# NATIONAL AVIATION OPERATIONS MONITORING SERVICE
# (NAOMS)

***Presentation to AvSSP Office***
***December 5, 2002***

**Unless otherwise indicated, the only modifications to this presentation are those made to ensure the information it contains is accessible to individuals with disabilities.

# Purpose

- **A number of databases attempt to capture safety-related information concerning National Airspace System, e.g.**
  - 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, e.g.**
  - FOQA
  - PDARS
  - ASAP
- **No existing database addresses the health and safety of the NAS as a whole in a quantitatively defensible fashion.**

# Goal

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

1. Track aviation safety trends
2. Monitor the impacts of technological and procedural changes to the aviation system
3. Contribute to the development of a data-driven basis for safety decisions.

# Industry Groups Briefed

- NBAA
- HAI
- GAMA
- AOPA
- ALPA
- CAST
- NATCA
- NATA
- Boeing
- FAA
- SWAPA
- ASRS Advis. Sub

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

# NAOMS Team

*NASA Managers*

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

*Battelle Support Service Contract to NASA*

- **Loren Rosenthal** — **Battelle Manager**
- **Robert Dodd** — **Principal Investigator**
- **Jon Krosnick** — **Survey Methodologist**
- **Joan Cwi** — **Survey Application**
- **T. Ferryman** — **Statistician**
- **Mike Silver** — **Survey Methodologist**
- **Mike Jobanek** — **Aviation Safety Analyst**

# Agenda

- 9:00-9:15 - NAOMS Introduction
  Mary Connors
- 9:15-9:35 - Concepts and Rationale
  Loren Rosenthal
- 9:35-10:00 - Protocol Development and Description
  Jon Krosnick
- 10:00-10:20 - Data Collection
  Joan Cwi
- 10:20-10:30 Break
- 10:30-12:00 - Air Carrier Survey Results
  Bob Dodd
- 12:00-1:00 - Lunch
- 1:00 - 1:30 - General Aviation Survey
  Mary Connors
- 1:30-2:15 - Future Plans
  - General Survey Perspectives
  Jon Krosnick
  - Perspectives on NAOMS
  Linda Connell
- 2:15-2:25 - Break
- 2:25-2:50 - Outreach and Community Information
  Linda Connell
- 2:50-3:15 - Summary and Wrap-up
  Mary Connors and Irv Statler
- 3:15-5:00 - Discussion
  AvSSP Program Office, NAOMS Team
- Adjourn

# CONCEPTS and RATIONALE

Loren Rosenthal

# The Unmet Data Need

- **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

After examining various possibilities, it was decided that a survey approach could best meet the unmet requirements

# Features of the Survey Method

- Human-centered
- Quantitative
- Flexible (versatile, topical)
- Comprehensive
- Well developed methodology
- Statistically accurate
- Stable

# Users of Survey Research

**The advantages of the survey method have been demonstrated by its wide use in:**

- Federal, State, and Local Government
- Academia
- Federal and State Courts
- Consumer Research

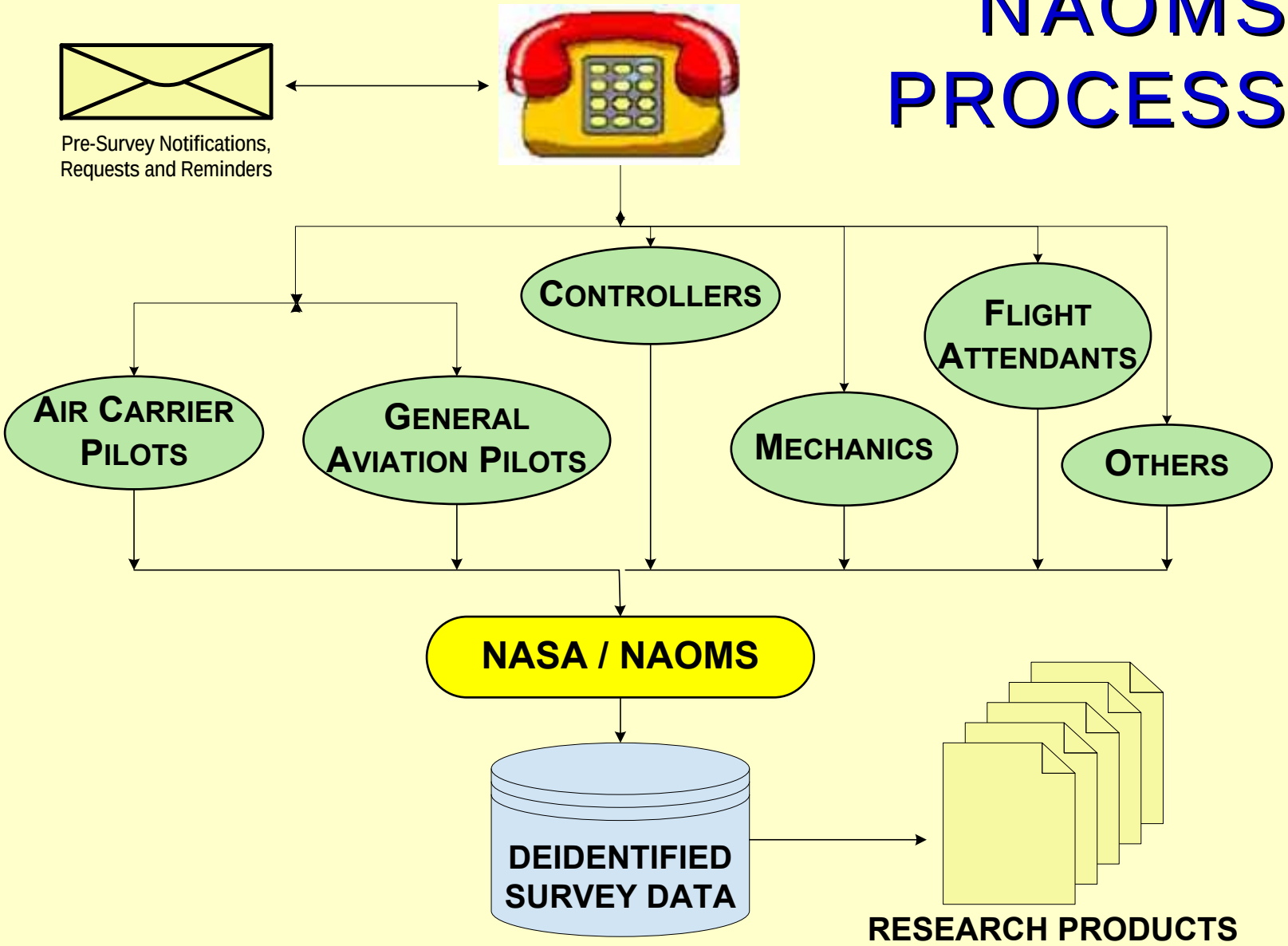
# Common Characteristics of these Efforts

- Appropriate over the long-term
- Measure the degrees or levels of changes
- Demonstrate trends
- Identify risk factors
- Address human performance
- Employ statistical methods
- Evaluation of study population changes

# NAOMS Survey Approach

- **Regularly survey pilots, controllers, mechanics, flight attendants and others who operate the national aviation system (NAS)**
  - View the national aviation system through their eyes
  - Includes all types of operations (air carrier, regional, corporate, general aviation)
- **Collect data on respondents events (as operationally experienced)**
- **Guarantee confidentiality of data**
- **Normalize for risk exposure (hours, legs, etc.)**
- **Achieve scientific integrity by using well crafted survey instruments and statistical analysis methods**

# NAOMS PROCESS



# NAOMS Outputs

- **Safety Event Rates and Trends**
- **Quantitative Analyses of Safety Issues**

## NAOMS EVENT RATE ESTIMATES

**Preliminary Estimates for Internal Use Only**

| *Equipment Problems* Question | | Risk Exposure Factor | Estimated Event Frequency per Million Exposure Units ( COV )* SMA | MED | LRG | WDB |
|---|---|---|---|---|---|---|
| ER1 | Diversion Due to Equipment Problem | Hours | 2,137.5 (17.10%) | 783.8 (6.8%) | 498.7 (12.4%) | 577.3 (8.9%) |
| ER2 | Hazmat Spill, Fire, or Fumes | Legs | | 87.4 (32.6%) | 53.4 (104.3%) | 334.0 (25.2%) |
| ER3 | Cargo Shift | Legs | 262.1 (117.54%) | 115.7 (25.7%) | 2,159.6 (13.9%) | 2,674.9 (8.8%) |
| ER4A | Uncommanded Movement of Elevators | Hours | 578.7 (27.50%) | 243.7 (15.1%) | 115.5 (50.9%) | 137.0 (17.6%) |
| ER4B | Uncommanded Movement of Rudder | Hours | 219.8 (39.65%) | 81.5 (19.7%) | 46.3 (35.8%) | 61.2 (29.3%) |
| ER4C | Uncommanded Movement of Ailerons | Hours | 262.0 (56.64%) | 103.3 (19.8%) | 23.6 (65.2%) | 67.6 (27.6%) |
| ER4D | Uncommanded Movement of Spoilers | Hours | 65.2 (45.30%) | 97.8 (24.5%) | 72.5 (59.3%) | 82.3 (24.7%) |
| ER4E | Uncommanded Movement of Speedbrakes | Hours | 78.3 (54.34%) | 34.6 (34.5%) | 27.4 (48.0%) | 37.6 (54.8%) |
| ER4F | Uncommanded Movement of Trimtabs | Hours | 217.2 (43.99%) | 53.6 (26.4%) | 15.2 (75.3%) | 19.9 (43.7%) |
| ER4G | Uncommanded Movement of Flaps | Hours | 216.5 (37.63%) | 44.6 (24.9%) | 64.5 (34.7%) | 50.1 (23.8%) |
| ER4H | Uncommanded Movement of Slats | Hours | 12.2 (285.23%) | 42.6 (26.6%) | 53.5 (35.1%) | 61.1 (29.1%) |
| ER4I | Uncommanded Movement of Other | Hours | 478.8 (32.64%) | 178.4 (12.7%) | 192.6 (21.8%) | 183.2 (12.3%) |
| ER5A | Fire, Smoke, or Fumes; Engine or Nacelle | Hours | 177.8 (54.42%) | 70.8 (24.1%) | 65.0 (61.9%) | 64.8 (29.8%) |
| ER5B | Fire, Smoke, or Fumes; Flight Deck | Hours | 140.5 (46.84%) | 50.7 (22.8%) | 63.1 (29.5%) | 66.1 (19.8%) |
| ER5C | Fire, Smoke, or Fumes; Cargo Hold | Hours | | 21.8 (37.8%) | 30.3 (76.6%) | 47.5 (28.5%) |
| ER5D | Fire, Smoke, or Fumes; Galley | Hours | 116.9 (51.47%) | 328.3 (9.8%) | 199.7 (14.3%) | 266.3 (10.2%) |
| ER5E | Fire, Smoke, or Fumes; Elsewhere in Pax Compart't | Hours | 136.6 (44.19%) | 231.5 (11.5%) | 157.4 (17.5%) | 230.1 (12.5%) |
| ER5F | Fire, Smoke, or Fumes; Elsewhere | Hours | 92.8 (49.44%) | 185.1 (13.3%) | 88.4 (40.2%) | 114.5 (19.8%) |
| ER6 | Precautionary Engine Shutdown | Hours | 570.3 (35.08%) | 94.3 (17.8%) | 50.9 (45.8%) | 119.0 (16.9%) |
| ER7 | Total Engine Failure | Hours | 187.8 (90.02%) | 24.8 (33.6%) | 2.9 (126.1%) | 43.1 (36.8%) |

# Protocol Development and Description

Jon Krosnick

# Surveys Can Measure:

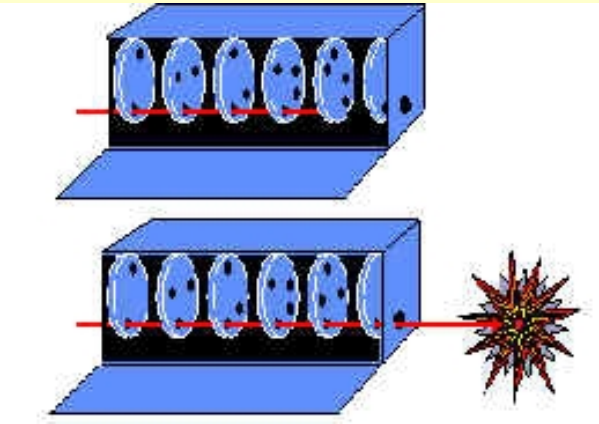
- Attitudes
- Preferences
- Beliefs about the state of the world
- Predictions about the future
- Past behavioral experiences or events

**NAOMS will focus on the measurement of events**

# NAOMS
# Design Decisions

- What events to address?
- What order of questions?
- How long of a recall period?
- What mode?

