



# **Human Factors Related to Maintenance**

**2003 DoD Maintenance Symposium**

**October 27-30, 2003**

**Valley Forge Convention Center**

**King of Prussia, PA**

**CAPT John K. Schmidt, PhD MSC USN**

**Head, Operational Psychology Department**

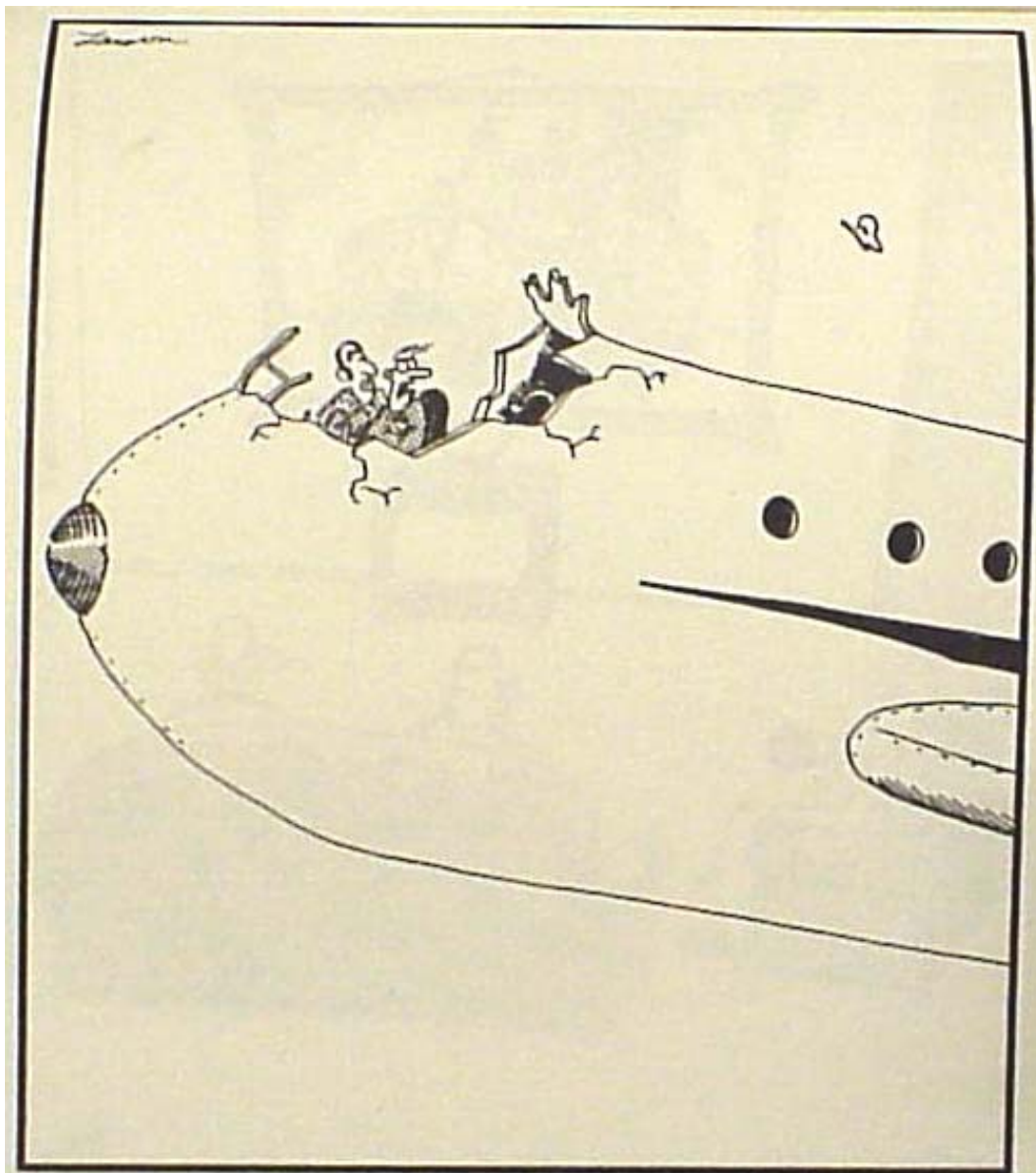
**Naval Aeromedical Medical Institute**

**[jkschmidt@nomi.med.navy.mil](mailto:jkschmidt@nomi.med.navy.mil)**

# **Technical Breakout Session:**

## **Human Factors Related to Maintenance**

Human factors' role in aviation safety continues to grow significantly. The Federal Aviation Administration (FAA), National Aeronautics and Space Administration (NASA), and similar government agencies abroad partnered with the airline industry over a 10-year period to conduct applied research and develop guidelines to improve maintainer productivity, maintenance quality, and flight safety. The Naval Services, recognizing the value of this work, actively sought to incorporate it into their maintenance and safety operations. This included investigating maintenance factors in mishaps; using error investigation techniques in depot overhaul and repair operations; incorporating crew resource management concepts in maintenance and flight line operations; applying human factors design principles in maintenance publication design; and proactively assessing the maintenance safety climate. This session will provide background information, implementation strategies, and lessons learned for planning similar human factors in maintenance initiatives in aviation and other maintenance arenas.



“Oh, great! Now there goes my hat!”



# Maintenance Errors



## Studies found that:

- **Maintenance contributed to 15% of commercial jet accidents (Boeing 1995)**
- **Maintenance problems are the 2nd greatest contributor to onboard fatalities, following CFIT (U.K.'s CAA, 1992)**

