



# The National Aviation Operations Monitoring Service

**A Project Overview of  
Background, Approach,  
Development and Current Status**

*Agenda*  
**NATIONAL AVIATION OPERATIONS MONITORING SERVICE  
WORKING GROUP MEETING #1**



**Morning Session**

**0900-0945**

***NAOMS INTRODUCTION AND OVERVIEW***

Dr. Mary Connors, NAOMS Co-Manager

Ms. Linda Connell, NAOMS Co-Manager

NASA Ames Research Center

**0945-1015**

***SURVEY METHODOLOGY- SCIENTIFIC BASIS***

Dr. Jon Krosnick, Stanford University

**1015-1030**

***BREAK***

**1030-1045**

***INDUSTRY/GOV'T WORKING GROUP STRUCTURE***

Dr. Mary Connors

**1045-1110**

***SURVEY METHODOLOGY- NAOMS DESIGN DECISIONS***

Dr. Jon Krosnick,

**1110-1145**

***NAOMS SURVEY INSTRUMENT***

Dr. Robert Dodd, NAOMS Principal Investigator, Battelle

**1145-1300**

***LUNCH***

# *Agenda: Continued*

## **WORKING GROUP MEETING #1**



### **Afternoon Session**

**1300-1345**

#### ***DETAILS OF THE NAOMS SURVEY METHODOLOGY***

Dr. Joan Cwi, Battelle Centers for Health Research and Evaluation (CPHRE)

**1345-1445**

#### ***NAOMS SURVEY – PRELIMINARY RESULTS***

Dr. Robert Dodd and Loren J. Rosenthal, Battelle Manager

**1445-1500**

#### ***FUTURE DIRECTIONS***

Dr. Mary Connors and Linda Connell, NASA

**1500-1515**

#### ***BREAK***

**1515-1645**

#### ***OPEN DISCUSSION***

**1645 - 1700**

#### ***SUMMARY AND PLANNING***

#### ***ADJOURN***

# Purpose of Meeting

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- Familiarize participants with NAOMS project
- Describe project in sufficient detail that potential benefits are understood

# NAOMS Team



## ■ NASA Managers

- Mary Connors AvSP, Level 3
- Linda Connell AvSP, Level 3

## ■ Battelle Support Service Contract to NASA

- Loren Rosenthal Battelle Manager
- Robert Dodd Principal Investigator
- Jon Krosnick Survey Methodologist
- Mike Silver Survey Methodologist
- Joan Cwi Survey Application
- Tom Ferryman Statistician
- Bruce Ellis Statistician
- Mike Jobanek Aviation Safety Analyst
- Rowena Morrison Aviation Safety Research

# The NAOMS Team

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- **The NAOMS team is highly experienced and qualified in...**
  - *Survey methodology*
  - *Statistics*
  - *Survey application*
  - *Aviation operations and safety*

# Expressed Need for Event Data



*There have been multiple and consistent recommendations for improvement in aviation data systems . . .*

- **White House Commission on Aviation Safety and Security (“Gore Report”) --**
  - “Most effective way to identify incidents and problems in aviation is for the people who operate the system (pilots, mechanics, controllers, dispatchers, etc) to self-disclose the information.” (Page 13)
- **GAO Evaluation (Safer Skies Review, June 2000) --**
  - Additional performance measures required (by law)
  - Use precursors associated with past accidents to track safety baseline and improvements from interventions
- **NTSB (Safety Report on Transportation Safety Databases, 2002) --**
  - Over 19 recommendations for improvements in safety event reporting (1968-2001)
  - Need to address problem of under-reporting in current aviation safety data systems
- **FAA (Internal Studies, 2004 Strategic Plan draft)**
  - Identify risks before they lead to accidents

# The Unmet Data Need

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- **Reliable, stable numbers with system-wide scope**
  - To inform policy decisions
  - And, investment decisions
  
- **Providing better and more rapid feedback on system change**
  
- **Technological and procedural**
  
- **Facilitating a truly data-driven basis for safety decisions**
  - An escape from the accident *du jour* policy-making syndrome