# Types of Events



| | |
|---|---|
| Accidents | Mid-air collision |
| ↑ | |
| Proximal Causal Events | Incorrect altitude |
| ↑ | |
| Distal Causal Events | Altitude clearance misunderstood by pilot |
| ↑ | |
| Static Contribution Factors | Microphone, earphones, radios, pilot's hearing, noise, etc |

# Building Lists of Events

- **Focus Groups with Active Professional Participants**
- **Consultation with Industry/Gov't Safety Group, e.g.**
  - CAST
  - FAA
  - ASRS Analysts
  - Workshops
- **Review of Aviation Databases, e.g.,**
  - ASRS
  - NTSB
  - NAIMS
  - BTS
- **Decision: Sample Events at Distal or Proximal Levels of Event Chain**

# Question Ordering

**Question Ordering Relates to Memory Organization:**

- Records of experiences are organized systematically and thematically in memory
- Asking questions in clusters that match a person's memory organization improves measurement precision
- Various hypotheses about how pilots might organize their memories discussed, but no hard data.

# Memory Organizations

- **Severity**
- **Causes**
- **Phase of Flight**

# Identifying Memory Organization

- **Experiments**
- **Participants: Air carrier pilots**
- **Various tasks**
  - Order of Recall
  - Labeling of Clusters
  - Sorting of Events into Categories
- **Decision: A "hybrid" organization emerged: mostly causes with some phases**

# Recall Period

**Recall Period - The optimal time between event occurrence and survey**

- Needs to maximize recall and balance survey logistics
- Memories fade over time
- Participants should not be asked to recall things from too far in the past
- Literature Review: A literature review resulted in data that we felt to be insufficient for our purposes
- Our own study of pilots' recall of mundane flight events: 7 days maximum
- We needed to determine how long more serious events can be remembered

# Recall Period: Validity Analysis

- Association of hours flown with number of events witnessed
- Association of days in the recall period with number of events witnessed
- Strongest relationships for one month and two months
- Decision: Keep recall period less than four months (60 days chosen as recall period)

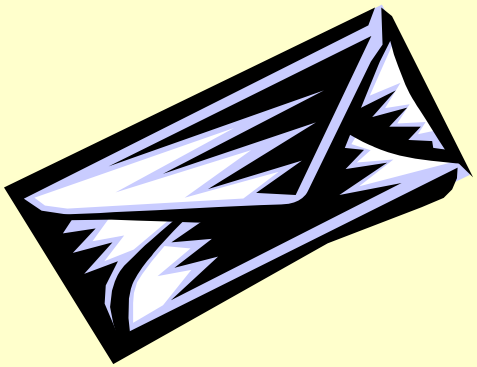
# Data Collection Modes

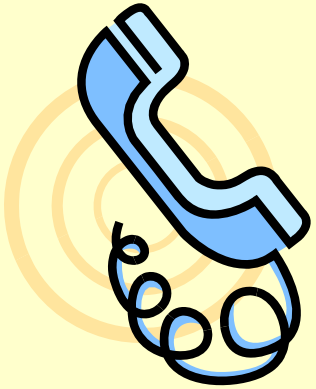
- **Mailed, Self-Administered (SAQ)**
- **Telephone (CATI)**
- **In-Person**

Each mode has positive and negative aspects related to a variety of considerations

# Test Findings:

- **Cost**
  - Mail $60
  - Telephone $75
- **Response Rate**
  - Mail 73%
  - Telephone 81%
- **Completion Rate**
  **(% missing responses)**
  - Mail 4.8%
  - Telephone 0.0%
- **Confidence**
  - Mail 80%
  - Telephone 91%





In-Person Interviewing Terminated Early d/t Time and Cost Investment

# Mode: Selection and Validation

- **Validation results:**
  - More hours flown should be associated with more events witnessed
  - More days in the recall period should be associated with more events witnessed
  - Stronger relationships indicate more accurate reporting
- **Mode selection:**
  - 30% stronger relationships for telephone than mail
- **Decision: Perform telephone interviewing (Computer Assisted Telephone Interview - CATI)**

# Summary of Design Conclusions

- Address as many events as practical from focus groups
- Order questions to match hybrid clustering
- Use 60-day recall period to maximize documentation of rare events
- Use telephone interviewing to maximize measurement accuracy

# Data Collection

Joan Cwi

# Sample Design

- **Sample source**
  - Airmen Certification Directory (N = 670,000)
  - Available online at FAA Oklahoma City
- **Two samples are drawn among U.S.-based pilots**
  - Air Carrier (N = 55,000)
  - General Aviation (N = 450,000)
- **Sample drawn on quarterly basis**
  - Sampling without replacement for 12 rolling months

# Locating Pilots

- **Addresses updated, telephone numbers obtained**
  - National Change of Address
  - Telematch
  - Other sources, such as Directory Assistance, Web sites
- **Location results**
  - 80% of AC pilots
  - 70% of GA pilots

# Interviewing Process

- Sending Advance Letter
- Screening for Eligibility
- Conducting the Interview

# Sending Advance Letter

- Sent to pilots about a week before calling
- On NASA letterhead/envelopes
- Explains purpose of study, what participation means, confidentiality, who will call, etc.

# Screening for Eligibility

- **Attempt to screen all pilots by telephone**
- **AC screener**
  - Determines pilot has flow in last 60 days as air carrier pilot
- **GA screener**
  - Determines pilot has flown in last 60 days as
    - Helicopter pilot
    - Fixed wing general aviation pilot
    - Air carrier pilot (not captured in air carrier sample)

# Conducting the Interview

- Conduct screening and interviewing using computer-assisted telephone interviewing (CATI)
- Interviewer administers questionnaire from telephone center
- Questionnaire pre-programmed into computer so data entered immediately--no additional data entry
- CATI has most error checks built into the programs--requires little editing
- 10% of each interviewer's work is validated

# Air Carrier Interviewing Effort

- **Yearly interviewing effort**
  - Sample size (N = 14,300)
  - Screening (N = 10,700)
  - Interview (N = 8,000)
  - Interview length averages 18 minutes
- **Non- completes**
  - No locates (N = 18%)
  - Not eligible (N = 19%)
- **Progress to date (1.5 years)**
  - 11,800 completed interviews

# General Aviation Interviewing Effort

- **Yearly interviewing effort**
  - Sample size (N = ~23,800)
  - Screening (N = ~15,000)
  - Interview (N = 8,000)
  - Interview length averages 27 minutes
- **Progress to date (13 weeks)**
  - 2,000 completed interviews

# General Aviation Interviewing

- Too early to predict final outcomes
- Initial location efforts seem to indicate that when compared with air carrier pilots, GA pilots difficult to locate
- Once located, it takes more effort to get a completed interview
- Although refusal rate is not high yet, it is higher than AC rate after same period of time

# Air Carrier Survey Results

Robert Dodd

# Air Carrier Questionnaire Structure*

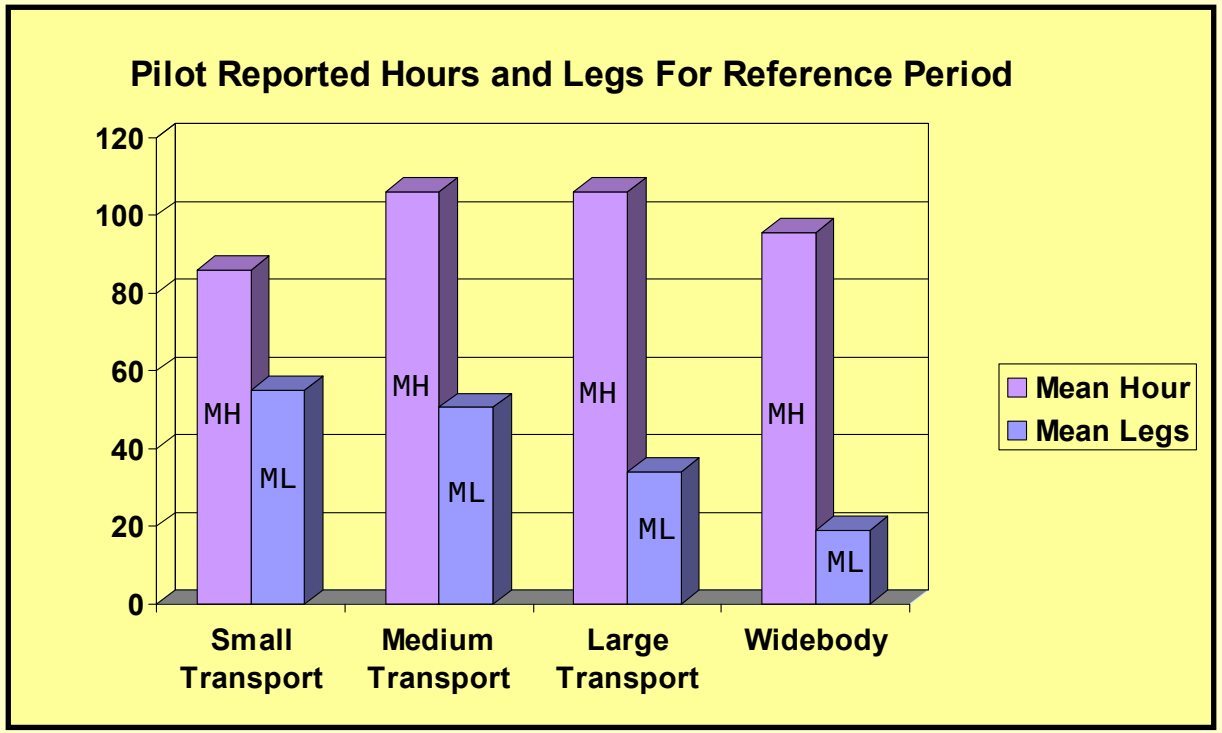
- **Section A: Descriptive Demographic Information**
  - Information suitable for exposure determination: Lifetime hours flown, hours and legs flown last 60 days, aircraft make/model, type flights, crew position and more
- **Section B: Safety Related Events**
  - Consistent data set over time
- **Section C: Focus Questions**
  - Specific topics driven by government/industry high-priority needs
- **Section D: Questionnaire Feedback**

*** Data collection started April, 2001; over 11,800 completed interviews to date**

# Air Carrier Results
# Section A - Demographics

| Respondent Flight Experience | Mean Value |
|---|---|
| ***Total Life-Time*** Flight Hours | 10,094 hours |
| ***Last 60 Days*** Flight Hours | 97.8 hours |
| ***Last 60 Days*** Departures | 37 Departures |

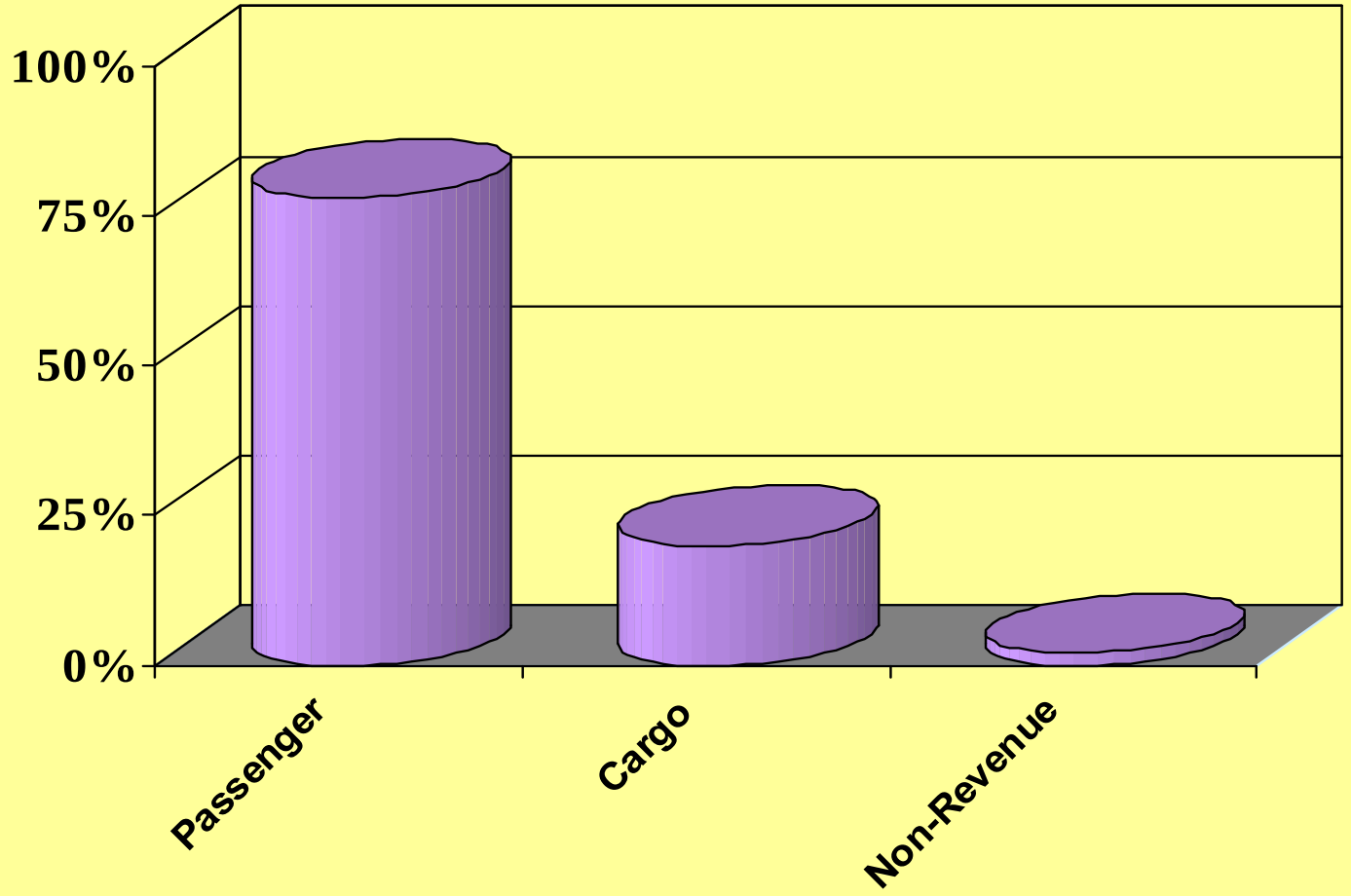
# Hours and Legs by Aircraft Size




| Aircraft Size | Mean Hours Per Leg |
|---|---|
| Small Transport | 1.5 |
| Medium Transport | 2.1 |
| Large Transport | 3.1 |
| Widebody | 4.9 |