# Additional Maintenance/Ramp Error Data

**20-30% of engine in-flight shutdowns and 50% of engine-related flight delays/cancellations are caused by maintenance error. (Boeing/Rankin 1997)**



**48,800 unairworthy aircraft are dispatched per year as a result of maintenance error! (Marx, 1998)**



**Ramp accidents cost \$2-2.5 Billion annually. (Ramp Safety, Vol. 11:3)**



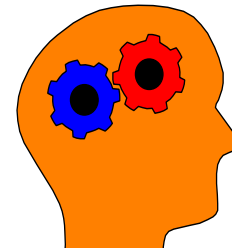
# Commercial Maintenance Incident Costs

- **Ave. cost of an in-flight engine shutdown is \$500,000**
- **Ave. cost of a flight cancellation is \$50,000**
- **Ave. cost of a return to gate is \$15,000**
- **Ave. ground damage incident costs \$70,000**
- **One airline estimates \$75-\$100 million/year is lost**
- **Airline Transport Association estimates that ground damage costs \$850 million per year.**

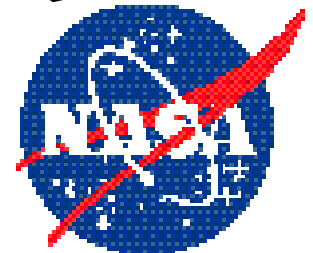
(Source: [hfskyway.faa.gov](http://hfskyway.faa.gov))

# Paradigm Shift: Aloha Airlines, 1988

**Watershed  
Event**



**Brainstormin**



# AIR TRANSPORT ASSOCIATION



[About Us](#) | [Industry Information](#) | [News](#) | [Publications](#) | [Members Only](#) | [Events](#) | [Links](#)

choose a category

## PUBLICATIONS

### ATA Spec 113: Maintenance Human Factors Program Guidelines

Search pubs

#### ATA Specification 113 Maintenance Human Factors Program Guidelines

##### Revision 2000.1

Air Transport Association of America, Inc.  
1301 Pennsylvania Ave., N.W., Suite 1100  
Washington, D.C. 20004-1707

Copyright © 2001 by Air Transport Association of America, Inc. All rights reserved. No part of this document may be reproduced or transmitted by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, except as may be expressly permitted in writing by the publisher.

#### Important Information About This Document

##### Read Before Using This Document

This document contains recommended specifications that have been developed for the covered topics. ATA does not mandate their use.

