Assessing High Reliability Organizational Effectiveness

Prevention First 2006

The High-reliability Organizational Effectiveness Survey (HROES)™
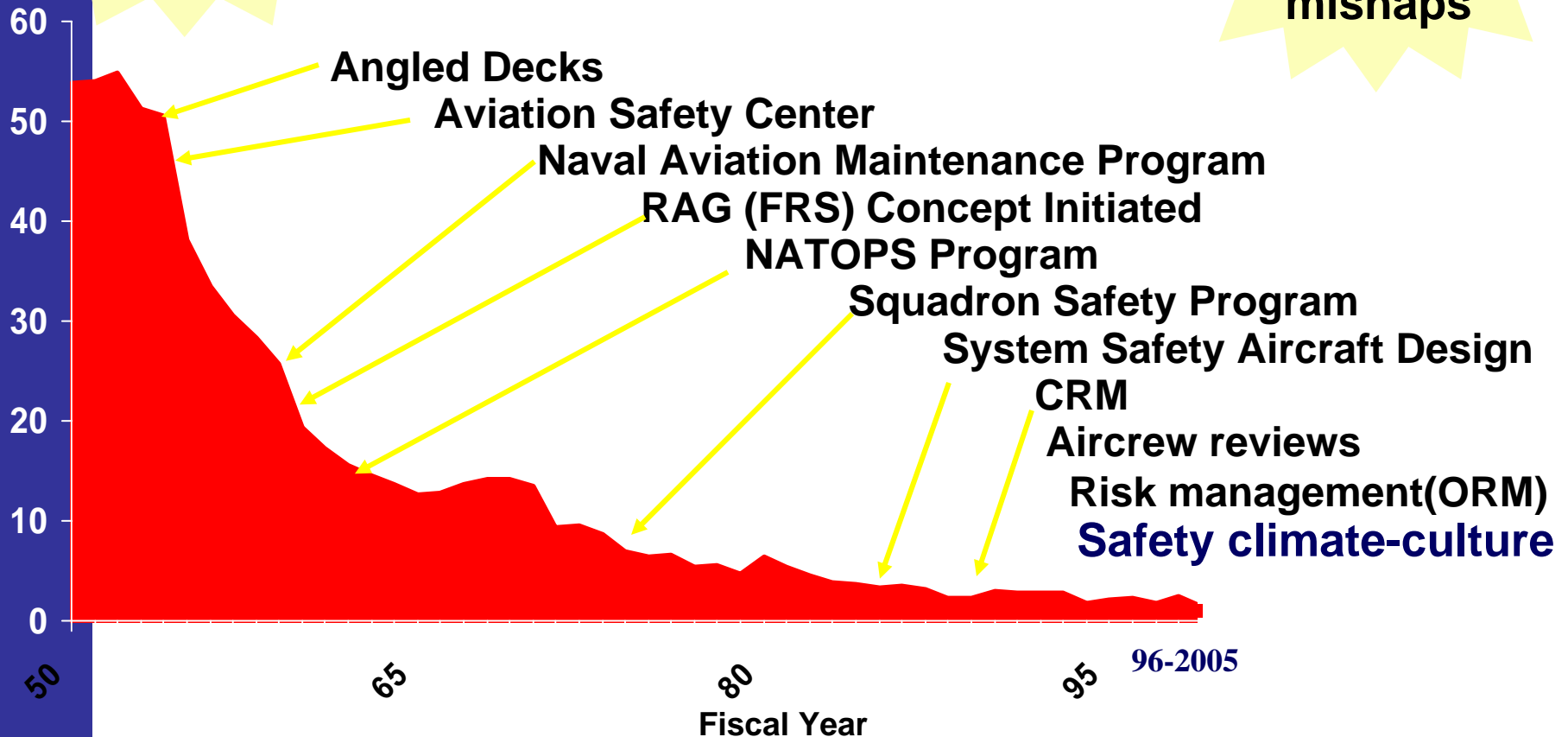
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September 2006