# Available Data



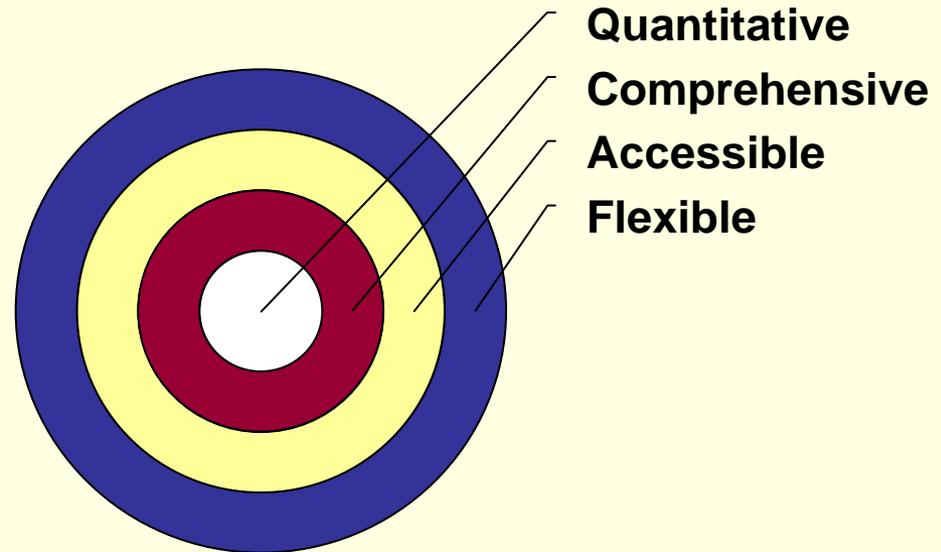
- **A number of databases attempt to capture safety-related information concerning the National Airspace System (NAS)**
  - NTSB Accident/Incident Database
  - FAA Data System (NAIMS)
  - Aviation Safety Reporting System (ASRS)
  
- **A number of databases attempt to capture safety-related information concerning specific parts of the NAS**
  - FOQA
  - PDARS
  - ASAP
  
- **No existing database addresses the health and safety of the NASA as a whole in a quantitatively defensible fashion**

# Goals



***To create a new national capability that will :***

1. Track long-term aviation safety **trends** and patterns.
2. Monitor the impacts of technological and procedural change on the system.
3. Make substantial contributions to data-driven aviation safety decision making.



**Features sought  
in NAOMS**

# Approach

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***NAOMS measures event occurrences, not causes.  
(Notable findings require **additional** investigation.)***

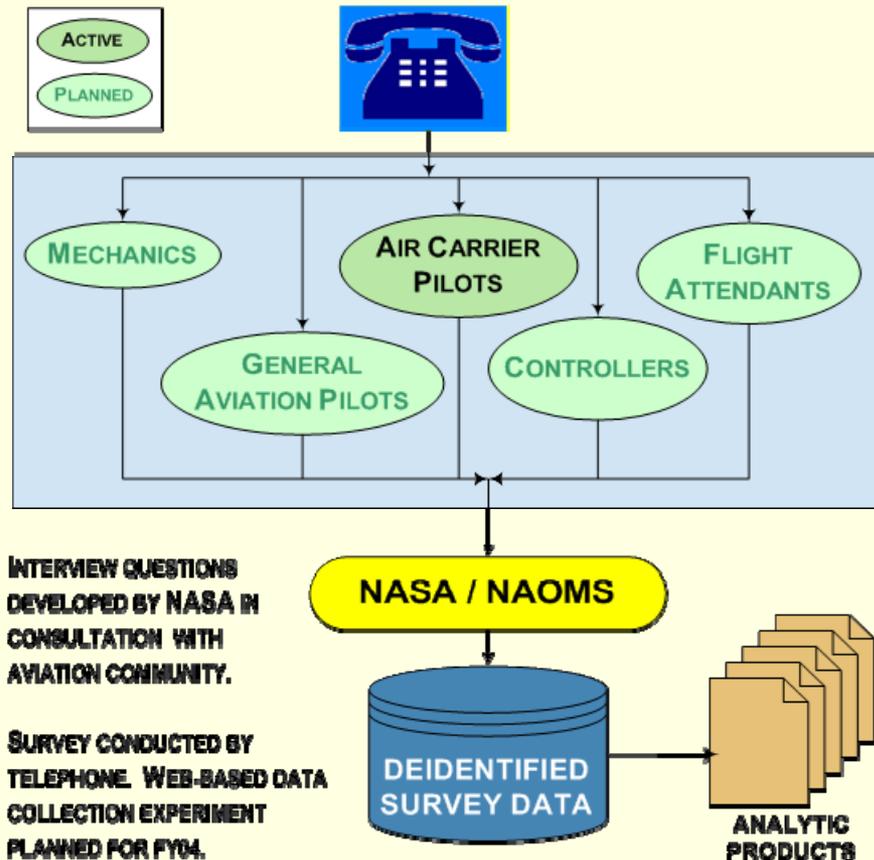
# Insight Into Aviation System Events



- Survey is only viable method to:
  - Address operations of all front line personnel
  - Gain insight into the system as a whole in a quantifiable fashion
  - Provide reliable and valid results
    - Must be designed and implemented according to established scientific procedure
    - High response rate required