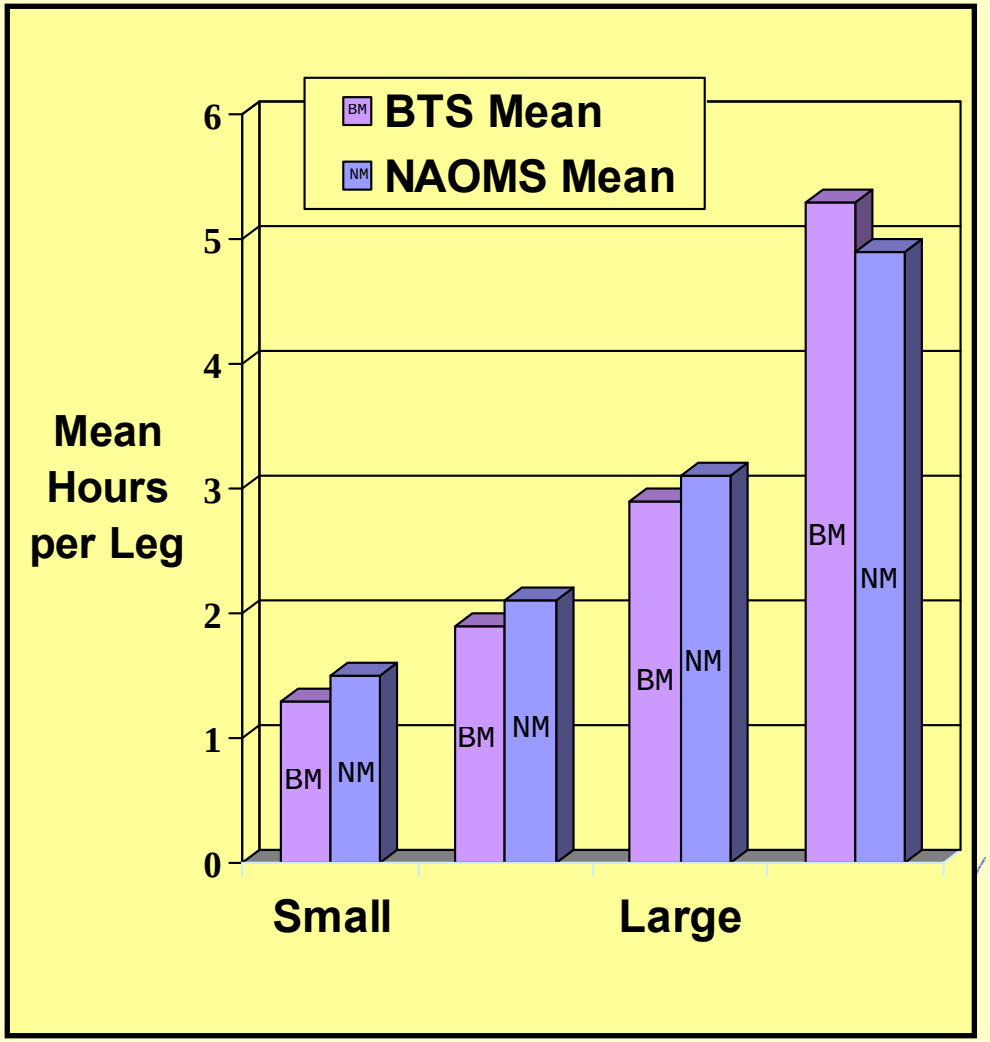
- Small Transport < 100 k lbs GTOW
- Medium Transport ≥ 100 k lbs and < 200 k lbs GTOW
- Large Transport > 200 k lbs GTOW with single aisle
- Widebody > 300k lbs GTOW with two aisles

# Type of Flight

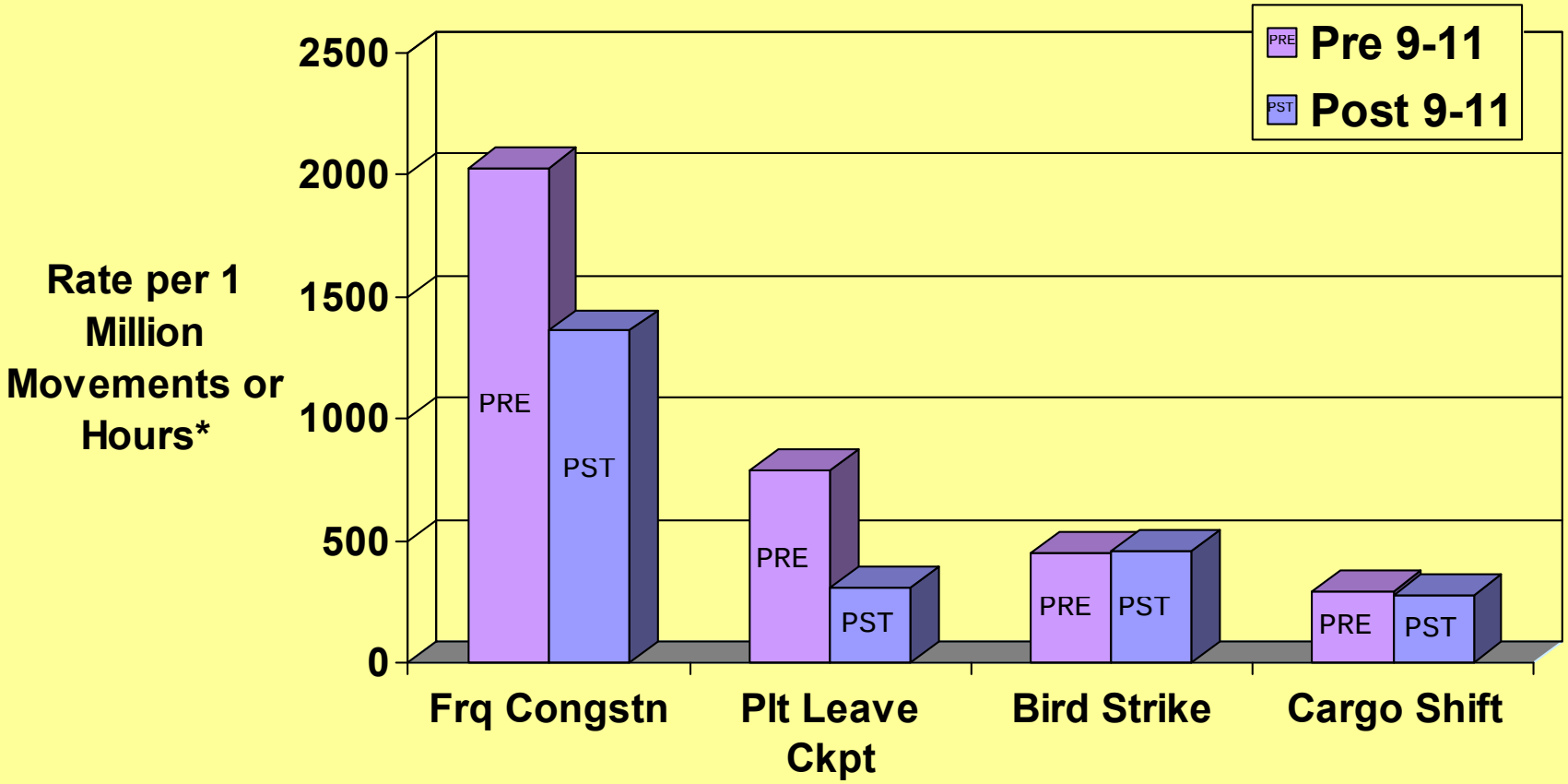


# NAOMS Flight Time per Leg Estimates Compared to BTS Census Data

| Aircraft Category | Estimate Source | Mean Hours Per Leg |
|---|---|---|
| Small Transport | NAOMS | 1.5 |
| | BTS | 1.3 |
| Medium Transport | NAOMS | 2.1 |
| | BTS | 1.9 |
| Large Transport | NAOMS | 3.1 |
| | BTS | 2.9 |
| Widebody | NAOMS | 4.9 |
| | BTS | 5.3 |



# Pre and Post 9-11 Evaluation of Sample Events




* Rate for Bird strikes is calculated for each departure.

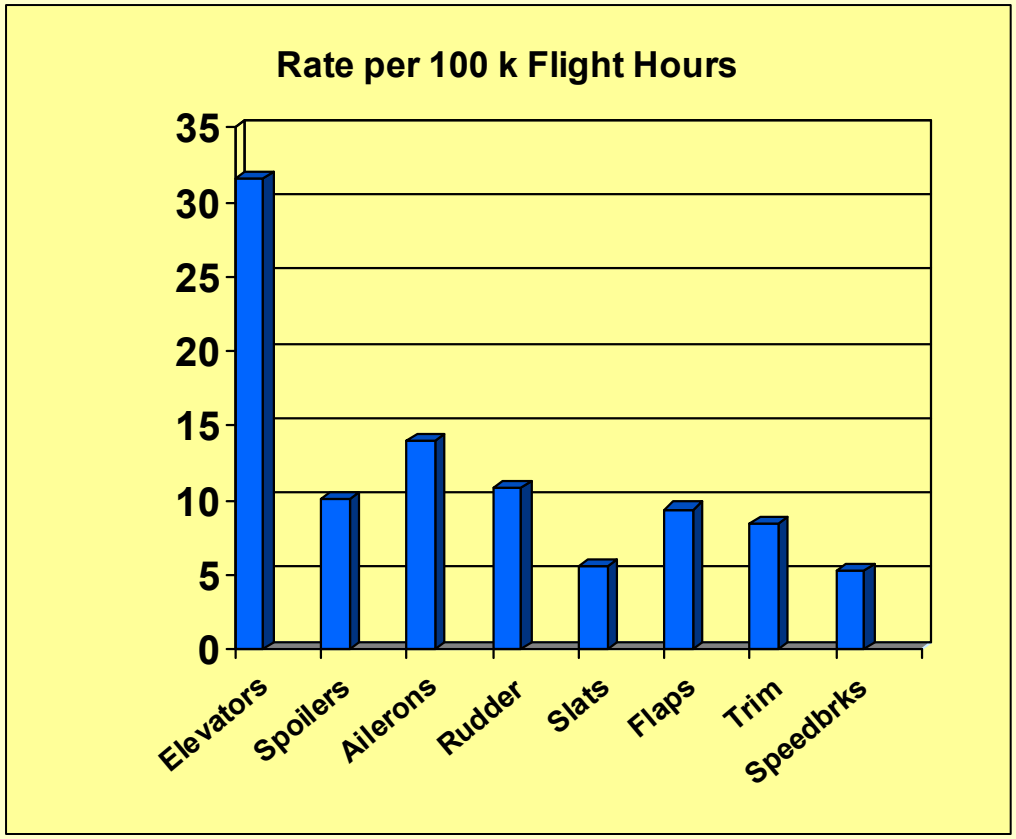
# Section B: Safety Related Events

- Equipment Problems
- Turbulence
- Weather Events While Airborne
- Passenger Related Events
- Airborne Conflicts
- Ground Operations
- Aircraft Handling Events
- Altitude Deviations
- Air Traffic Control Interactions

# Equipment-Related Events

This section addresses aircraft related equipment failures such as equipment-related diversions, engine problems, uncommanded movements etc.