Naval Aviation Class A Flight Mishap Rate

776 aircraft destroyed in 1954

FY50-05

29 aircraft destroyed in FY05- all in flight mishaps

Angled Decks
Aviation Safety Center
Naval Aviation Maintenance Program
RAG (FRS) Concept Initiated
NATOPS Program
Squadron Safety Program
System Safety Aircraft Design
CRM
Aircrew reviews
Risk management(ORM)
Safety climate-culture

60
50
40
30
20
10
0

50   65   80   95   96-2005

Fiscal Year

US Naval Aviation: A high-reliable organization

Naval Aviation Risk Mitigation

- **Recruitment and selection**
- **Aeromedical screening**
- **Training standardization and qualifications**
- **Command supervision and risk management**
- **Aircrew performance reviews**
- **Human Factors reviews (Boards & Councils)**
- **Crew Resource Management (CRM)**
- **Safety Climate and Culture Assessments**

US Naval Aviation: A high-reliable organization
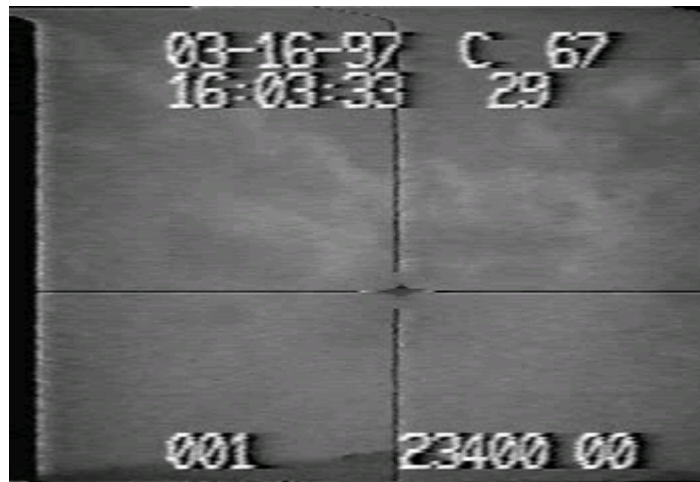
Examples of Organizational Failures

- US Navy F-14 crash in Tennessee
- Valu Jet crash into Florida Everglades
- Three-mile Island and Chernobyl
- Challenger and Columbia
- Exxon Valdez Oil Spill
- Enron and World Com, others

What Are Common Root Causes? (Organizational)

- Poor risk perception and threat recognition
- Lack of leadership commitment to safeguards
- Inadequate management oversight and control
- Inadequate or unclear risk-decision criteria
- Too difficult to report at-risk decisions/behavior
- Policy and incentives reward excess risk taking
- Culture does not support desired attitudes/behavior

Common root Causes (Cultural)

- **Unhealthy attitudes about safety, risk perception and performance expectations**
- **Inadequate job qualification standards, training and personnel assignments**
- **Management tolerance of high risk behaviors**
- **Poor communications and information flow**
- **Non-compliance with rules, or best practices**
- **Poor management of job Stress, fatigue and/or excess production pressure**
- **Inadequate resources to support tasks assigned**
- **Flawed reward system with little or no reward for safe behavior**

Management Contributions to Failure

- Failure to instill strong risk values/culture
- Pressure to complete to the job, or meet a schedule
- Failure to establish or enforce standards
- Over-tasking personnel in high-risk jobs
- Failure to identify and manage people under stress
- Inadequate resources to do job within acceptable risk
- Error prone technical equipment, or low reliability
- Failure to manage known risks, including high-risk
- Permitting High-risk individuals in the workplace

What is a high-reliability organization (HRO) ?

An organization that:

– Conducts nearly error free operations, with very few accidents, low incidents, and no disasters

– Demonstrates superior performance over a long period of time

– Makes consistently good risk decisions resulting in high quality, safe and reliable operations

Characteristics of an HRO

- A Culture of trust and shared Values.
- Risk mitigating communication processes that provide opportunities for open discussion and improvement.
- Distributed decision-making, "where the buck stops everywhere."

