



**NTSB** National Transportation Safety Board

---

# **NTSB PERSPECTIVES ON NAOMS**

Vernon S. Ellingstad

Director, Research & Engineering

# Questions posed by NRC Committee

- Background & role of NTSB
- NTSB's Accident Database
- NTSB's role in NAOMS
- View of NAOMS in “Grand Scheme” of Aviation Safety. Is there value in integrating survey data with other data systems?



# Question # 1.

Background and mission of the NTSB.



*1938*

**In 1938, The Civil Aeronautics Act created the Civil Aeronautics Authority with a three-person “Air Safety Board.” This Air Safety Board exercised both investigative and judicial powers in determining the cause of accidents.**







*1940*

- In 1940, the Air Safety Board was abolished when the 5-member Civil Aeronautics Board (CAB) was organized. Accident investigative duties were absorbed into the newly formed CAB's Bureau of Aviation Safety.



1967

**In 1967, the Congress created an independent NTSB within the newly formed Department of Transportation (DOT), and expanded the NTSB's authority to include all modes of transportation.**







**In 1974, Congress made the  
NTSB completely independent  
of the DOT.**

*1974*





UNITED STATES CODE, TITLE 49  
**CHAPTER 11—NATIONAL TRANSPORTATION SAFETY BOARD**

**SUBCHAPTER 1—GENERAL**

Sec.  
1101. Definitions.

**SUBCHAPTER 2—ORGANIZATION AND ADMINISTRATIVE**

1111. General organization.  
1112. Special boards of inquiry on air transportation safety.  
1113. Administration.  
1114. Disclosure, availability, and use of information.  
1115. Training.  
1116. Reports and studies.  
1117. Annual report.  
1118. Authorization of appropriations.

**SUBCHAPTER 3—AUTHORITY**

1121. General authority.  
1122. Civil aircraft accident investigations.  
1123. Review of other agency action.  
1124. Inspections and audits.  
1125. Secretary of Transportation's responses to safety recommendations.

**SUBCHAPTER 4—ENFORCEMENT AND PENALTIES**

1131. Aviation enforcement.  
1132. Injunctive and intervention in aviation proceedings.  
1133. Judicial review.  
1134. Discovery and use of cockpit voice and other material.  
1135. Aviation penalties.

**SUBCHAPTER 5—GENERAL**

§1101. Definitions

Section 40102(a) of this title applies to this chapter.

**SUBCHAPTER 2—ORGANIZATION AND ADMINISTRATIVE**

§1111. General organization

(a) ORGANIZATION.—The National Transportation Safety Board is an independent commission in the executive branch of the Government.

(b) APPOINTMENT OF MEMBERS.—The Board is composed of 5 members appointed by the President, by and with the advice and consent of the Senate. Not more than 3 members may be appointed from the same political party. The members shall be appointed on the basis of technical qualification, professional standing, and diverse geographic representation. One member shall be appointed on the basis of accident reconstruction, safety engineering, human factors, transportation safety, or transportation law.

(c) TERMS OF OFFICE AND REMOVAL.—The term of office of each member is 7 years, except that the President may appoint a member to fill a vacancy occurring before the expiration of the term for which the predecessor of that member was appointed for the remainder of that term. When the term of office of a member ends, the President may appoint a successor to the same office. The President may remove a member for inefficiency, neglect of duty, or other cause.

(d) CHAIRMAN AND VICE CHAIRMAN.—The President shall designate, by and with the advice and consent of the Senate, a Chairman of the Board. The President also shall designate a Vice Chairman of the Board. The terms of office of both the Chairman and Vice Chairman are 2 years. When the Chairman is absent or unable to perform the duties of the office, the Vice Chairman shall perform those duties.

# Mission

The NTSB is an independent federal agency charged with determining the probable cause(s) of transportation accidents, making recommendations to prevent their recurrence, conducting special studies and investigations, and coordinating resources to assist victims and their families after an accident.





## **Independence**

***“Proper conduct of the responsibilities assigned to this Board requires vigorous investigation of accidents involving transportation modes regulated by other agencies of government . . .”***

***“No federal agency can perform such functions unless it is totally separate and independent from any other . . . Agency of the United States.”***



**The NTSB is Responsible for Investigating:**

**All U.S. Civil Aviation Accidents**







<http://www.ntsb.gov/aviation/9707.htm>

National Transportation Safety Board

Last updated on

## Other NTSB Responsibilities:

- Maintains official civil aviation accident database.
- Conducts safety studies.

