

# NATIONAL AVIATION OPERATIONS MONITORING SERVICE (NAOMS)

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*August 5, 2003*

# Purpose of Briefing

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**Precisely describe NAOMS development and purpose.**





# NAOMS Purpose

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**To fill an aviation safety data gap through the collection of primary and quantifiable safety data from pilots, air traffic controllers and others. The resulting data to be reliable, accurate and timely.**





# Foundation of NAOMS

- A number of databases attempt to capture safety-related information concerning the National Airspace System
- A number of databases attempt to capture safety-related information concerning specific parts of the NAS

**No existing database addresses the health and safety of the NAS as a whole in a quantitatively defensible fashion.**



# Expressed Need for Event Data



- **Multiple and consistent recommendations for improvement in aviation safety 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





# Survey Rationale

- **Reliable and valid results**
  - Must be designed and implemented according to established scientific protocols
  - Require high response rates
- **Survey methodology widely used by industry and government policy makers**
- **Many Federal programs use data for safety and management decisions**
  - **DOT Omnibus Transportation Survey**
    - Telephone, monthly, ongoing, all households, 1,000 interviews per month
  - **National Household Travel Survey (NHTS)**
    - Telephone, 40,000 households, every five years
  - **Commodity Flow Survey**
    - Telephone, shippers of domestic products, every five years, over 100 k sampled each time survey applied



# Key NAOMS Characteristics

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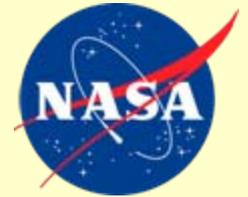


- Quantitative
- System-wide
- Representative and inclusive
- Timely
- Statistically and scientifically valid
- Flexible (Section C)



# Goals

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1. Track aviation safety trends
2. Monitor the impacts of technological and procedural changes to the aviation system
3. Encourage emphasis on areas where improvements could have the greatest impact
4. Contribute to the development of a data-driven basis for safety decisions
  - Through integration of findings through industry and government groups



# Survey Approach

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- Regularly survey pilots, controllers, mechanics, flight attendants and others who operate in the NAS
- View the national aviation system through their eyes (primary data)
- Includes all types of operations (air carrier, regional, corporate, general aviation)
- Collect data on events directly experienced by respondents
- Guarantee confidentiality
- Achieve scientific integrity by using well crafted survey instruments and statistical analysis methods



# Focus

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NAOMS measures event occurrence, not causes. Notable trends or findings require *additional* investigation.



# 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
- T. Ferryman Statistician
- Bruce Ellis Statistician
- Mike Jobanek Aviation Safety Analyst