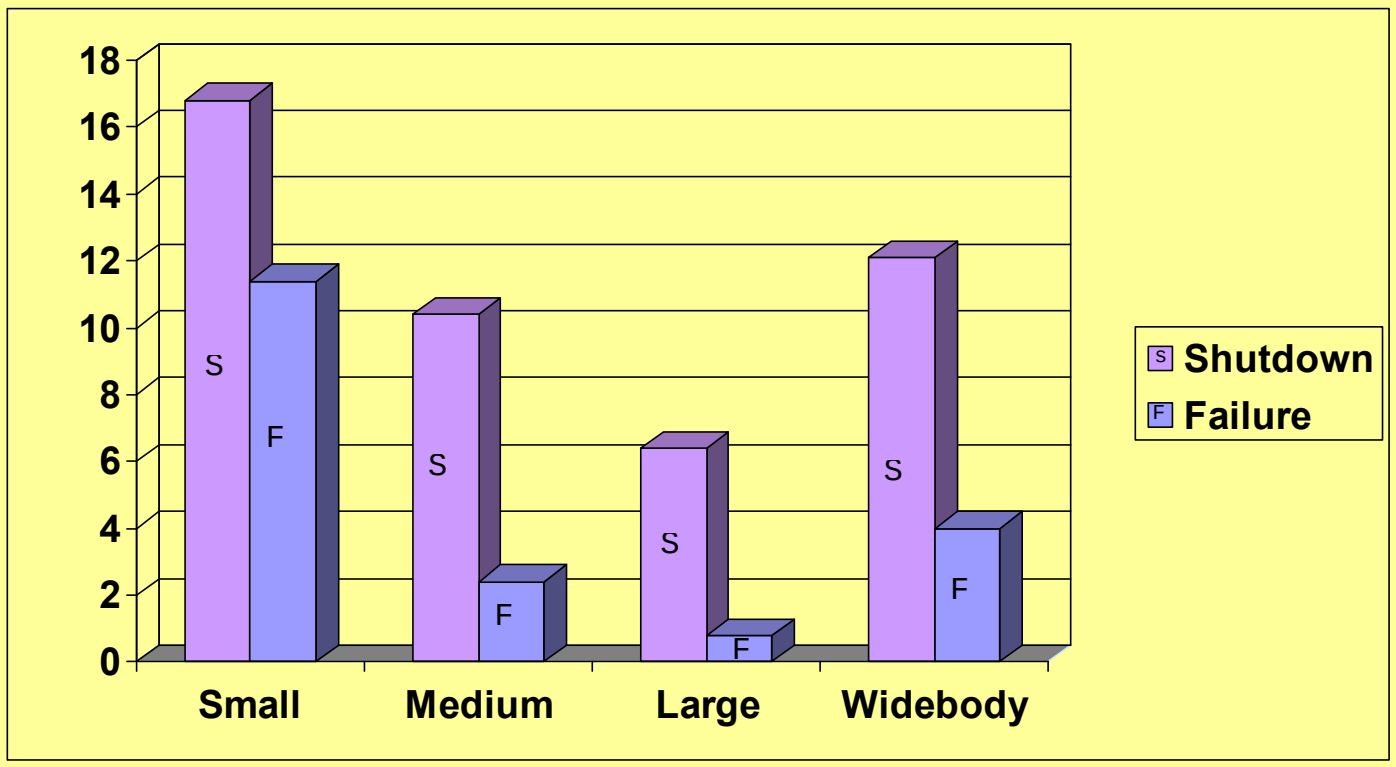
# Uncommanded Control Surface Movements




| Control System | Event # | Extrapolated Annual Events |
|---|---|---|
| Elevators | 263 | 3,153 estimated |
| Spoilers | 83 | 1,005 estimated |
| Ailerons | 109 | 1,393 estimated |
| Rudder | 95 | 1,085 estimated |
| Slats | 43 | 549 estimated |
| Flaps | 81 | 936 estimated |
| Trim | 74 | 835 estimated |
| Spdbrakes | 44 | 521 estimated |

Recent accidents have highlighted importance of the risk of uncommanded movements

# Engine Shutdown and Failure Rates per 100k Flight Hours

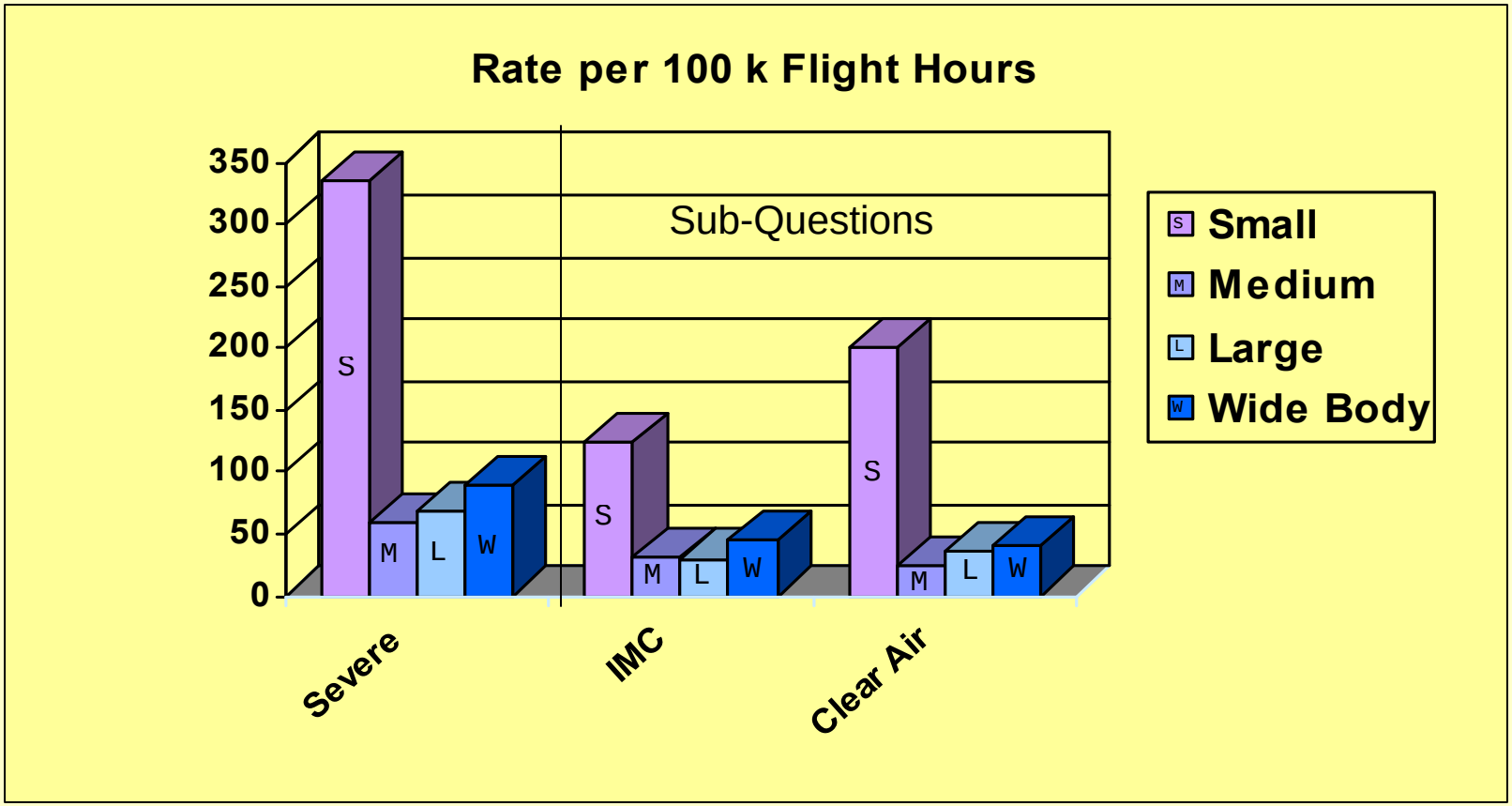



NAOMS data suggest approximately 470 engine failures occur per year system-wide.

# Turbulence Events

**Questions address severe turbulence as well as wake turbulence events.**

# Atmospheric Turbulence Encounters

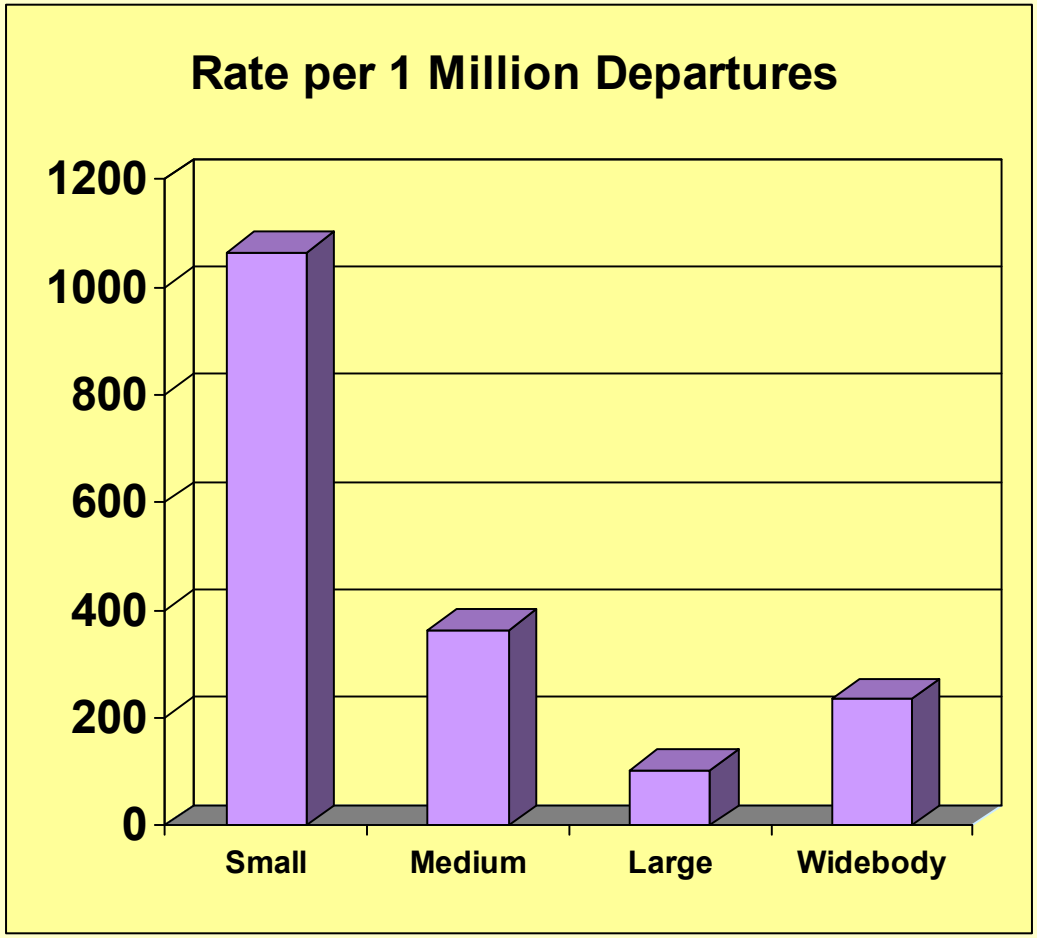



NAOMS data suggest 13,500 severe turbulence events each year system-wide.