(Roberts, 1997)

Organizational Culture

Shared Values *(What is important)* and **Beliefs** *(How things work)* that interact with an organizations structures and control systems to produce **Behavioral Norms** *(The way things work around here).*

Successful Risk Management Culture

- Shared values about what's risky and what's not
- Common beliefs about how to conduct risk minimizing operations
- Behavioral norms that govern risk-taking, everyday procedures and precautions
- Transmission of values, beliefs and accepted practices to others in the organization

HRO Climate Assessment

Measurement of an organization's ability to effectively and safely conduct their hazardous operations within a healthy risk culture, expressed in terms of leadership engagement and oversight, and with adequate management policies, clear performance standards and practices.

Five Element HRO Model

1) <u>Process Auditing</u> -- a system of on-going checks and tests designed to monitor hazardous conditions and risks

2) <u>Reward System</u> -- expected social compensation to reinforce desired behavior, and/or disciplinary action to correct undesired

3) <u>Quality Assurance</u> -- policies and procedures for promoting high-quality performance and work products

4) <u>Risk Management</u> – whether or not the organization correctly perceives operational risks and takes corrective action

5) <u>Leadership and Supervision</u> -- policies and procedures and communication processes used to proactively mitigate risks

Adapted from Libuser and Roberts (1994)

Survey based on HRO Principles

- Process auditing

- Reward system

- Quality assurance

- Risk management

- Leadership and supervision

- **SAMPLE SURVEY ITEMS**

- **Our hazard reporting system is likely to identify problems that could lead to a serious accident.**

- **Senior management supports a climate that promotes safety.**

- **My [organization] has a reputation for high quality performance.**

- **I believe that our leaders have a clear picture of operational risks.**

- **Senior executives at FAA/ATC are genuinely concerned about risk management.**

