A(111-65 1

COPY 1

DOT/FAA/DS-89/17,I
Advanced System Design Service
Washington, D.C. 20591

Accident/Incident Data Analysis Database Summaries - Vol. I

T.P. Murphy
R.J. Levendoski

RJO Enterprises, Inc.
4550 Forbes Boulevard
Lanham, MD 20706

March 1989

Final Report

This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

U.S. Department of Transportation
Federal Aviation Administration

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the objective of this report.

Technical Report Documentation Page

1. Report No. DOT/FAA/DS-89/17,I	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Accident/Incident Data Analysis Database Summaries (Vol. I)		5. Report Date March 1989
		6. Performing Organization Code
7. Author(s) T.P. Murphy, R.J. Levendoski		8. Performing Organization Report No.
9. Performing Organization Name and Address RJO Enterprises, Inc. 4550 Forbes Boulevard Lanham, MD 20706		10. Work Unit No. (TRAIS)
		11. Contract or Grant No. DTFA01-87-Y-01043
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		13. Type of Report and Period Covered
		14. Sponsoring Agency Code ADS-210

15. Supplementary Notes

Flightcrew Systems Research Branch, ADS-210
Martin J. Lynn

16. Abstract

This two volume report provides a compendium of the existence, availability, limitations, and applicability of aviation accident and incident databases for use in human factors research. An aviation and data processing oriented form was used to survey 41 U.S. Government, military, aircraft manufacturers, airlines, special interest groups, and international aviation safety database sources. The compendium in Volume I presents information about 34 aviation safety databases.

Recommendations include a feasibility study of a combined master aviation safety database, the convening of a task force to standardize human factors terminology and data collection, the establishment of a limited immunity program to facilitate the flow of air carier incident data, and a more vigorous effort to present available aviation safety information to pilots.

Appendices are contained in Volume II to provide detailed information about database collection forms, data structures, and human factors information within the database.

17. Key Words Aviation Accident Aviation Incident Database Compendium Human Factors	18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 192	22. Price

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

ACCIDENT/INCIDENT DATA ANALYSIS

DATABASE SUMMARIES

Volume I

Contract No. DTFA01-87-Y-01043

March, 1989

Prepared for:

Department of Transportation
Federal Aviation Administration
Flight Crew Systems Research Branch (ADS-210)
800 Independence Avenue, S.W.
Washington, DC 20591

Prepared by:

RJO Enterprises, Inc.
4550 Forbes Boulevard
Lanham, MD 20706

EXECUTIVE SUMMARY

The purpose of this two volume report is to provide a compendium of the existence, availability, limitations, and applicability of aviation accident and incident databases for use in human factors research. To accomplish that end a four section format was developed jointly by aviation and data processing oriented personnel to collect and present database information in a consistent and organized manner. The surveyed aviation accident and incident database sources included 7 U.S. Government agencies, the 3 U.S. military services, 7 U.S. aircraft manufacturers, 12 airlines, 10 special interest groups, and 2 international aviation organizations.

The U.S. civil government and the two international organizations freely provided information about their databases. The U.S. military services volunteered some information about their aviation safety databases, and other information was obtained through the Freedom of Information Act. All nongovernment organizations contacted were reluctant to furnish aviation safety information relative to their organizations due to fears of litigation, bad publicity, and possible violation actions.

The compendium of aviation accident and incident database information is presented in Volume I. Information about 34 databases is presented. Appendixes are included in Volume II to provide detailed information about individual database collection forms, database structures, and human factors information within the databases.