# Weather-Related Events

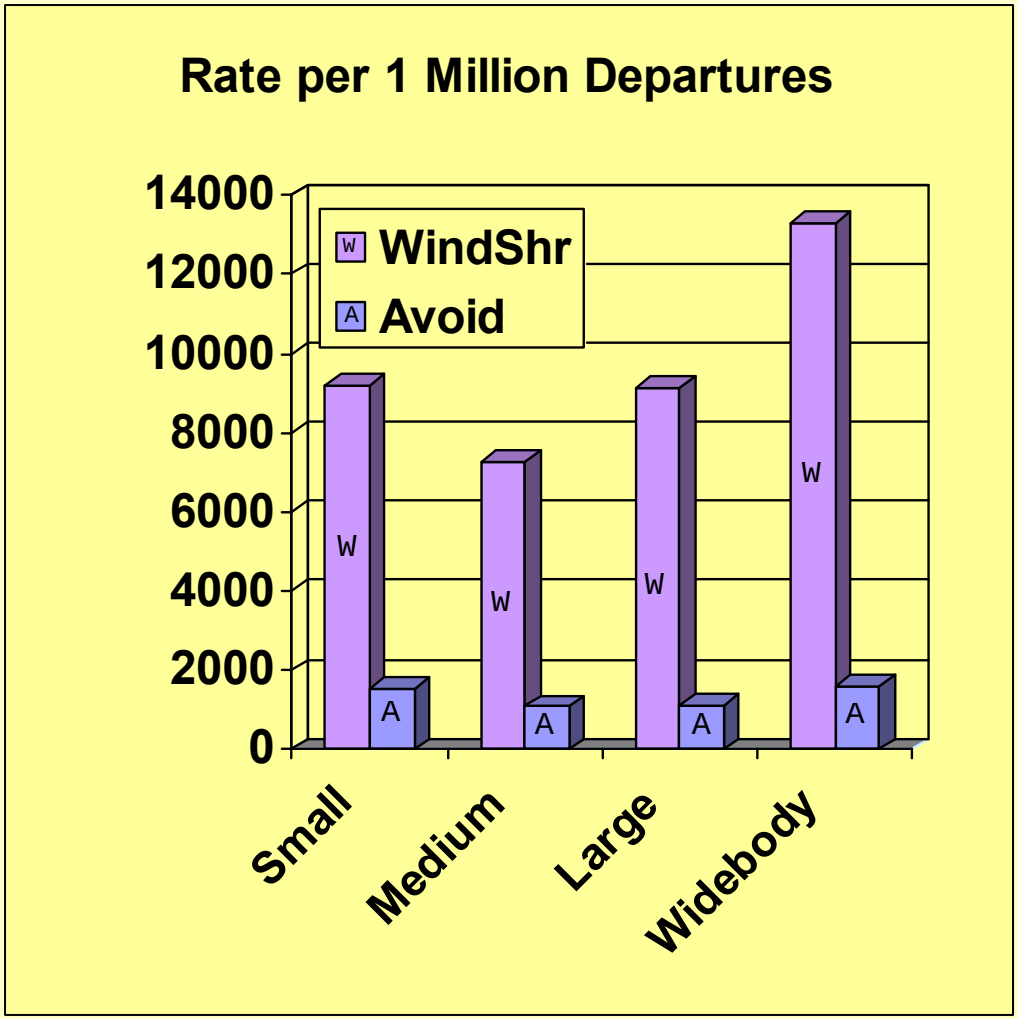
Questions focus on weather related events and issues. Topics include, but are not limited to, airframe icing, wind shear, weather diversions and other factors.

# Performance Compromising Airframe Icing Events




**NAOMS data suggest that approximately 3,000 icing events occur per year system-wide.**

# Windshear Encounters

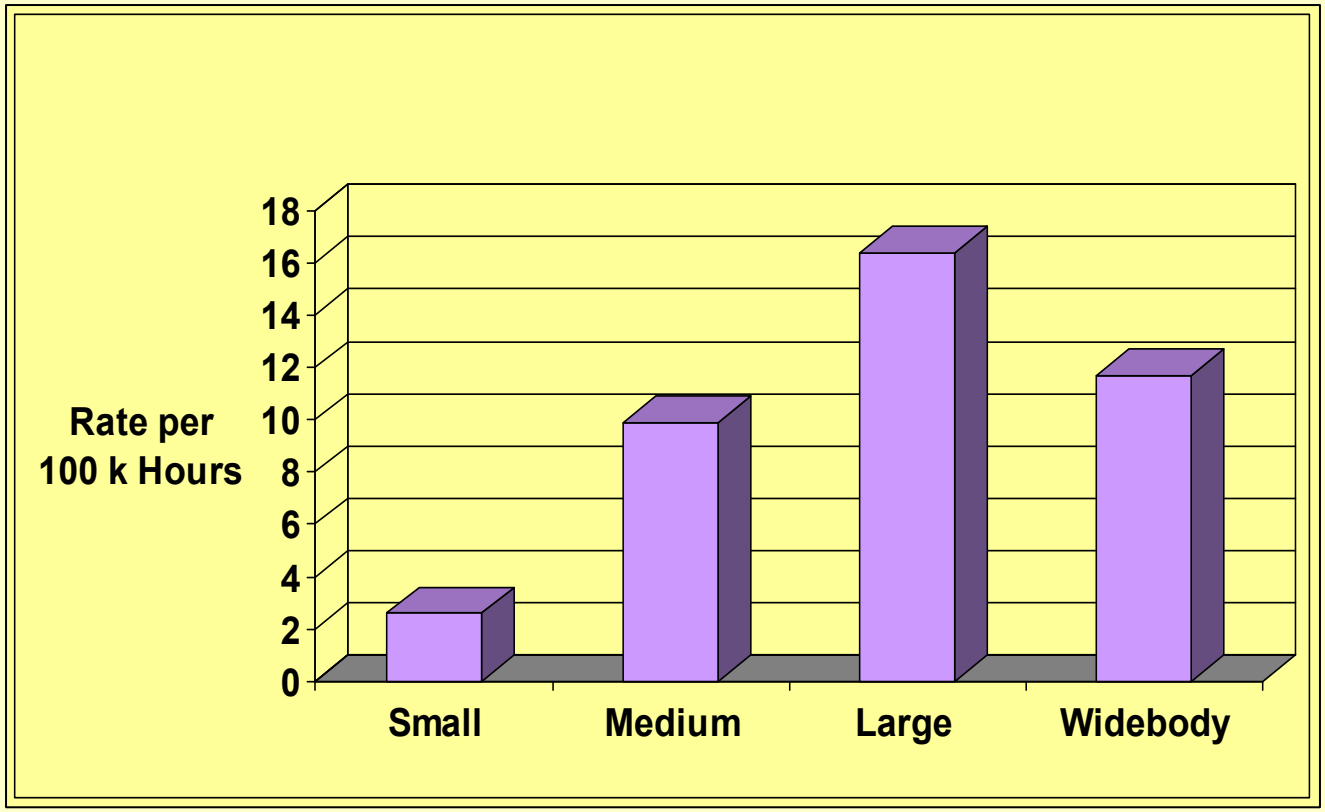



**NAOMS data suggest that approximately 7,600 wind shear avoidance maneuvers per year system-wide.**

# Passenger-Related Events

These questions focus on passenger emergencies and disruptions.

# Passenger Disturbance Rates

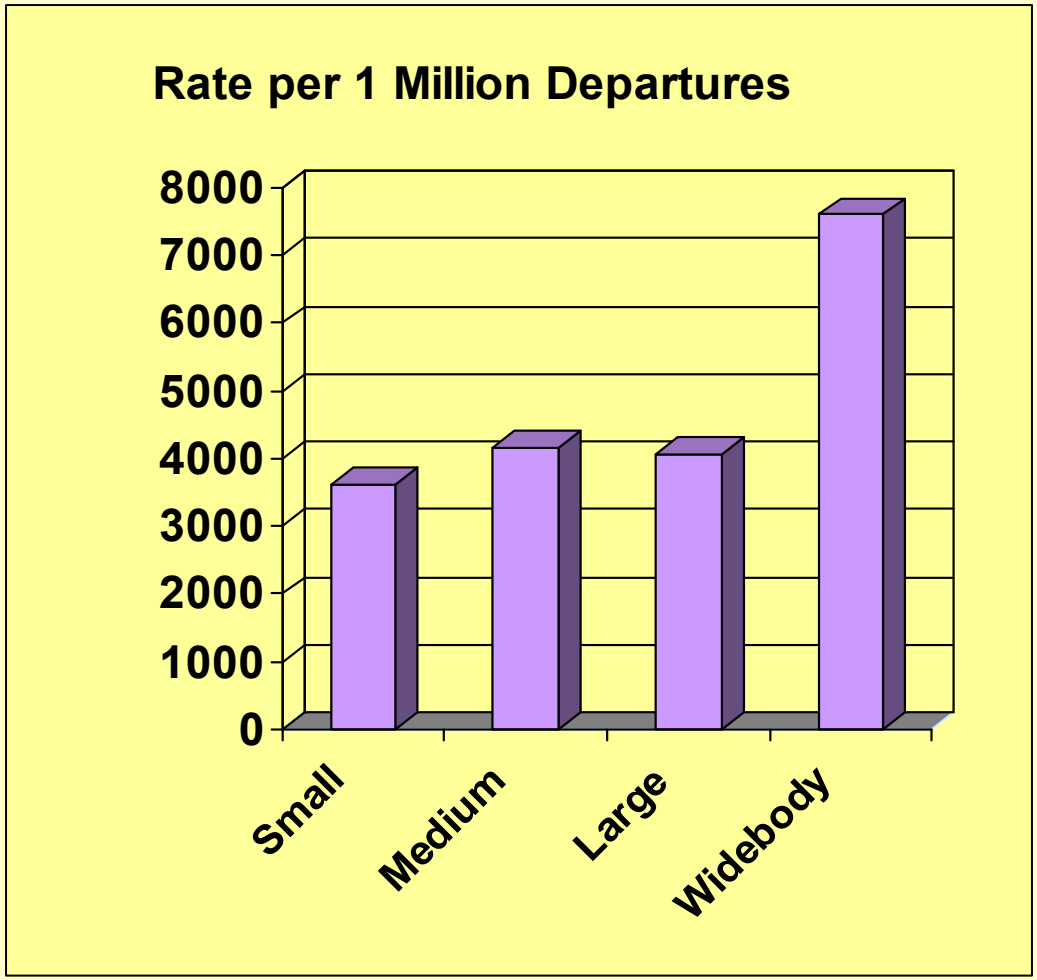



NAOMS data indicate approximately 1,400 landings occur system-wide each year due to passenger disturbance.

# Airborne Conflicts

Airborne conflicts involve issues such as near mid-air collisions, evasive actions to avoid collisions and bird strikes.

# Bird Strikes

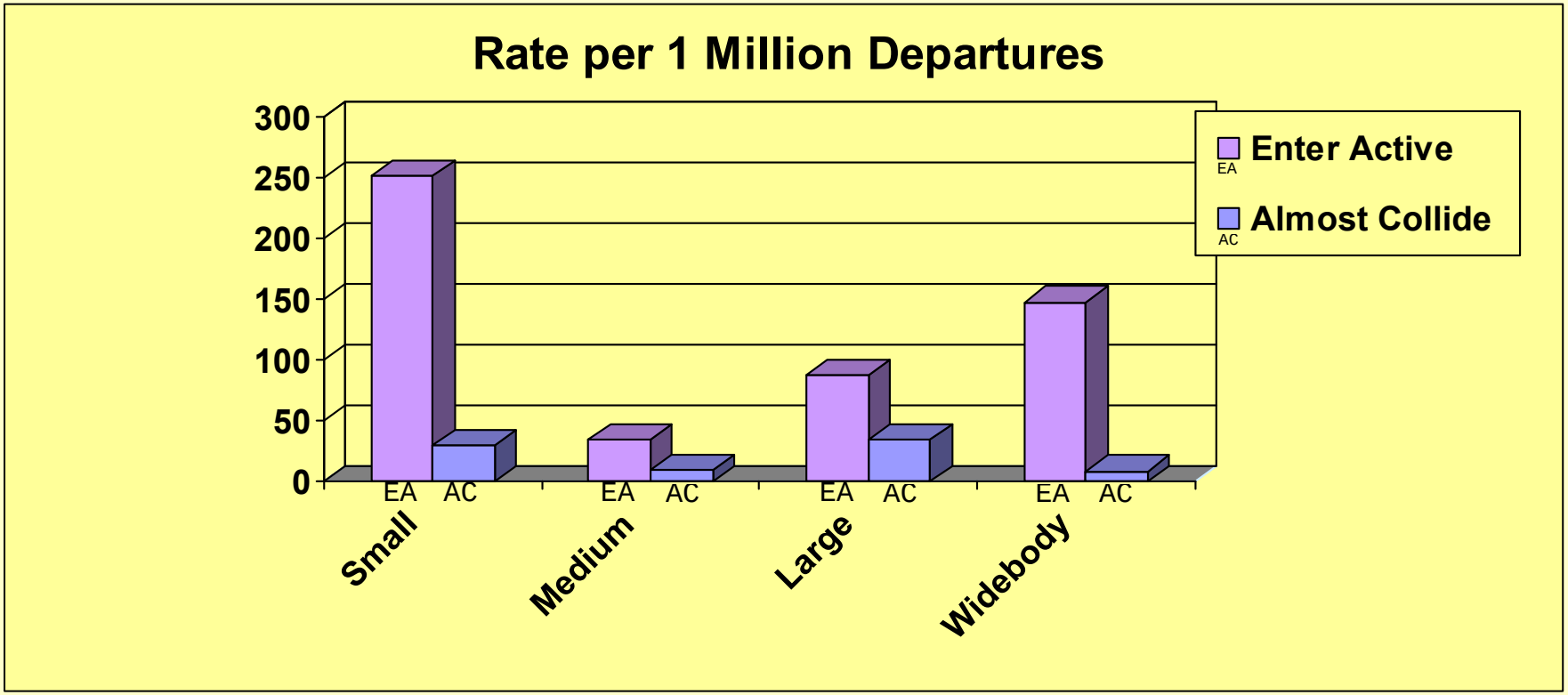



The FAA reports 5,450 bird strikes for the time period of August 2001 through July 2002. NAOMS data suggest approximately 26,000 bird strikes occur each year system-wide.