**Such methodology is widely used by industry and government policy makers to generate quantitative measures including rates to support policy and program decisions**

# NAOMS Survey Approach



- **Regularly survey those who operate the National Aviation System (NAS)**
  - View the NAS through their eyes
  - Include all types of operations (air carrier, regional, corporate, GA)
- **Collect data on respondents' events (as operationally experienced)**
- **Guarantee confidentiality of data**
- **Achieve scientific integrity by**
  - Using well crafted survey instruments
  - And, rigorous analytic methods.

# NAOMS Development: Survey Content

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- **Reviewed literature, past accidents, safety data systems and past surveys**
  - ASRS, NTSB, AIDS, NAIMS, FOQA programs, other
  - 43 of 62 core questions associated with past air carrier accidents
  
- **Conducted four ALPA-supported focus groups**
  - 36 active air carrier pilots
  - Gained insight into safety problems that concern active line pilots
  - Gained insight into their opinion of possible survey
  
- **Also conducted 3 NATCA-sponsored focus groups with 27 controllers**

# Questionnaire Structure



- **Section A: Operational Exposure**
  - Measures operational activity levels (risk exposure)
  
- **Section B: Safety Event Experiences (Core Questions)**
  - Counts standard event frequencies with long-term trends in mind
  
- **Section C: Focus Topics**
  - Provides a moving “searchlight” that can be redirected as needed to topics of interest
  
- **Section D: Participant Feedback**
  - Seeks continuing feedback on the validity of the NAOMS survey process and survey questions

# Statistical Approach: Rate Development



- **Numerator: safety event counts**
- **Denominator: risk exposure**
  - Flight hours (events that can occur any time during flight)
  - Flight legs (events that occur mainly during terminal operations)
- **NAOMS collects data for the numerator (events) and denominator (exposure) at the same time**
- **Rates are developed for aircraft-size groups**
  - Small transport (<100k# GTOW)
  - Medium transport ( $\geq$  100k# and <200k# GTOW)
  - Large transport (>200k# GTOW with single aisle)
  - Wide-body (>200k# GTOW with two aisles)
- **Confidence intervals are calculated for all rates**

# Quality Assurance



- **NAOMS has QA checks during many steps during data collection and analysis process**
- **CATI (computer aided telephone interviewing) software used at data collection to minimize data entry errors**
  - Range checks on quantities
  - Valid value check on fixed fields
- **Second-stage QA occurs during data processing**
  - Second validation check
  - Check for outliers (roughly 0.5% of data is unreasonable)
- **Additional review and calculation of results done by NAOMS team statisticians to verify analyses**