Recommendations include a feasibility study of a combined master aviation safety database, the convening of a task force to standardize human factor terminology and data collection, the establishment of a limited immunity program to facilitate the flow of air carrier incident data, and a more vigorous effort to present available aviation safety information to pilots.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ACADS	Air Carrier Accident Data System
ACASS	Air Carrier Analysis Support System
ADREP	Accident/Incident Data Reporting
AIDS	Accident/Incident Data Subsystem
ALPA	Air Line Pilots Association
AOPA	Aircraft Owners and Pilot Association
APA	Allied Pilots Association
ARTCC	Air Route Traffic Control Center
ASAS	Aviation Safety Analysis System
ASMIS	Army Safety Management Information System
ASRS	Aviation Safety Reporting System
AT	Air Traffic
ATA	Air Transport Association
CAIS	Comprehensive Airmen Information Subsystem
DoD	Department of Defense
DoI	Department of Interior
DoT	Department of Transportation
EIS	Enforcement Information Subsystem
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FBI	Federal Bureau of Investigation
FSF	Flight Safety Foundation
GAMA	General Aviation Manufacturing Association
HAI	Helicopter Association International
HAP	High Accident Potential
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
LOFT	Line Oriented Flight Training
NAIMS	National Airspace Incident Monitoring System
NASA	National Aeronautics and Space Administration
NBAA	National Business Aircraft Association
NMAC	Near Mid Air Collision
NORAD	North American Aerospace Defense Command
NTSB	National Transportation Safety Board
OE	Operational Error
PD	Pilot Deviation
RAA	Regional Airline Association
SIE	Safety Information Exchange
SIS	Safety Information System
SDRS	Service Difficulty Reporting Subsystem

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	ii
GLOSSARY OF ACRONYMS AND ABBREVIATIONS	iii
TABLE OF CONTENTS	iv
SECTION 1 - INTRODUCTION	1-1
1.1 BACKGROUND	1-1
1.2 PURPOSE OF REPORT	1-2
1.3 REPORT ORGANIZATION	1-2
SECTION 2 - METHODOLOGY	2-1
2.1 FORMAT FOR PRESENTATION OF DATABASE INFORMATION	2-1
2.2 AVIATION ACCIDENT OR INCIDENT DATABASE SOURCES	2-6
2.3 FACTORS AFFECTING DATA COLLECTION	2-7
2.3.1 Fear of Litigation	2-8
2.3.2 Fear of Bad Publicity	2-8
2.3.3 Fear of Violation Actions	2-8
SECTION 3 - DATABASES	3-1
3.1 U.S. CIVIL GOVERNMENT AVIATION SAFETY DATABASES	3-1
3.1.1 FAA	3-2
3.1.1.1 FAA ASAS	3-2
3.1.1.1.1 FAA AIDS Database	3-3
3.1.1.1.2 FAA EIS Database	3-7
3.1.1.1.3 FAA SDRS Database	3-11
3.1.1.1.4 FAA CAIS Database	3-15
3.1.1.2 FAA NAIMS	3-19
3.1.1.2.1 FAA PD Database	3-20
3.1.1.2.2 FAA OE Database	3-25
3.1.1.2.3 FAA NMAC Database	3-31
3.1.1.3 FAA ACADS Database	3-37
3.1.1.4 FAA ASRS Database	3-41
3.1.2 NTSB Aviation Safety Database	3-47
3.1.3 U.S. Coast Guard Aviation Safety Database	3-54
3.1.4 U.S. Customs Service Aviation Safety Database	3-60
3.1.5 DOI Aviation Safety Database	3-64
3.2 U.S. MILITARY AVIATION SAFETY DATABASES	3-68
3.2.1 U.S. Air Force Aviation Safety Database	3-69
3.2.1.1 U.S. Air Force Lessons Learned Database	3-75

TABLE OF CONTENTS (CONTINUED)

Page

3.2.2 U.S. Naval Aviation Safety Database 3-80

3.2.2.1 U.S. Naval Aviation Lessons Learned Database 3-85

3.2.3 U.S. Army Aviation Safety Database 3-90

3.2.3.1 U.S. Army Lessons Learned Database . . . 3-96

3.2.4 Department of Defense Air Carrier Analysis Support System Database 3-100

3.3 U.S. MANUFACTURERS AVIATION SAFETY DATABASES 3-104

3.3.1 Boeing Commercial Airplane Company Aviation Safety Database 3-105
3.3.2 Douglas Aircraft Company Aviation Safety Database 3-110
3.3.3 Gulfstream Aircraft Corporation Aviation Safety Database 3-114