Location	Aircraft Type
01-87 DIERKSBURG, TN	Maule MX-7-180C
01-87 SAYAMTA, KS	Grumman G-164
01-87 BOYATO, CA	Aviat A-1
01-87 PAGE, NE	Piper PA-18-150
01-87 CRISTONE, FL	DPL Holdings Inc. TAMGO
01-87 OLD BRIDGE, NJ	Beech C24R
01-87 DUNSTON, OH	Cessna 172M
01-87 SUNANA, AK	Piper PA-18
01-87 LOCUST GROVE, GA	Boeing Stearman B-75N1
01-87 ST. PAUL, ME	Piper PA-32
01-87 LINDSEY, TX	Beech 95-B55
01-87 FOOT WORTH, TX	Cessna 152
01-87 VIRGINVILLE, TX	Cessna T210M
01-87 PINEBROOK BAY, ME	Piper PA-28R-180
01-87 BRANDMONT, CA	Beech 95-B55
01-87 MILLER, CA	Cessna 152
01-87 CLEARWATER, FL	Cessna 150F
01-87 ALYON, FL	Grumman G-164
01-87 WAY ST LOUIS, MS	Cessna A185F
01-87 BRADWAY, AK	Piper PA-32
01-87 MIDVA, IL	Snow S2C
01-87 NEW IBERIA, LA	Bell 206B
01-87 WIND, AR	HEIFFER RS-15
01-87 MIDVALE, VT	Luscombe 8A

## Question # 2.

An Overview of the NTSB Accident Database.



# Aviation Accident Database

- NTSB aviation accident database is the official U.S. census of civil aviation accidents.
  - Since 1983: 63,534 data records, including 61,406 accidents and 2,128 incidents.
  - 1962 – 1982: 87,038 accident data records

# Accident Records since 1983 by Operating Part

- FAR Part 91 (General Aviation)
  - Accidents: 52,588
  - Incidents: 568
- FAR Part 121 (Scheduled and Non-Scheduled), and FAR Part 135 (Scheduled)
  - Accidents: 1,245
  - Incidents: 1,160
- FAR Part 135 (Non-Scheduled – Air Taxi)
  - Accidents: 2,409
  - Incidents: 195



# Definitions (49CFR Part 830.2)

- Aircraft accident means an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.
- Civil aircraft means any aircraft other than a public aircraft.
- Fatal injury means any injury which results in death within 30 days of the accident.
- Incident means an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations

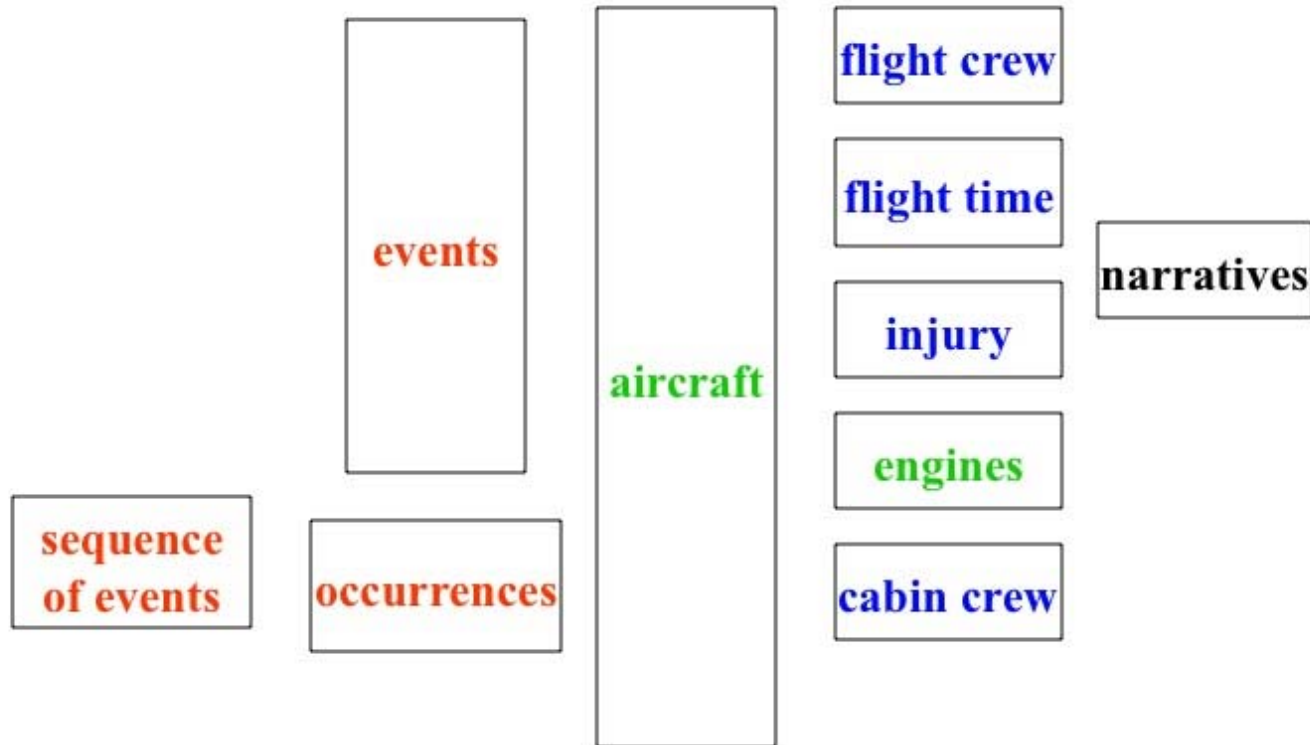
# Each ADMS Record Includes:

- About 270 parametric data fields (e.g., aircraft make/model; pilot certificate; etc.)
- Coded causes, contributing factors, and associated findings (The Sequence of Events Codes).
- A text field containing the narrative factual description of the accident.
- A text field containing a narrative description of the “Probable Cause” of the accident.



# ADMS Database Relationships

## Accident Data Relational Tables



# The NTSB Docket Mgmt. System (DMS)

The screenshot shows a Microsoft Internet Explorer browser window displaying the NTSB Docket Management System (DMS) web application. The address bar shows the URL <http://dmssvr/dms/production/>. The page features the NTSB logo and the title "NTSB Docket Management System". Below the title are four buttons: "Home", "Search", "Reports", and "Help". The main heading is "NTSB Internal Docket Access and Control". A notice reads: "\*\*\*Please read [important notes](#) regarding material distribution\*\*\*". Below this, there are three links with descriptions:

- [Search DMS](#): Search for docket and document information that has been submitted to the Docket Management System for viewing and/or editing.
- [DMS Reports](#): Get up-to-date information on Docket filings.
- [DMS Help/Support](#): Get assistance with the Docket Management System.

Below the links, a message states: "Please click on the button below to get Adobe Acrobat software." followed by a "Get Acrobat" button with the Adobe logo. At the bottom of the page, there are four buttons: "Home", "Search", "Reports", and "Help". The status bar at the bottom right indicates "Local intranet".

NTSB





# Narrative and graphic documentation of each investigation.

Items 1 through 30 of 274 Total Pages 7975: Photos 0

Seq.	Document Title	QC	App	Rel	Filing Date	Pages	Photo	Reseq.
1	Order of Hearing: 1A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oct 03, 2002	1		Reseq...
2	Notice of Designation of Chairman of Board of Inquiry: 1B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oct 03, 2002	1		Reseq...
3	Designation of Hearing Officer: 1C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oct 03, 2002	1		Reseq...
4	Designation of Parties to the Hearing: 1D	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oct 03, 2002	1		Reseq...
5	Notice of Hearing: 1E	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oct 03, 2002	1		Reseq...
6	Hearing Exhibit List: 1F	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oct 23, 2002	4		Reseq...
7	Operations 2 - Factual Report of Group Chairman	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sep 11, 2002	28		Reseq...
8	Operations 2 - Attachments A and B - Interview Summaries	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sep 11, 2002	812		Reseq...
9 R	Operations 2 - Attachment C - Port Authority Police Reports	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sep 25, 2002	15		Reseq...
10	Operations 2 - Attachment D - Submitted Statements	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sep 10, 2002	9		Reseq...
11	Operations 2 - Attachment E - Airport Diagrams	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sep 10, 2002	3		Reseq...