HRO-Climate-Culture Surveys

- **Aerospace**

  https://65.104.119.152/nasa/login.html

  https://65.104.119.152/lockmar/login.html

- **Aviation**

  https://65.104.119.152/alaskaair/login.html

  https://65.104.119.152/phi/login.html

  https://65.104.119.152/bristow/login.html

- **Medicine**

  https://65.104.119.152/totallykids/login.html

Validation Based on 10-years of Navy Research

Reliability Testing – dependability or consistency of measures

Construct Validity- Statistical verification that factors identified support the proposed safety climate model
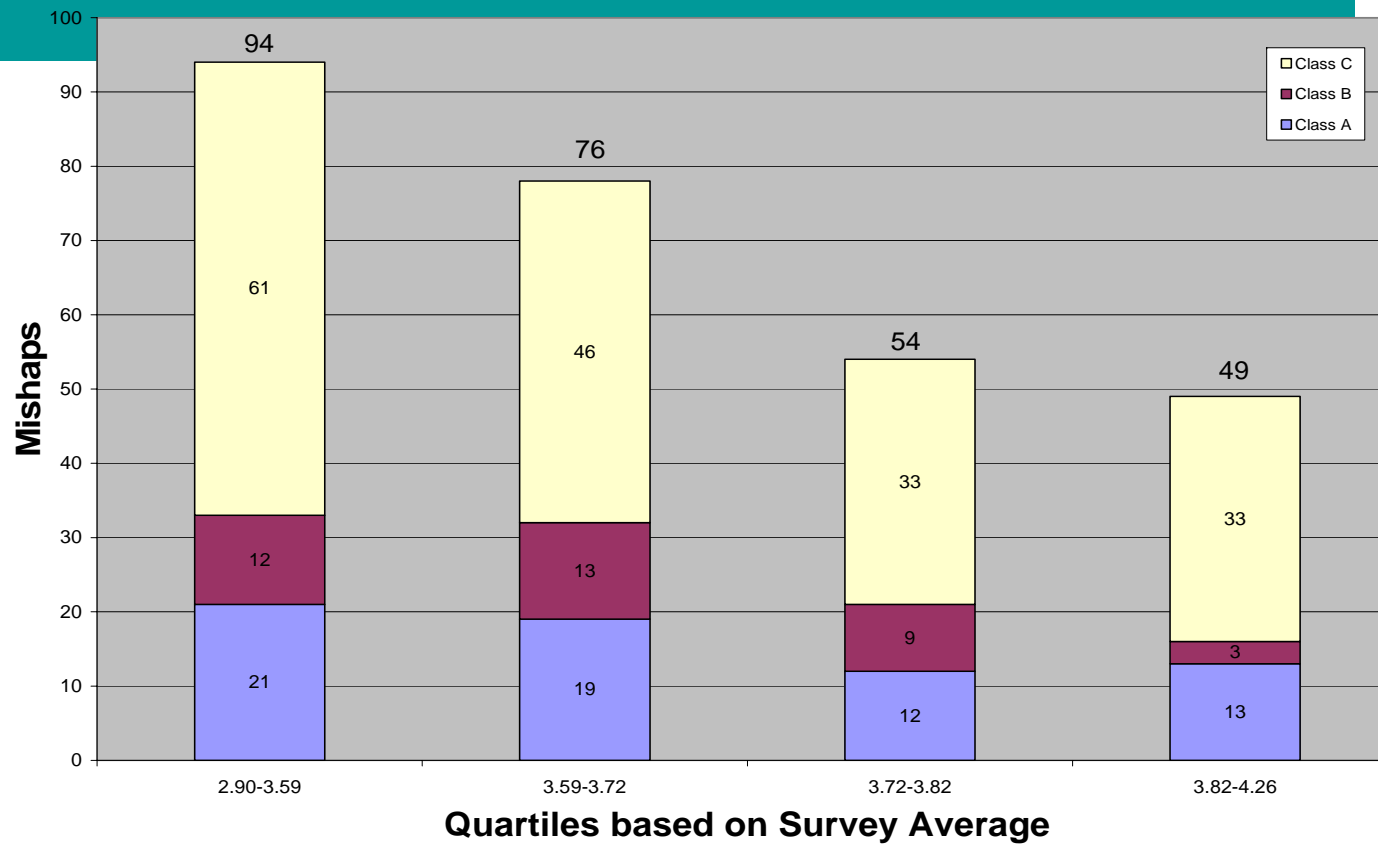
Predictive Validity- Correlation and statistical verification of relationships between climate measures and safety performance
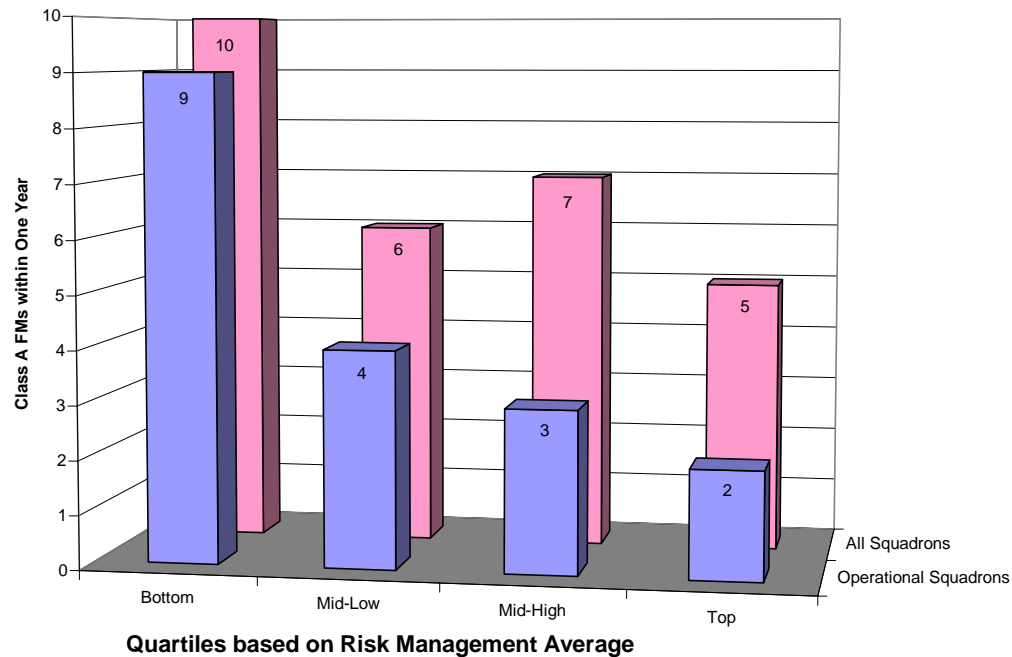
Trend Analysis: Navy Safety Climate