# Ground Operations

This section asks questions relating to aircraft departures from paved surfaces, near collisions with other vehicles on the ground, intrusion into occupied runways and more.

# Enter Active Runway Inadvertently or Nearly Collide with Other Aircraft on Runway

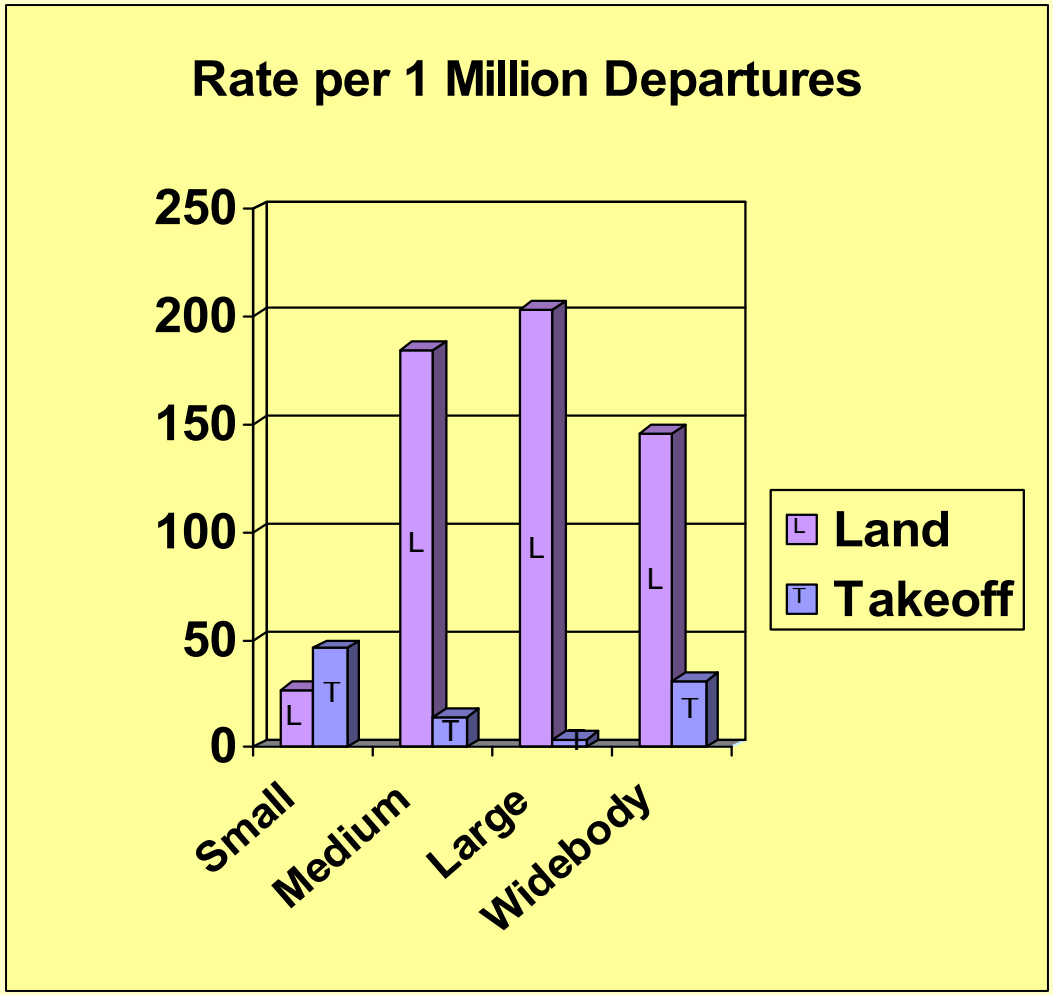



NAOMS data suggest that approximately 415 runway incursions occur system-wide per year.

# Aircraft Handling

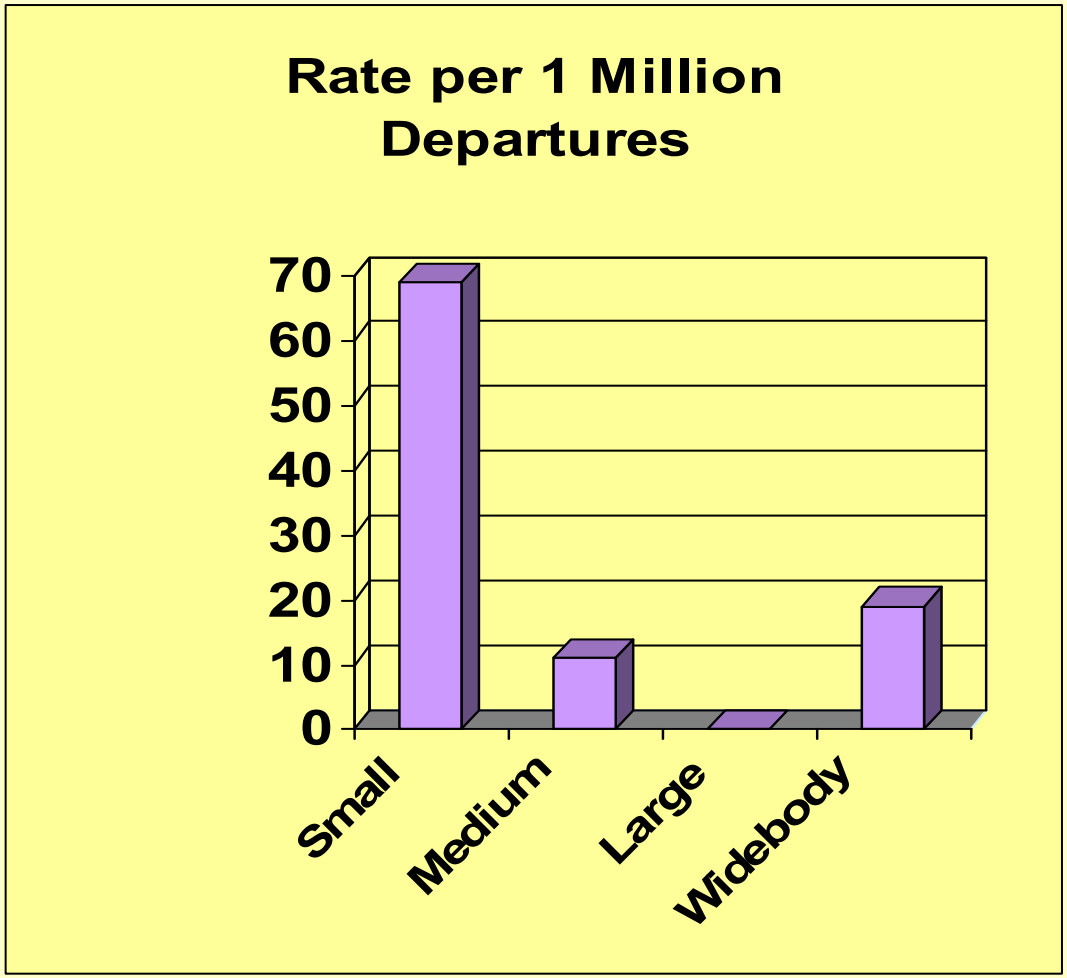
**Questions related to landing or takeoff without clearance, configuration issues, hard landings, near CFITs, and more.**

# Begin Takeoff or Land without Clearance From Tower




NAOMS data suggest approximately 909 flights per year system-wide land without clearance from the tower. ASRS recorded 530 landings without clearance over the last year.

# Nearly Collide With Terrain

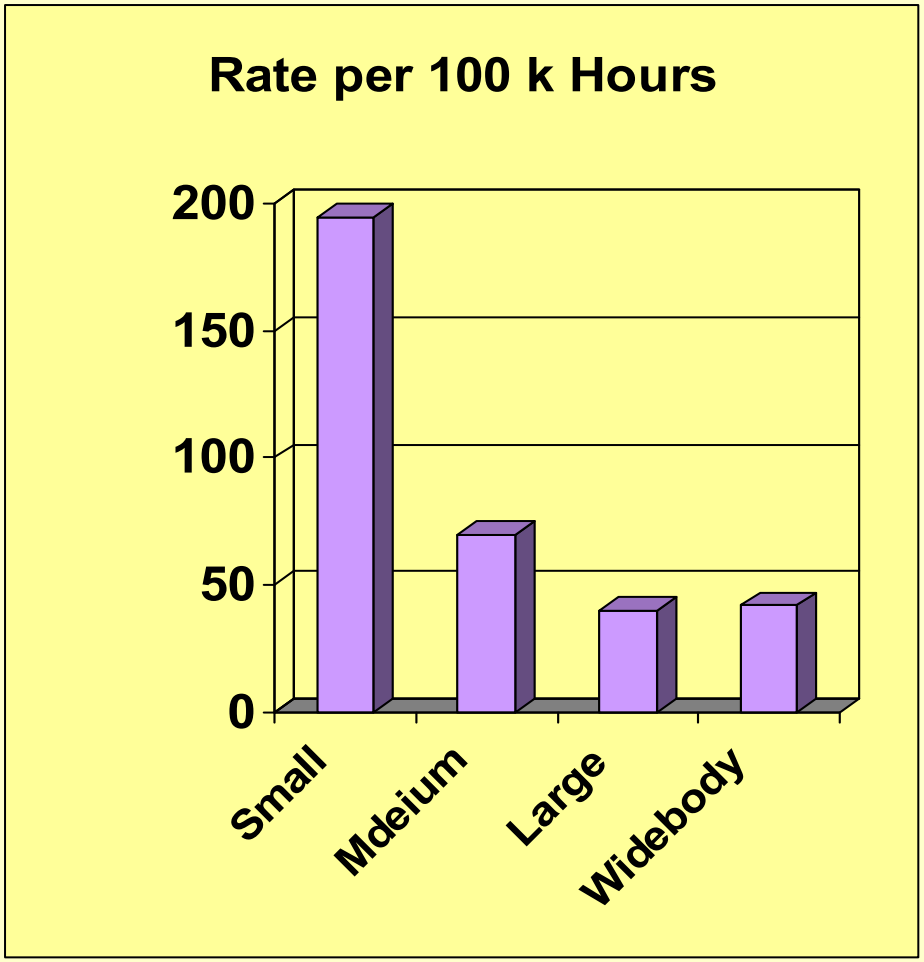



NAOMS data suggest that approximately 150 near-ground collisions occur system-wide per year.

# Altitude Deviations

**Questions relate to altitude overshoots, inadvertent altitude deviations, and descents below minimum safe altitude (MSA).**

# Inadvertent Altitude Deviations > 300 Feet

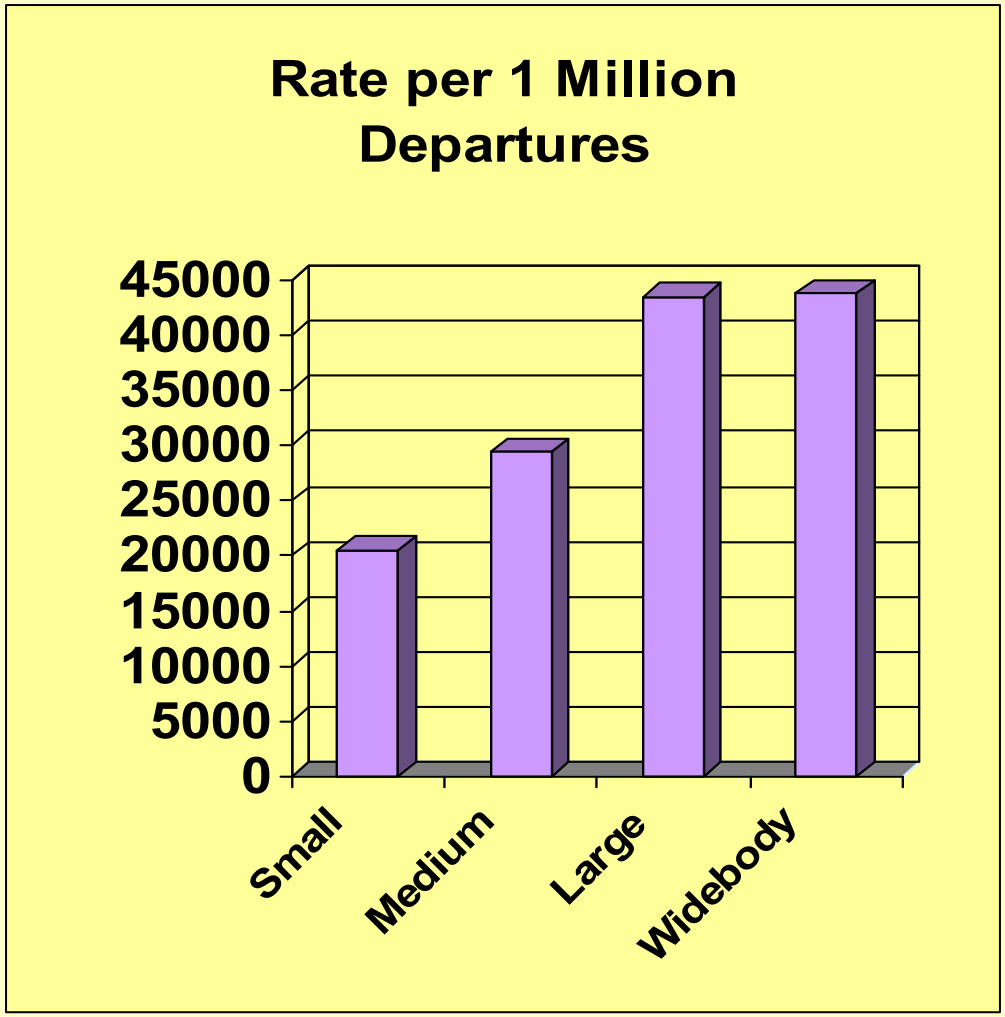



NAOMS data suggest that approximately 10,000 inadvertent altitude deviations occur system-wide per year. ASRS recorded 7,000 altitude deviations over the last year.