[Add a Document](#) [Add/Edit Standard Title](#)

Click To View Item Local intranet

NTSB



# The Docket Management System

- Complete investigative records for all NTSB accident investigations.
  - Factual and Analysis Reports
  - Photographs and other graphic documentation.
- Electronic DMS Records for 29,729 Aviation cases since Spring, 1995.
- Microfiche Records prior to 1995.



# NTSB Data Responsibilities

- Publication and Distribution of Accident Data
  - Via web query ([www.nts.gov/nts/query.asp](http://www.nts.gov/nts/query.asp))
  - Monthly accident statistics on the web
  - Annual Reviews of General Aviation, and Commercial Aviation Accidents
  - Data reporting to ICAO
  - Source of accident data to FAA as well as research community.
- Development of Statistical Studies of Accident Causes and Consequences.
- Data Mining Research

## Question # 3.

- NTSB VIEW (AND INVOLVEMENT IN) NAOMS PROJECT.



- No apriori NTSB consultation and involvement.
- NTSB sought briefings, relatively late in project, from NASA-Ames staff.
- Informal discussions with NASA-Ames regarding access to GA survey data (after project had been suspended).
- Staff intrigued by wealth of data and impressed by methodology.

## Question # 4.

- Potential role and value of NAOMS.



# Characteristics of Accident Data

- Defines the ultimate outcome measure.
- We capture the entire population of interest.
- Accidents are relatively thoroughly investigated.
- Accidents are rare events.

# Incident Reporting Systems

- Mandatory reporting systems (runway incursions, SDRs, etc.) tend to be very narrow, and limited to well defined historical events.
- Most voluntary systems (ASRS) depend on self-initiated self-report, of events considered serious enough to be reported, and have unknowable representativeness.
- Air Carrier systems (ASAP, FOQA) are designed to meet the needs of individual operators, and not available to outside evaluation across the industry.
- General aviation and Air Taxi (Part 135) are not well represented or covered.



# Problems of normalization & rates

- Normalization of accident data for scheduled commercial operations (Part 121 and 135) is straight forward using BTS exposure data.
- Exposure data from General Aviation and Air Taxi (Non-scheduled Part 135) based on General Aviation and Part 135 Activity (GAP135A) survey.
  - Sample frame is Aircraft Registration Master-file
  - Survey is voluntary
  - Exposure data based on single annual estimate

# NAOMS Advantages: Commercial Ops.

- Sampling methodology can provide cross-industry representativeness.
- Provides a practical way to assess the incidence of anomalous conditions in various phases of flight operations.
- Provides an opportunity to capture a range of events, ordered by “seriousness”
- Continuing survey provides opportunity to trend events and anomalies across time, and measure effects of system changes.



# What is the relationship between incidents and accidents?

- There is a strong presumption that incidents are predictors of accidents, but we have not validated this relationship.
- A sound survey, with strong sample selection methodology, and appropriate sample size can systematically evaluate this proposition.
- The nature and strength of the relationship between accidents and incidents likely varies with event types and operational characteristics.

—

# NAOMS Advantages: General Aviation

- Can provide much improved characterization of GA and Air Taxi operations than has ever existed.
- The measurement of types and amounts of exposure can be used to validate the General Aviation and Air Taxi Survey (GAP135A and previous surveys).
- Can provide particular insight into GA/Air Taxi training, human factors, and operational factors.



# Considerations relative to the existing data sets.

- The data are aging, but still useful –
  - In relation to accident data from the same period(s)
  - For stand-alone analyses relating reported “events” to pilot characteristics, types of operations, and other factors.
  - GA and Air Taxi data are particularly important because they are not replicated in any other source.
- To be useful they must not be overly redacted –
  - Respondent privacy can be safeguarded without deleting necessary demographic and operational characteristic information.
- Additional data validation work may be required.

# Considerations relative to future data collection

- A sound periodic survey of operators in the national air space system can provide safety information that is unavailable from other sources.
- It is important that such a survey be conducted in such a way as to protect the privacy of respondents.
  - (Survey methodology is probably sufficient to achieve this, otherwise statutory protection could be sought.)
- The survey should be managed by an independent, honest broker. The data and analyses should be made available to the aviation community and to the public.





**NTSB**