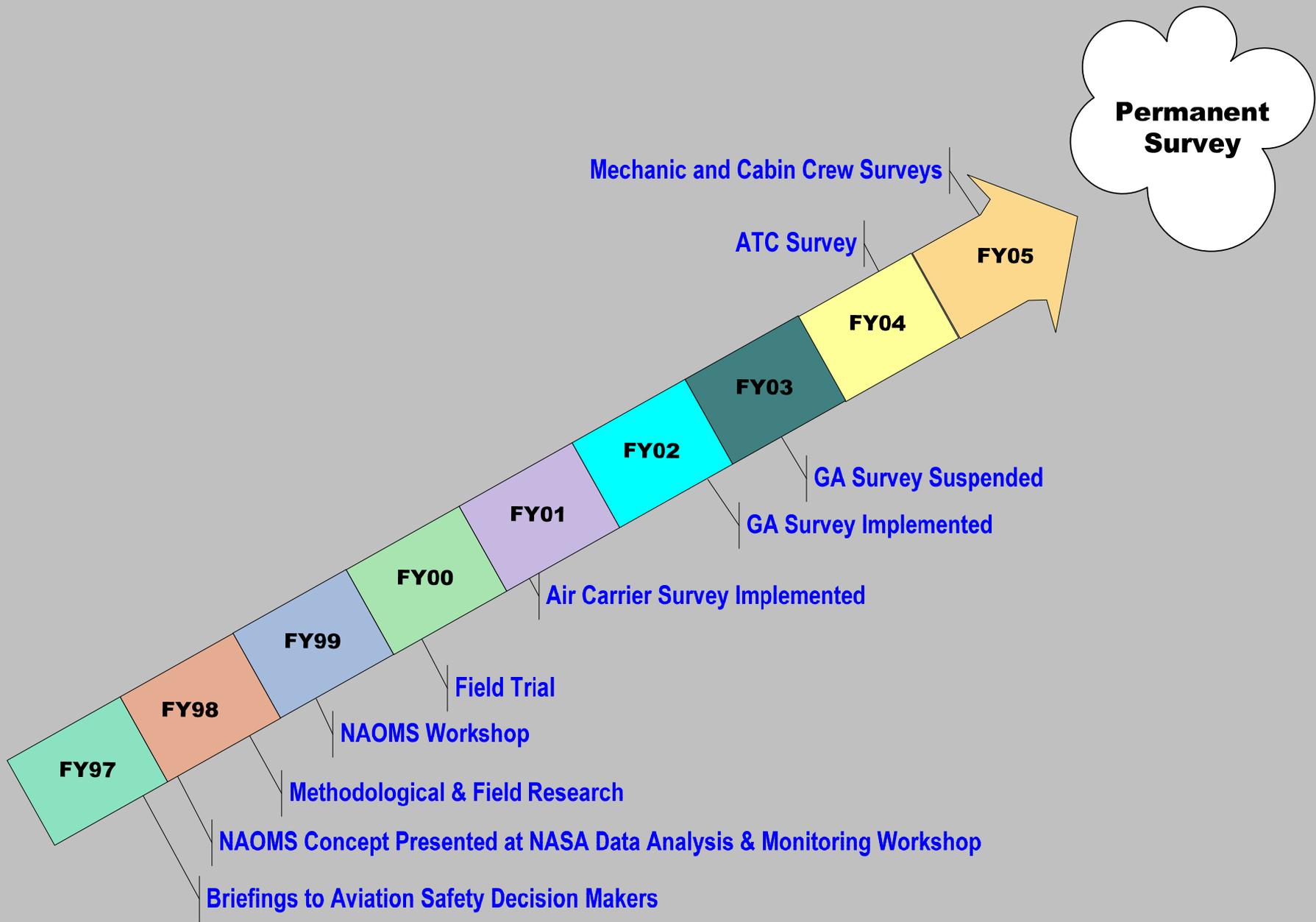




# NAOMS Development

- **Initial program planning started in FY 1997**
- **Part of the NASA's AvSP program**
  - Method for evaluating impact of AvSP interventions
- **Extensive briefings and workshops 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**





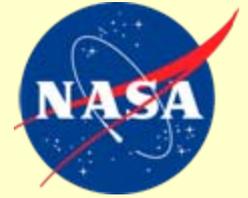
# NAOMS Development: Survey Content



- **Reviewed literature, 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)**



# NAOMS Development: Organization and Form

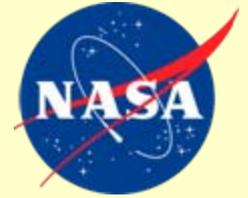


- **Conducted ALPA supported experimental research with active line pilots to determine**
  - How well pilots remember (period of recall)
  - How pilots organized memory of safety events (questionnaire organization)
  - Survey “talk-aloud” tests (individual pilots provide real time criticism of questionnaire content and structure)
- **Developed a draft survey that was**
  - Extensively edited and corrected for non-technical wording by survey method experts
  - Edited and corrected for technical accuracy by aviation subject matter experts