Average CSA Scores by Military Rank
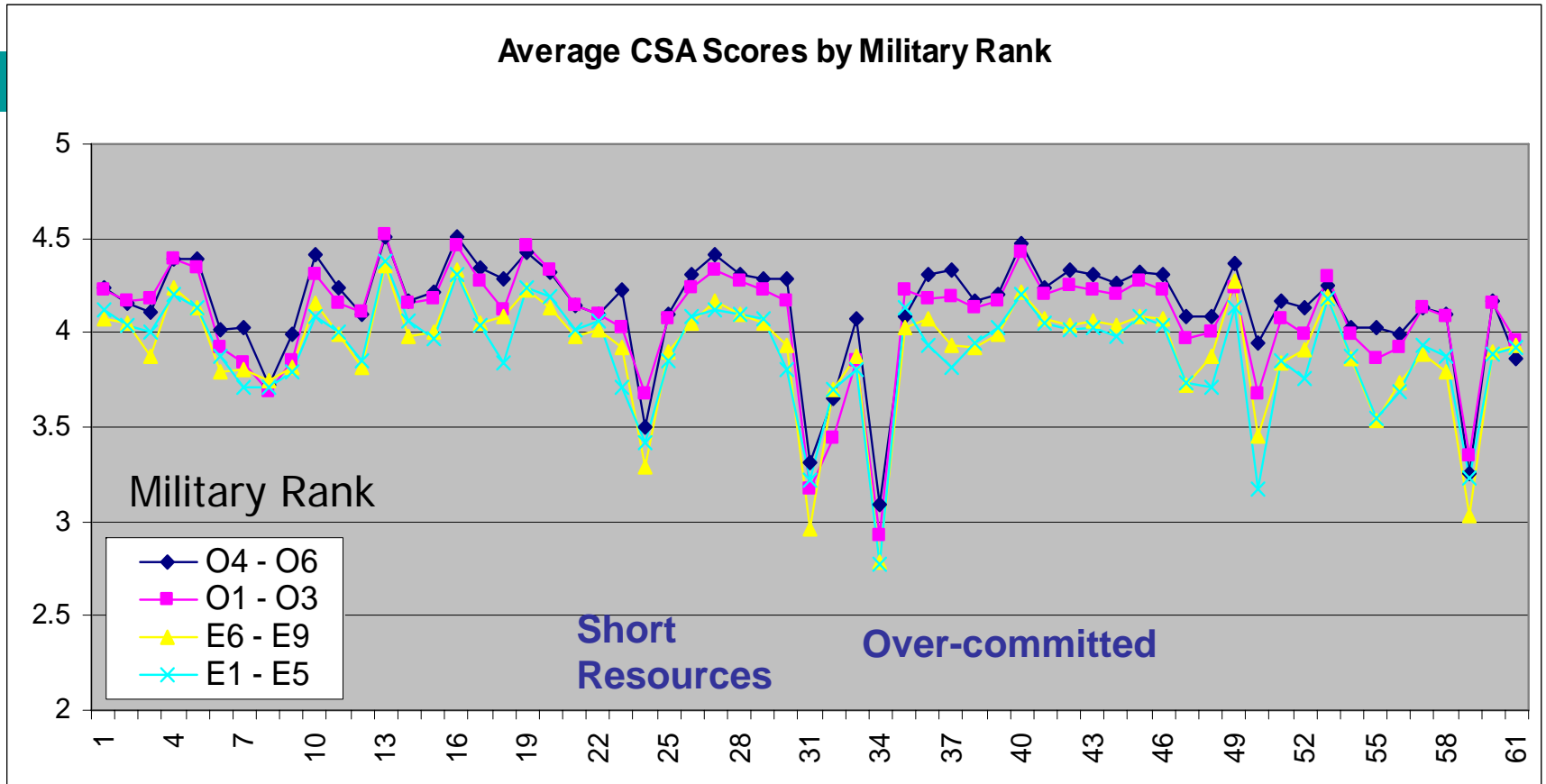
Example of Navy Validation Data (2001-2004)