3.4 U.S. AIRLINES AVIATION SAFETY DATABASES 3-118

3.4.1 Eastern Airlines Aviation Safety Database 3-119
3.4.2 Pan American World Airways Aviation Safety Database 3-123
3.4.3 United Airlines Aviation Safety Database 3-128

3.5 OTHER U.S. ORGANIZATIONS' AVIATION SAFETY DATABASES . . . 3-133

3.5.1 AOPA Aviation Safety Database 3-134
3.5.2 ALPA Aviation Safety Database 3-139
3.5.3 APA Aviation Safety Database 3-143
3.5.4 ATA Aviation Safety Database 3-148
3.5.5 FSF Aviation Safety Database 3-149
3.5.6 Robert Breiling Associates Aviation Safety Database 3-153

3.6 INTERNATIONAL AVIATION ORGANIZATIONS' AVIATION SAFETY DATABASES 3-158

3.6.1 IATA Aviation Safety Database 3-159
3.6.2 ICAO Aviation Safety Database 3-163

SECTION 4 - CONCLUSIONS AND RECOMMENDATIONS 4-1

4.1 CONCLUSIONS 4-1
4.2 RECOMMENDATIONS 4-2

REFERENCES R-1

SECTION 1

INTRODUCTION

Widely quoted statistics in the aviation community attribute from 60 to 85 percent of aviation accidents to flight crew causes, or human error. Although the rate of aircraft accidents has declined over the long term, the percent of accidents that are flight crew cause related has remained relatively constant, or even increased. Therefore, flight crew error involvement in aviation accidents offers the most fertile area to be explored in the ongoing effort to further enhance aviation safety.

1.1 BACKGROUND

Flight crew errors are human errors. A better understanding of human errors would logically provide a better understanding of flight crew errors. The volume of literature available on human error is overwhelming. Many theories abound, several theories overlap, and some theories conflict. Theories about human performance in general and human error in particular are based upon psychology, sociology, and physiology. Interwoven throughout these basic disciplines are many subspecialties such as attention theories, cybernetics, decision theory, information processing theory, memory theories, perception theory, personality theories, social theories, stress theories; all offering reasons why humans make mistakes. Many of these theories have admittedly not been tested in any real world scenario, and the application of such theories to the complex, dynamic environment of an airplane cockpit is particularly difficult. Therefore, while research into human error theory is necessary, it is natural that efforts to reduce flight crew errors also continue along the more definitive lines of aviation accident and incident data analysis.

The analysis of aviation accidents to determine causes so that future similar accidents may be eliminated has been a valid procedure since the dawn of aviation. An old adage states that we must learn from the mistakes of others because we won't live long enough to make them all ourselves. This is particularly true in aviation.

A consistently large percentage of aviation accident causes is attributed to flight crew error (Boeing 1987)[1]. Postaccident analysis of technical data and operating procedures has contributed much to the outstanding safety record of the U.S. aviation industry. However, the small number of commercial jet transport accidents in recent history yields a low confidence factor for any statistical analysis of those accidents, according to Sears (1985)[2]. Sears' study illustrates the random and unpredictable nature of commercial jet transport accidents. Foushee and Helmreich (1988)[3] also report that the infrequency of air carrier accidents makes them unreliable research criteria for judging crew performance. Nagel (1988)[4] states that what is generally missing from postaccident analysis is why flight crew errors were made in the first place. The indepth analysis of aviation incidents may offer further insight into why crew errors occurred. Billings and Cheaney (1981)[5] contend that aviation incidents involving operational and human factors contain the same elements

that constitute aircraft accidents. Aviation accident and incident investigation has evolved into a complex science of its own requiring technical expertise, operational and practical experience, and, more recently, an appreciation for the involvement of human factors in aviation. Hawkins (1987)[6] states that it is easier to demonstrate historically the cost of human error in aviation than it is to quantify the future benefit which can be expected from applying human factors in a more enlightened fashion. Lederer (1988)[7] noted that the same dedication to the reduction of losses that the aviation industry has applied to technical and procedural problems has the potential, when applied to human factors, of doubling safety performance.

