ME Database (training, intervention, & ROI)
Supporting Agencies/Sponsors

Medical Specialties Division
FAA Office of Aviation Medicine

Dr. Barbara Kanki
Crew Factors System Safety Branch
NASA Ames Research Center
Moffett Field, CA

CAPT Jim Frazier MC USN
Aeromedical Division
Naval Safety Center
Questions?