# Pilot Interactions with ATC

These questions are related to frequency congestion, rushed (high or fast) approaches and other ATC related issues.

# Rushed Approaches Due To ATC Request




NAOMS data suggest there are approximately 186,000 rushed approaches system-wide per year.

# Section C: Special Topic – In-Close Approach Changes

- **Dynamics of approach clearance changes requested by ATC within ten-miles of a destination airport**
- **Sixteen questions relating to:**
  - Pilot execution of requested changes
  - Consequences
- **Questions focus on number of in-close approach change (ICAC) events**
- **Followed by additional questions concerning the last ICAC experienced by pilot**

# Number of In-close Approach Changes Requested by ATC of NAOMS Response Pilots

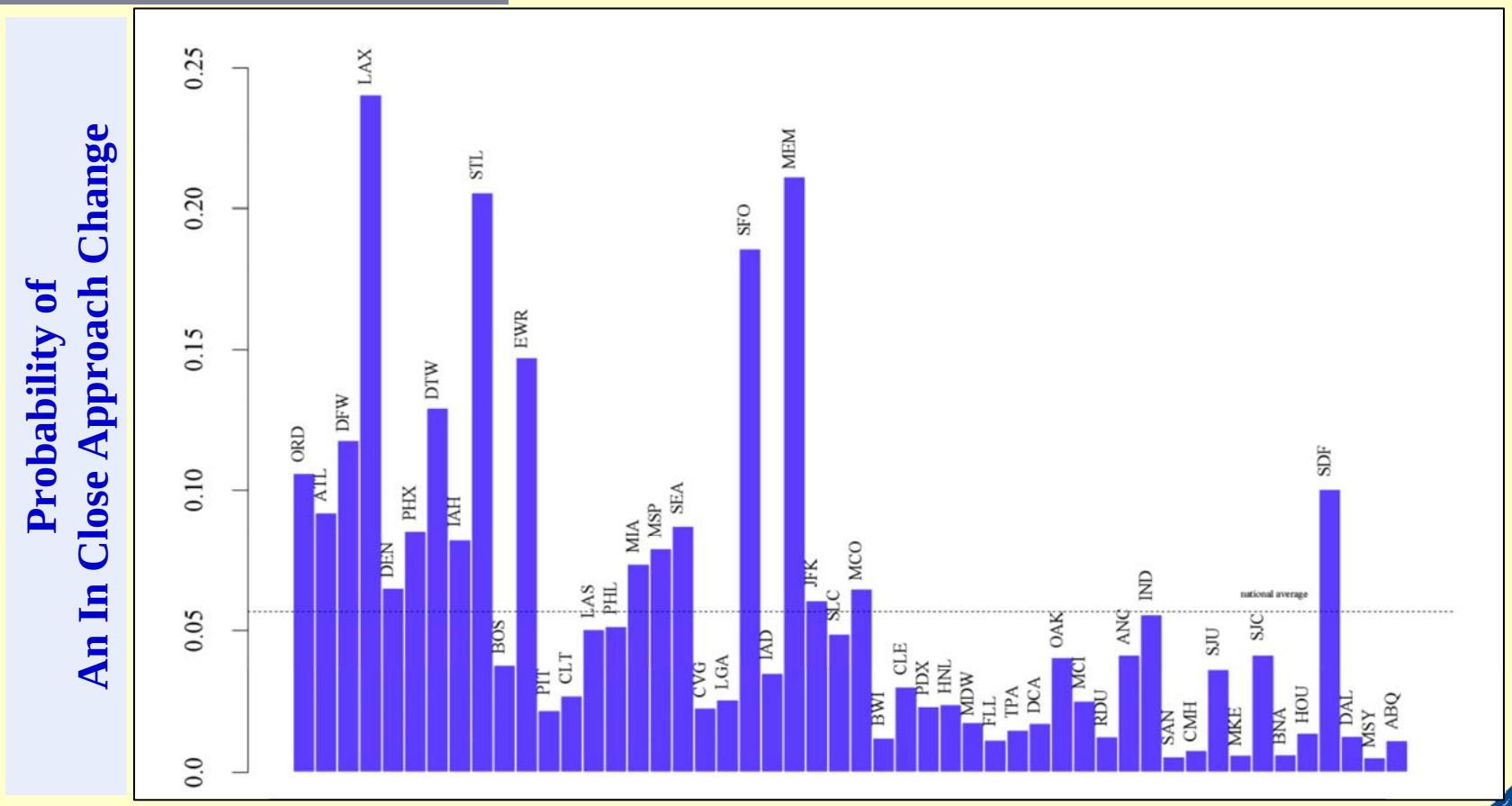
| | Approaches Flown | Percentage of Approaches Flown | Extrapolated Annual Events | Comment |
|---|---|---|---|---|
| Total Approaches Flown | 296,165 | 100.00 | 8,000,000 | Estimated |
| Total Number of ICAC Requested by ATC | 17,943 | 6.0 | 484,675 | Estimated |
| Total Number Accepted by Pilots | 16,802 | 5.7 | 453,855 | Estimated |
| Total Number of ICAC Approaches with Issues | 1,083 | 0.4 | 29,254 | Estimated |

# Issues Associated with In-Close Approach Changes

| Type of ICAC Problem | Number Reported | Percentage of Itemized Problems | Extrapolated Annual Events |
|---|---|---|---|
| Unstablilized Approach | 631 | 3.76 | 17,045 |
| Long/Fast Landing | 561 | 3.52 | 15,964 |
| Wake Turbulence | 213 | 1.27 | 5,754 |
| Missed Approach | 211 | 1.26 | 5,700 |
| Ground Conflict | 52 | 0.31 | 702 |
| Airborne Conflict | 50 | 0.30 | 675 |
| Out of Limit Winds | 33 | 0.20 | 891 |
| Landing without Clearance | 7 | 0.04 | 189 |
| Other | 479 | 2.85 | 12,939 |

ok

# In-Close Approach Change Probability for the 50 Busiest US Airport




**Highest Number of Airport Operations** ⟷ **Lowest Number of Airport Operations**

# Type of Actions Requested for In-Close Approach Changes

| | Total Number | Percentage |
|---|---|---|
| Most Recent Accepted ICAC | 3,972 | 100.0 |
| Change of Runway Assignment | 2,865 | 72.1 |
| Change in Airspeed | 1,291 | 32.5 |
| Change in Altitude | 582 | 14.6 |

# Flight Crew Actions in Response to In Close Approach Change

| | Total Number | Percent |
|---|---|---|
| Most Recent Accepted ICAC | 3,972 | 100.0 |
| Change in Navigational Aid | 2,383 | 60.0 |
| Revised Approach Briefing | 2,012 | 50.6 |
| Disconnect one or more aspects of auto control | 1,429 | 36.0 |
| Change to ATC Frequency | 899 | 22.6 |
| Change to Aircraft Configuration | 761 | 19.2 |

# FMS Reprogramming Problems

| Action Taken | Total | % |
|---|---|---|
| **Had FMS (72%)** | **2,864** | **100.0** |
| **Attempted to reprogram** | **1,096** | **38.3** |
| Inputs were not cross-checked among those that attempted reprogramming | 350 | 32.0 |
| Programming was not completed in time among those that attempted reprogramming | 99 | 9.0 |
| Inputs did not load properly among those that attempted reprogramming | 67 | 6.1 |
| Other programming problems among those that attempted reprogramming | 98 | 8.9 |

# Reasons Given by ATC for In Close Approach Change

| Reasons Given for ICAC Change | Number | Percentage |
|---|---|---|
| Number of Time One or More Reasons Given by ATC | 1,679 | 100 |
| Maintaining Traffic Flow | 1,436 | 85.5 |
| Runway Favorable to Gate | 277 | 16.5 |
| Change in Active Runways | 146 | 8.7 |
| Weather or Wind Factors | 90 | 5.4 |
| Wake Turbulence Avoidance | 79 | 4.7 |
| Noise Abatement | 19 | 1.1 |
| ATC Equipment Problems | 6 | 0.4 |
| Other Reason | 163 | 9.7 |

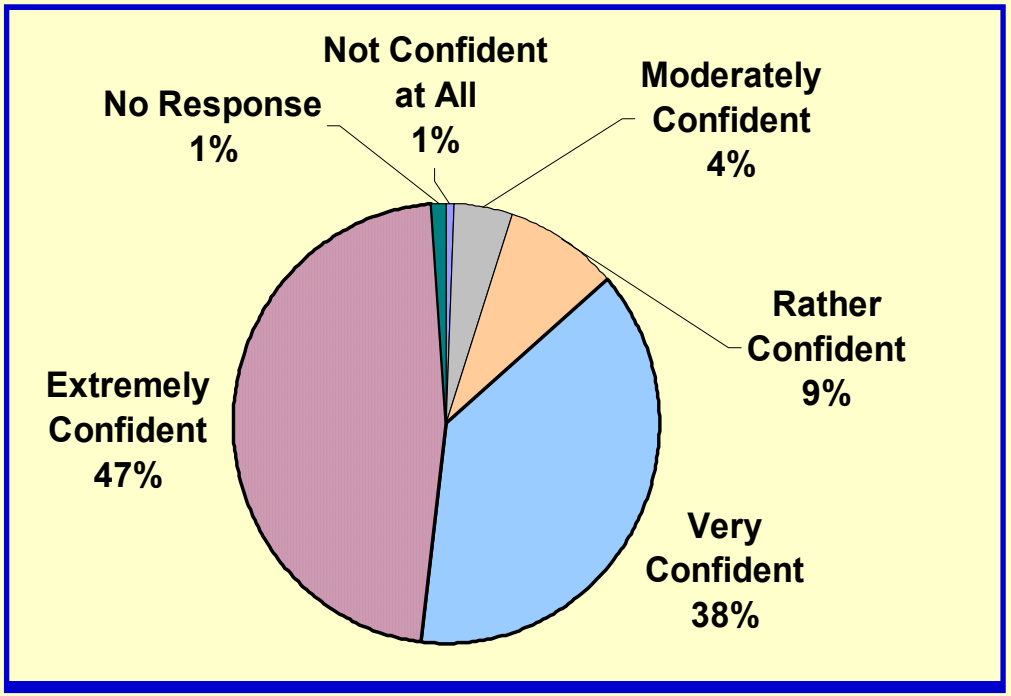
ok

# Section D
# Questionnaire Feedback

- **This section contains specific follow-up questions to determine the pilots' opinions on process, content and potential new topics.**

# Confidence Regarding Accuracy

**How confident are you that you reported accurately all the significant safety-related events that you experienced for the time period specified in the survey?**



# Suggested Topics
## (from survey and field trial)

- **ATC**
  - Communication including phraseology, readback/hearback
  - Delays during reduced weather
  - Frequency Congestion
- **Aircraft Operations**
  - Checklist usage
  - Cockpit Automation
  - LAHSO
  - Portable Electronic Devices, Interference

# Suggested Topics (cont'd)

- **Human Factors**
  - Crew Fatigue/rest (cargo, international flights, flight/duty time limitations)
  - Crew Pairing, CRM/Interaction
  - Crew Training
- **Airports**
  - Congestion
  - Security
- **Taxiway Signing and Marking**
- **International Operations including Language**

# General Aviation Survey

Mary Connors

# General Aviation Questionnaire Structure*

- **Section A: Descriptive Demographic Information**

  Information suitable for exposure determination

- **Section B: Safety Related Events**

  Consistent data set over time

- **Section C: Focus Questions**

  Specific topics driven by government/industry high-priority needs

- **Section D: Questionnaire Feedback**

*** Data collection started August, 2002; over 2,000 completed interviews to date; analysis based on 1,425 interviews**

# Flight Time Summary of Respondents

| | Lifetime Hours: Mean | Last 60 Days Hours: Mean |
|---|---|---|
| Helicopter | 7,023 | 54 |
| Fixed Wing | 2,763 | 29 |

*** Preliminary analyses involved 40 helicopter and 1,375 fixed-wing GA pilots.**

# Distribution of Flight Activity

| | Helicopter * | Fixed Wing * |
|---|---|---|
| Flight Instructor | 6.9 % | 13.5 % |
| Student | 1.3 % | 5.5 % |
| Corporate Pilot | 1.8 % | 15.4 % |
| Personal Business | 2.1 % | 12.3 % |
| Public Use | 13.4 % | 3.0 % |
| Revenue Passengers | 38.3 % | 8.9 % |
| Cargo Transport | 4.9 % | 4.1 % |
| Air Medical | 14.0 % | 1.5 % |
| Recreational | 1.8 % | 32.2% |

* Categories are not mutually exclusive

# Event Indications for General Aviation

- **Preliminary data analysis begun**
- **Data volume still too low for detailed analysis**
- **But, certain events suggest a higher level of occurrence than anticipated**
  - Inadvertently entering airspace without clearance
  - Attitude Indicator Failures, some under IMC

# Earmarked Congressional Funds

- **500 helicopter and 500 corporate pilots surveyed with earmarked congressional funds**
  - Interviews just completed
  - Preliminary analyses just begun
- **The broader GA survey confirms**
  - Both helicopter pilots and corporate pilots are infrequently captured in the randomly-selected general aviation survey
  - These groups would require further focused investigation if further information is desired in the near term.