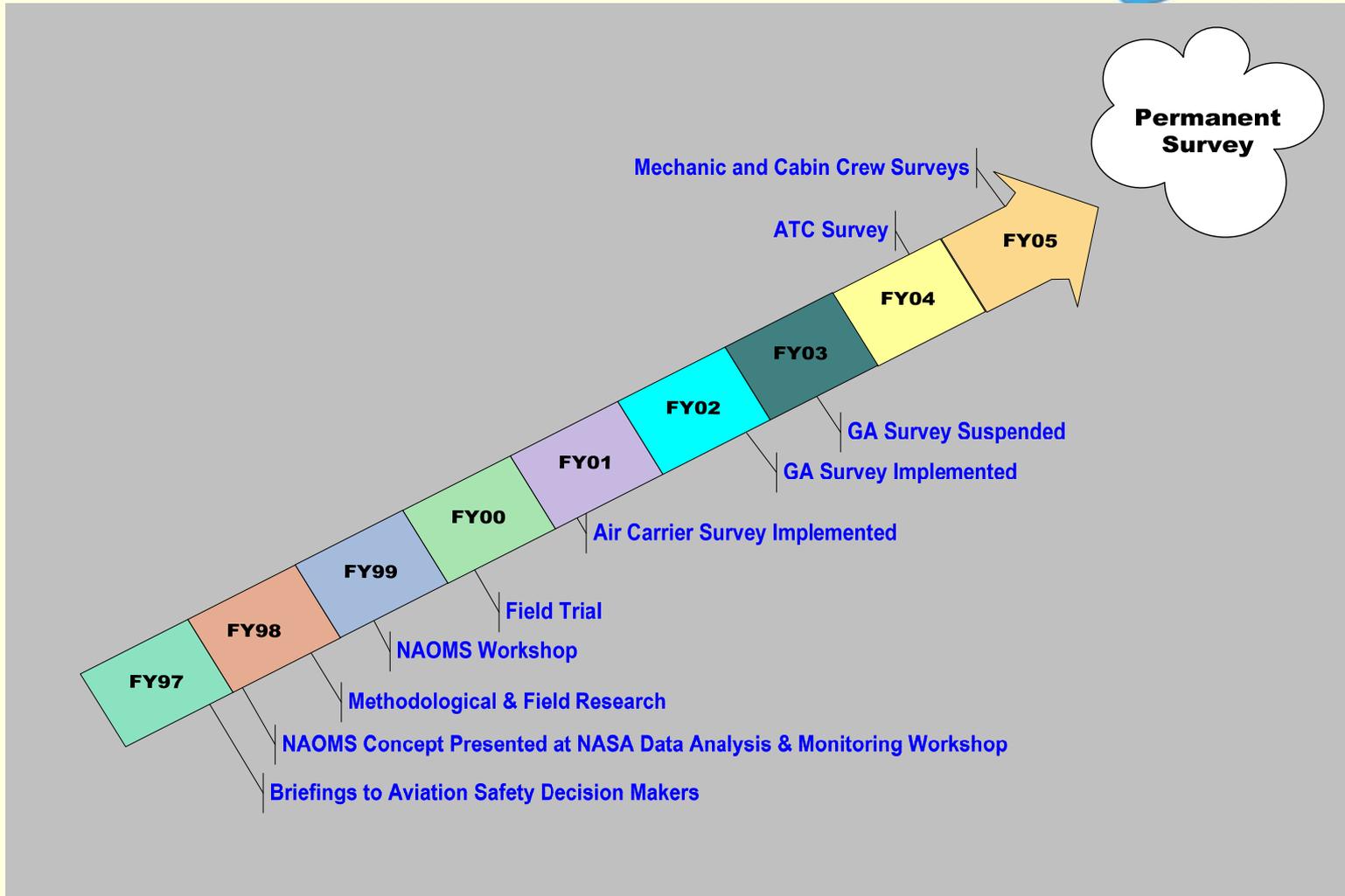
# NAOMS Development: Initial Stages

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- **Initial program planning started in FY1997**
- **Part of NASA's AvSP program**
  - Method for evaluating impact of AvSP interventions
- **Extensive workshops and briefings to FAA and industry through all phases**
- **Development process and OMB approvals were comprehensive, rigorous, and labor-intensive**
  - Required Federal Register Notices (FRN)
- **Routine data collection began with air carrier pilots in April 2001**

# NAOMS Development Timeline



# Government & Industry Groups Briefed



- **FAA**
- **HAI**
- **GAMA**
- **AOPA**
- **ALPA**
- **CAST**
- **NATCA**
- **NATA**
- **Boeing**
- **NBAA**
- **SWAPA**
- **ASRS Advisory Subcommittee**

## *Workshops*

*Preliminary NAOMS workshop, 5/11/99, Alexandria, VA, 60 attendees*

*NAOMS field study briefing 3/1/00, D.C., 75 attendees*

# FAA Participation



- Elements of the FAA have been involved in the NAOMS process from the beginning and at various stages in its development
  - Office of System Safety
  - Flight Standards
  - XXXXXXX (Linda and Mary Input)
- NASA has invited FAA representatives to serve on the NAOMS Working Group
- Encourage others within their organization to provide feedback through the NAOMS Working Group
- Lend support to the NAOMS ATC survey effort
- Determine how the NAOMS results can best be used to support the FAA safety mission.

# Current Status



- **NAOMS follows best survey practices**
- **NAOMS measures the occurrence of events, not causes**
- **It is intended to serve the aviation industry as a whole**
- **The NAOMS survey is designed to expose areas that need further investigation**
- **NAOMS questionnaires development is (excrutiatingly) deliberate and thorough**
- **Numerous briefings and workshops have been conducted with the aviation community**

# Current Status

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- NAOMS statistical methods are robust
- NAOMS meets the goal of a quantitative statistically defensible, system-wide safety assessment tool, complementing other databases and assessment tools.