**<http://www.airlines.org>- The ATA provides free access on their website to ATA SPEC 113: Maintenance Human Factors Program Guidelines, which outlines all of the recognized essential elements for effective error management.**

# Human Factors in Maintenance Programs





# HUMAN FACTORS IN AVIATION MAINTENANCE AND INSPECTION

Welcome to the Human Factors in Aviation Maintenance and Inspection (HFAMI) web site.

This site provides access to products of the Federal Aviation Administration Office of Aviation Medicine's Human Factors in Aviation Maintenance and Inspection Research Program.

The sponsor and authors kindly request that users of this information provide proper citations and credits when using the documents herein.

For more information contact:  
Jean Watson, Program Manager.  
(202) 267-8393

This site complies with DOT H 1350.2

16th SYMPOSIUM  
APRIL 2002  
SAN FRANCISCO, CA, USA



GET INFO • MAKE PLANS  
CLICK HERE

<http://hfskyway.faa.gov>- The FAA's Human Factors in Aviation Maintenance and Inspection Program website provides free access to research products, training materials, etc.



750 Cedarbridge Way  
Richmond, BC V6X 2A7  
Phone: (604) 207-9100  
Fax: (604) 207-9101  
Email: [marss@marss.org](mailto:marss@marss.org)

- [Home](#)
- [Videos](#)
- [Posters](#)
- [Training](#)
- [Membership](#)
- [Newsletter](#)
- [Sponsors](#)
- [Order Page](#)
- [Guest Book](#)
- [What's New](#)
- [Safety Links](#)

## *Maintenance And Ramp Safety Society (MARSS)*

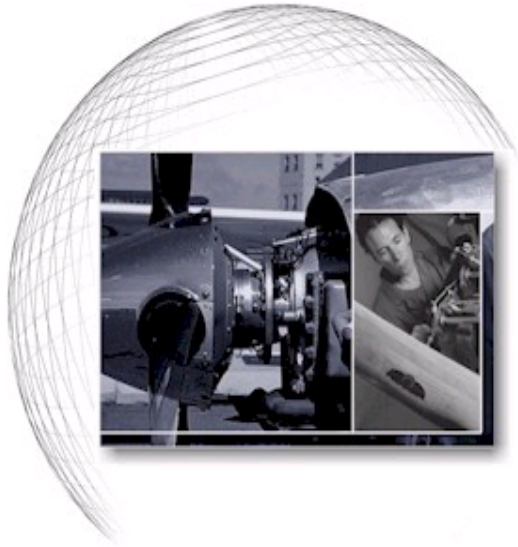
A non-profit society dedicated to reducing aviation human error

**The President, committee members, and members of MARSS would like to extend their condolences to the American people over the tragic losses suffered through the September 11th. bombings in New York city and Washington D.C.**



<http://www.marss.org>- The Maintenance and Ramp Safety Society website provides information on available MRM training videos, professional newsletters, posters, etc etc.

# Canadian Aviation Maintenance Council Conseil canadien de l'entretien des aéronefs



the most  
highly skilled  
**AVIATION**  
and  
**AEROSPACE**  
workforce  
in the world



les  
professionnels en  
**AÉRONAUTIQUE**  
et en  
**AÉROSPATIALE**  
les plus qualifiés  
au monde

<http://www.camc.ca> - The Canadian Maintenance Council website provides information on available MRM courses, courseware, training materials, CBTs, posters, etc.

# Technical Session Speakers:

- LCDR Rick Christoffersen USCG HQTRS USCG
  - *MRM in USCG Aviation Maintenance Risk Reduction*
- Dr. Bob Figlock (USMC Ret) Naval Postgraduate School
  - *Assessment of Naval Aviation Maintenance Safety Climate*
- Mr. Les Wethrington Naval Air Systems Command
  - *Human Error Investigation for Overhaul & Repair Operations*
- Dr. Katie Ricci Naval Air Systems Command Orlando
  - *Human Factors Issues in Maintenance Publication Design*