# FUTURE PLANS

## General Perspectives on Long-Term Survey Research

Jon Krosnick

# Survey Benefits

- Surveys have been used to shape national policy for many decades
- This use is extensive in areas such as public health policy and economics
- Aviation safety is a natural topic for survey data collection
- Survey methods are mature and well understood

# Examples of Continuing Surveys

- Survey of Income and Program Participation (Census Bureau) 1984 -
- Consumer Expenditure Surveys (Census Bureau) 1968 -
- Annual Housing Surveys (Census Bureau) 1973 -
- Survey of Consumer Attitudes (NSF) 1953 –
- Health and Nutrition Examination Surveys (NCHS) 1959 -
- National Health Interview Surveys (NCHS) 1970 -
- American National Election Studies (NSF) 1948 -
- Panel Study of Income Dynamics (NSF) 1968 –
- National Longitudinal Surveys (BLS) 1964 -
- Behavioral Risk Factor Surveillance System (CDC) 1984 –
- Monitoring the Future (NIDA) 1975 -

# Features of These Studies

- Federally-funded via contracts or grants
- Long-term tracking studies
- Large constituencies use the data
- Important policy decisions are based on the data
- Conducted by the most prestigious survey research firms in the nation

# Features of These Studies (cont'd)

- Design done by collaborative teams of investigators
- Principal Investigators remain stable over time
- Planning Boards make decisions – rotating membership
- Advisory Oversight Boards oversee the entire project and make suggestions about planning board membership and project direction.
- Methodological experts serve on advisory boards

# Features of These Studies (cont'd)

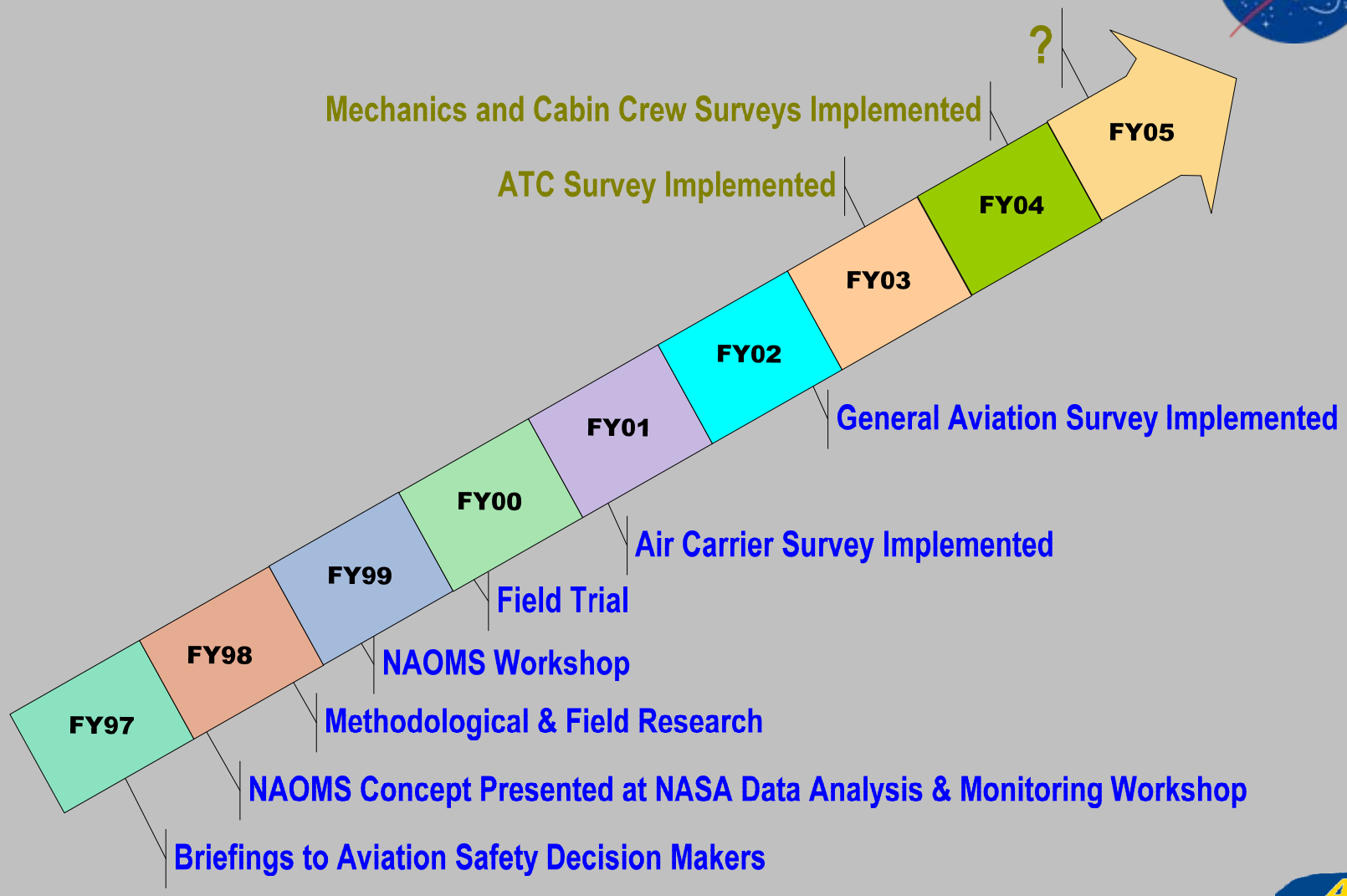
- Questionnaires have core items that remain constant from wave to wave
- Topical questions are rotated into and out of the questionnaire to reflect current interests
- Press releases and press conferences mark the release of new data (e.g., once a year)
- Publications by the project staff summarize a simple set of core trend findings
- Information is released to the public
- Information forms basis for follow-on studies

# Perspectives on NAOMS

Linda Connell

***The plan for NAOMS called for the full inclusion of air carriers pilots, general aviation pilots, air traffic controllers, mechanics/technicians, and flight attendants by the end of FY 04***

# NAOMS MILESTONE TIMELINE



***Although on schedule through FY02, present planning will not allow the activity to be completed in FY04***

# Revised Plans for FY03, 04

- **Based on project guidelines, no new user categories will be added in FY'03, FY'04**
- **Emphasis will be placed on:**
  - ATC survey materials and approach (including working with FAA, NATCA, etc.)
  - OMB approval process and field testing of ATC survey in FY '04
  - Efficiency Plan - Assessment of costs/benefits of reducing numbers of interviews; time per interview (number of questions); possible alternative modes; etc.)
  - Developing and distributing products to the community
  - Exploring all options for suitable management organization and funding for continuation of NAOMS beyond FY'04.

# FY05 and Beyond

**NAOMS must be established as a permanent service**

# Exploring Outside Options for NAOMS beyond FY'04

**Opportunities for hand-off will be explored. However, it should be noted that there are significant barriers to overcome.**

# Potential Barriers to NAOMS Hand-Off at end of FY 04

- **NAOMS will not be a turn-key system at the end of FY04. Will still need to:**
  - collect and analyze baseline ATC data
  - add mechanics/technicians and flight attendant communities
  - make final adjustments on approaches, methods, modes, questionnaire content
- **Potential new organization would have to take on the added costs in time, money, skill development, etc. associated with managing an uncompleted project.**

# Potential Barriers to NAOMS Hand-Off at end of FY 04 (cont'd)

- **Since the system is still being developed, NAOMS value to the community will be only partially demonstrated by the end of FY '04**
  - difficult for an organization to make a long-term commitment when the full benefits cannot be assessed

# Outreach and Community Information

Linda Connell

# Products

- **OUTPUTS**
  - Summarized aviation operational experience data
  - Statistically reliable estimates of incident rates
  - Identification/tracking of safety trends
  - Near real-time feedback on impacts of new technology and procedures
  - Support for data-driven safety agendas

- **PRODUCT CONSUMERS**
  - Decision makers (government and industry)
  - Safety professionals and research organizations

# Industry Groups Briefed

- NBAA
- HAI
- GAMA
- AOPA
- ALPA
- CAST
- NATCA
- NATA
- Boeing
- FAA
- SWAPA
- ASRS Advis. Sub

# Briefing Plans

- **December 02 - AvSSP Program Office**
- **February 03 - NAOMS Working Group Kickoff**
- **February 03 – Report to ATAC Subcommittee (?), Code R/HQ (?)**
- **March 03 – Report to AvSSP Bi-Annual (?)**
- **Proposed Follow On:**
  - FAA - Office of System Safety, Flt. Standards, System Capacity, Other - March, 03
  - CAST - March, 03
  - Alphabet Groups, airlines, other - As can be arranged, March through June, 03

***Permanent service possibilities will be explored in conjunction with briefing activities.***

# NAOMS Working Group

- **Industry and government group**

  (Individuals recruited from all major industry groups; independent from employer; selected for their individual/team skills)

- **Non-Disclosure/Confidentiality Agreement**

  (Based on pre-decisional exemption from public information requirements)

- **Ames Associates Program - Industry Participants**

  (No government compensation; no intellectual property rights covered by Workmen's Compensation [by ARC])

- **Purpose**
  - Ensure that results are validly interpreted
  - Gain consensus on content, level, and timing of information release
  - Build community support for NAOMS
  - Meet four times/year

**Dear xxxxxx:**

**Through the Aviation Saf ety Program (AvSP), NASA has developed an approach to obtai ning accurate information on aviation safety events occurring in the National Airspace System. This informatio n is gathered from front line participants such as pilots, air traffic controllers, mechani cs, and ohers through a systemati c and ongoing scientifically designed survey. The project is called th Natio nal Aviation Operations Monito ring System (NAOMS).**

**I am writing you today to invite you to participate as a representativ e on a working group that will provide counsel to NASA and the NAOMS project team as we continue the project's development. The counsel we are seeking relates primarily to yo ur experience in aviation op erations. We will be looking to the working group for help in correctly interpreting survey results and potentially in sugg esting appropriate follo w-up activity. We would like to invite you, or your designee, to attend a initial t wo-day kickoff meeting o f prospective working group members scheduled for winter in Washing ton D.C. During this meeting, we will describe fully the NAOMS project, provid e an update on its status and dis cuss the working group's intended functions and goal s.**

**We are very excited with the attention this project has received and its potentia to provid e quality in formation tha t will assist the aviation ind ustry in it s conti nuing efforts to improve aviatio n safety. We hope that you will be able to participate as a active member of th e group. It would be very helpful if we coul receive an indication of your willingness to pa rticipat e by the xx of xx. You can conta ct either Mary Connors or Linda Co nnell, the project co-leads by phone o e-mai l (contact informatio n listed below.) Please also provid e an indication of you r availabili ty during the February and March, 2003 ti me frame. We would like to select the best time for our kickoff meeting to ensure as many as po ssible can attend. We hav e atta ched some general background informatio n on NAOMS for you r review. Please feel free to conta ct either of us if you would lik to discuss the project or hav e any questions.**

**Sincerely,**

**Mary Conno rs**
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mconno rs@mail.arc nasa.gov

**Linda Conn ell**
**(650 ) 604-6654**
**lconn ell@m ail.a rc.nasa .go**