**Extensive and detailed up-front effort devoted to questionnaire development.**



# Pre-Field Trial Industry and Government Workshop



- **May 1999 – Pre Field Trial Workshop in Alexandria, VA**
- **Goals of workshop**
  - Described program and solicited input
  - Presented draft questionnaire and asked for comments
- **Participants**
  - Industry and government invited, 52 participants
  - All major organizations represented including FAA, NTSB, ALPA, ATA, etc
- **Comments**
  - Working groups developed for comments
  - Comments provided and summarized
  - FAA conducted internal survey and provided summary comments



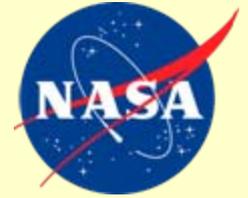
# NAOMS Development: Field Trial



- Survey was tested in a field trial among 630 active air carrier pilots to determine its suitability and to discover weaknesses or flaws
- Pilots in field trial were asked to provide input into areas that were unclear, needed improvement, or topics that should be dropped or added
- Findings from field trial used to further edit and revise questionnaire



# Post-Field Trial Industry and Government Workshop



March 2000 – Post Field Trial Workshop in Washington D.C.

- **Goal of workshop**
  - Presented findings from field trial
  - Described next steps of program
  - Obtained additional input from industry and government organizations
- **Participants**
  - Industry and government invited, 39 participants
  - All major organizations represented including FAA, NTSB, ALPA, ATA, etc
- **Summary of results**
  - Comments provided and summarized



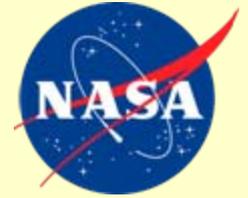
# Survey Initiation



- **Air Transport Pilots initial group**
- **60-day recall period; telephone interviews**
- **8,000 interviews/year**
- **Questionnaire Content**
  - Section A - Demographics/experience
  - Section B - Core questions of study; consistent data set over time
  - Section C - Focused topics to be driven by government/industry high priority needs, changes over time
  - Section D - Questionnaire Feedback



# 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 developed for aircraft size groups**
  - Small transport (<100 k# GTOW)
  - Medium transport ( $\geq 100$  k# and < 200 k# GTOW)
  - Large transport (> 200 k# GTOW with single aisle)
  - Wide-body (> 200 k# GTOW with two aisles)
- **Confidence intervals are calculated for all rates**



# Statistical Approach: 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**



# Statistical Approach: Future Directions

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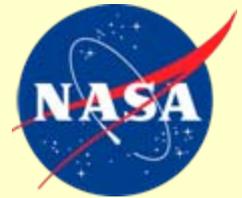


**Future data products to be determined by guidance from the NAOMS working group**



# Status

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- **Air Carrier Pilots**
  - Over 17,000 interviews
  - 70% response rate
  - Interviews continue
- **Over 4,000 interviews with General Aviation Pilots**
  - Presently suspended
- **Air Traffic Controller Survey scheduled for startup in FY- 04**



# NAOMS Working Group



## ■ Purpose

- Ensure that all aspects of the NAOMS are and continue to be properly implemented and that results are valid and appropriate
- Gain agreement concerning information release in terms of content, level, form, and timing

## ■ Industry and Government Groups

- Individuals recruited from all major industry and government; selected for their individual/team skills

## ■ Non-Disclosure/Confidentiality Agreement

## ■ Ames Associates Program - Industry Participants

- No government compensation, no intellectual property rights covered by Workmen's Compensation [by ARC]



# Summary

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- **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**
- **Numerous briefings and workshops have been conducted with the aviation community**
- **Over 17,000 air carrier pilot surveys have been completed**
- **NAOMS meets the goal of a quantitative, statistically defensible, system-wide safety assessment tool, complementing other databases and assessment tools**





# FAA Participation

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- Elements of the FAA have been involved in the NAOMS process from the beginning and at various stages in its development
- NASA has invited 2-3 FAA representatives serve on the NAOMS Working Group
- Encourage others within their organization to provide feedback through the NAOMS Working Group
- Lend support to NAOMS ATC survey effort
- Determine how the NAOMS results can best be used to support the FAA safety mission.