There is no easy, absolute solution to the elimination of human error in aviation. It must be assumed, however, that the human error contribution to aviation accidents can be reduced. A better understanding of human performance in aviation may more clearly illuminate areas where innovative study will lead to better awareness and better control of those human errors that contribute to aviation accidents.

1.2 PURPOSE OF REPORT

The primary objective of this report is to provide a compendium of the existence, availability, limitations, and applicability of aviation accident and incident databases for use in human factors research. For purposes of this report human factor data are defined as information about a human being, or factors affecting a human being, that influence a human being's performance. This study was conducted under the auspices of the Flight Crew Systems Branch of the Federal Aviation Administration, Code ADS-210.

Other studies, such as one being conducted by Boeing, are attempting to classify flight crew errors and construct a predictive model to be used in aircraft design and certification so that the probability of flight crew errors can be reduced. An initial step in flight crew error classification involves the identification and weighing of the significance that various human factors have contributed to aviation accidents and incidents. This information may be contained in existing aviation accident and incident databases.

1.3 REPORT ORGANIZATION

Section 2 of this report explains the methodology used in compiling the compendium of aviation accident and incident databases. A format jointly developed by aviation and data processing oriented personnel was used to collect and present database information in a consistent and organized manner. That format is explained in Section 2. Some factors that affected the collection of information are also presented in Section 2. Section 3 of this report presents the compendium of aviation accident and incident databases and other aviation safety databases that may contain human factor information. Seven U.S. Government agencies, the U.S. military services, 7 U.S. aircraft manufacturers, 12 airlines, 10 aviation special interest groups, and 2 international aviation organizations were surveyed about aviation safety databases. Section 4 of this report lists conclusions and recommendations drawn from the compendium and from the process used in the compendium development.

SECTION 2

METHODOLOGY

The primary objective of this study is to provide a compendium of the existence, availability, limitations, and applicability of aviation accident and incident databases for use in future human factors research. To accomplish that objective, a format was developed to collect and present the database information in a consistent and organized manner. Using the format as a guide, a wide variety of possible database sources was contacted in the development of the compendium. Section 2.1 contains an annotated copy of the format used in this study. Section 2.2 lists the organizations contacted in this study. Some factors that affected the research associated with this study are discussed in Section 2.3.

2.1 FORMAT FOR PRESENTATION OF DATABASE INFORMATION

The format was developed jointly by aviation and data processing oriented personnel. The format presents database information in four major parts:

Part A - Source Information
Part B - Contents
Part C - Utility of Data
Part D - Retrieval Information

A copy of the format used to present surveyed database information is contained in the remainder of this section. Amplifying details about the information in each subsection of the format are listed in brackets beneath each subsection needing clarification. The specific database information is contained in Section 3 of this report.

FORMAT FOR PRESENTATION OF DATABASE INFORMATION

A. Source Information

1. Database Name:

2. Database Sponsor/Manager:

3. Database Purpose:

4. Implementation/Guiding Directive:

   [This subsection lists the basic directive that established the database, if known, and lists any directives that may guide in the collection of data for the database.]

5. Type of Records:

   [This subsection refers to what basic information makes up the record content, such as accidents, incidents, suggestions, infractions, recommendations, etc.]

6. Record Source:

   [This subsection lists the source documents or methodology used to collect database information. Sources could include reports of accident investigations, incident reports, voluntary reports, or mandatory reports.]

7. Investigation By:

   [This subsection describes who investigates the occurrence or who provides the record information to the database. Such information could provide an insight into the quality of the record information.]

8. Criteria for Entry:

   [This subsection defines the criteria used to determine what information is entered into the database.]

B. Contents

1. General Structure:

   [This subsection lists general information about the database.]

2. Type of Operations:

   [This subsection refers to the type of flight operations, e.g., military, civil, cargo, passenger, that may be applicable to information in the database.]