MCAS Survey vs Mishaps within 24 Months after Survey

Mishaps within One Year after Taking CSA (Class A: Major Accidents)
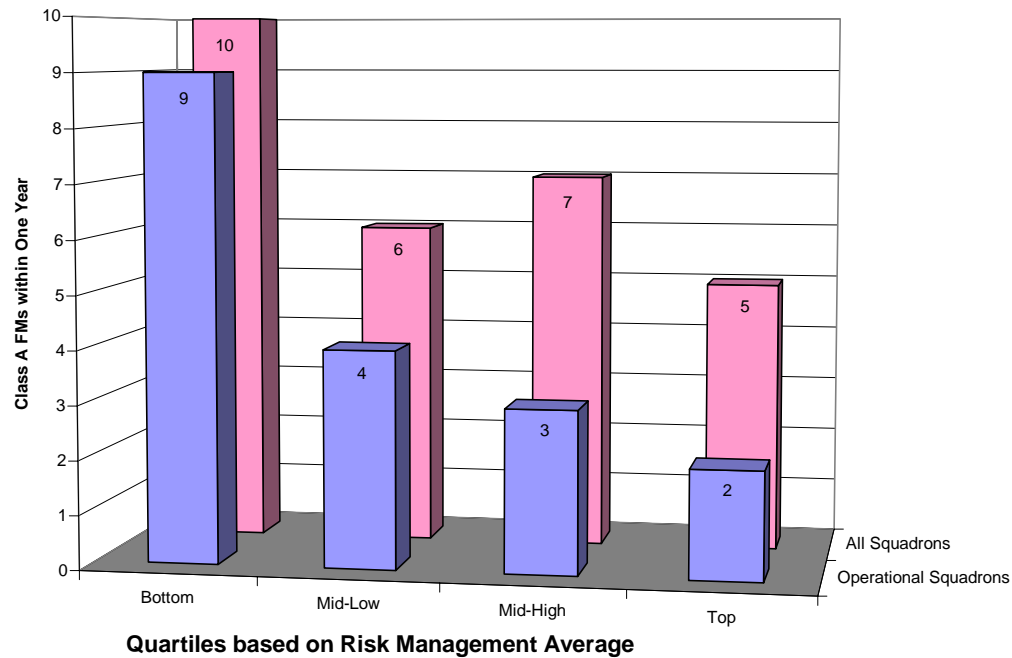
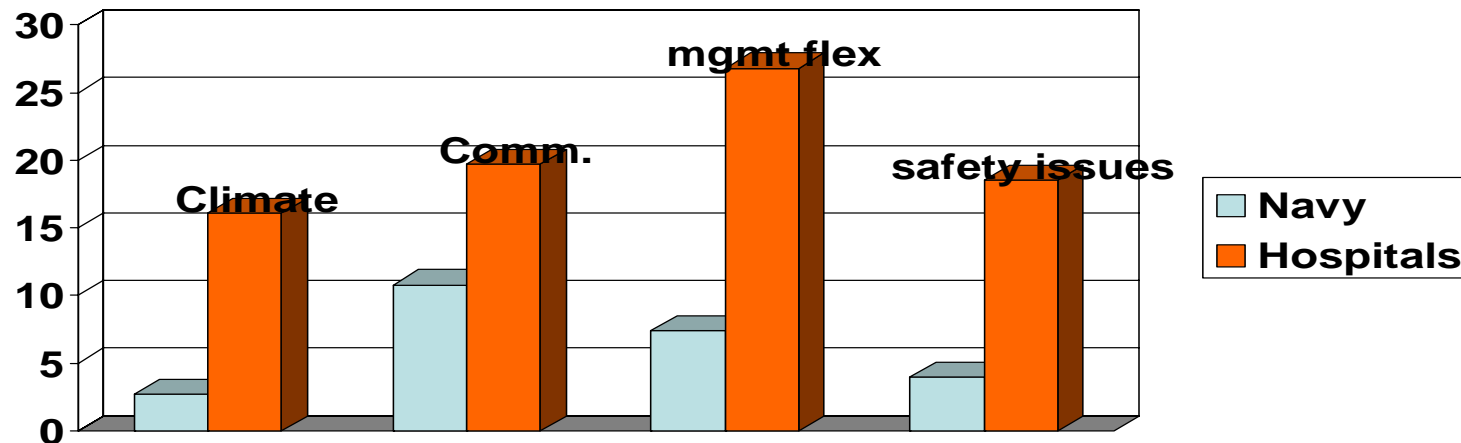**(Surveys conducted from 01JUN04-31MAY05)**

Schimpf and Figlock, 2006)

Mishaps within One Year after Taking CSA (Class A: Major Accidents)

(Surveys conducted from 01JUN04-31MAY05)

US Navy verses Hospitals as HROs:
Safety climate survey comparison shows much fewer "problematic" responses for US Navy than Hospitals.

Gaba, Singer, Ciavarelli, et al, 2003

Summary of Validation Tests

- Over 50,000 US Naval Aviation surveys provided a substantial validation sample for the HRO-climate survey.

- Cronbach-alpha reliability 0.90 overall and for each subscale

- Factor analysis showed 46% of the survey items are related to the "organizational (safety) climate" dimension.

- Safety outcomes (accidents) are significantly related to safety climate ratings. Navy squadrons with low safety climate ratings have the highest accident rate, and conversely higher rated units have the lowest accident rates (Ciavarelli, 2005).

- US Navy Safety Climate vs. hospitals tested on same survey items show US Navy Aviation is perceived to out perform hospitals as an operational high-reliability-organization or HRO.

Characteristics of the Survey System

- Founded on a validated HRO climate survey
- Anonymity for participants and confidentially for managers
- Strategies to maximize participation
- Online survey administration
- Ease of participation; 18-22 minutes to complete
- Online immediate diagnostic results feedback using normalized scores for equitable comparisons across different organizations and domains
- Trend analysis and intervention strategies

Survey Development Process

- Survey developers meet with unit personnel to discuss the survey system and its potential uses
- Survey developers conduct interviews with a strata of management and operational personnel
- Together developers and unit personnel tailor baseline (paper) survey items to fit a specific domain, and operational environment
- Following approval of "paper" survey, a web-based version is created and a customized web site constructed
- The Web Survey is Beta Tested on a selected (small) sample
- Following successful Beta, large-scale data collection and performance feedback is undertaken on a scheduled roll out.

Summary and Conclusions

- Original HRO Climate assessment methodology has been developed, successfully applied in Naval Aviation and US Marine Corp ground forces.

- HRO Climate measures show excellent reliability and have been validated against performance outcomes for use as a risk assessment tool.

- Approach incorporates a complete measurement, analysis and diagnostic display "dashboard" feedback system for managers.

- Comparable online systems have been developed and are now in use by civilian organizations, helicopter transport companies, aerospace, a major airline, and a medical care facility.

- Approach applies to other high-risk industries, such as air traffic control, nuclear facilities, homeland security, oil and gas platform operations, etc.

Demonstration of Web Site: NASA
https://65.104.119.152/nasa/login.html
(copy url and past to browser)