3. Types of Aircraft:

   [This subsection lists any particular aircraft type that is applicable to information in the database.]

4. Database Population Characteristics:

   [This subsection lists any known characteristics of the database records. Known population characteristics help identify the utility of the database for particular research.]

5. Total Records:

6. Time Period(s) Covered:

7. Rate Information Available:

   [This subsection lists information about any rate information directly available in the database. Rate information could be a comparison of events by aircraft flight time, aircraft departures, aircraft miles, etc.]

8. Fields/Data Coding:

   [This subsection lists known information about the data fields and data coding in the database fields.]

9. Recommendations:

   [The availability of recommendations contained in the records is listed in this subsection.]

10. Clear Text Available:

    [The availability of a clear text summary of the accident or incident record is listed in this subsection.]

C. Utility of Data

1. Finding/Causal Format:

   [This subsection contains known details of how findings and causal factors are listed in the accident or incident records.]

2. Focused Human Factor Information:

   [This subsection lists information about any known focused human factors information. The list of human factors information is often based on the opinion of the database manager.]

3. Raw Text Available for Review, In-depth Study:

   [If the original records from which the database is constructed are available, that information is listed here.]

4. Limitations/Caveats/Biases:

   [This subsection contains information about any known limitations or biases caused by data collection methods, influences on the database, and any other known database constraints.]

5. Potential Duplication in Other Databases:

D. Retrieval Information

1. Reports/Summaries Available:

   [This subsection contains information about any periodic reports issued using the database information.]

2. Accessibility:

   [This subsection lists information about the accessibility of the database and database information to researchers.]

3. Turnaround Time for Requests:

4. Data Use Limitations:

   [This subsection lists any limitations placed on data or information furnished from the database.]

5. Cost Per Request:

6. Contact Point for Requests:

   [This subsection lists a telephone number for a point of contact for more information about the database or for requests for data.]

2.2 AVIATION ACCIDENT OR INCIDENT DATABASE SOURCES

A wide variety of sources was contacted in the search for information about aviation accident or incident databases. Within the U.S. Government, seven agencies were contacted and visits were made to two agencies maintaining large aviation accident or incident databases. Seven field personnel who gather the data for the Federal Aviation Administration (FAA) aviation safety databases were interviewed to gain insight into the quality and thoroughness of reported data. Since the FAA and the National Transportation Safety Board (NTSB) generally maintain records of only civil aircraft accidents or incidents, a broad sample was taken of public aircraft operators. Public aircraft are noncivil, nonmilitary aircraft used only in the service of a government or a political subdivision. The following U.S. civil government agencies were contacted:

a. Federal Aviation Administration (FAA)
b. National Transportationn Safety Board (NTSB)
c. U.S. Coast Guard
d. U.S. Customs Service
e. Department of Interior (DoI)
f. National Aeronautics and Space Administration (NASA)
g. Federal Bureau of Investigation (FBI)

To obtain information about military aircraft aviation safety databases and military chartered aircraft, the following organizations were contacted:

a. U.S. Air Force
b. U.S. Navy
c. U.S. Army
d. Department of Defense (DoD)

Seven U.S. aircraft manufacturers were surveyed concerning aviation safety databases. Those seven manufacturers included:

a. Boeing Commercial Airplane Company
b. Douglas Aircraft Company
c. Lockheed Aircraft Corporation
d. Beech Aircraft Corporation
e. Cessna Aircraft
f. Learjet Corporation
g. Gulfstream Aircraft Corporation

Twelve airlines that represent a large part of the airline industry were surveyed concerning aviation safety databases. The twelve airlines included a cargo airline and a regional air carrier that operates modern turbojet aircraft. One airline's safety office was visited. Several pilots employed by various airlines were informally interviewed. The airline pilots' comments were not pertinent to aviation safety databases and therefore their comments are not included in this report. The airline

pilots provided useful background information and viewpoints of people directly and continuously involved with aviation safety. The following airlines were contacted:

a. Continental
b. Northwest
c. Flying Tigers
d. Piedmont
e. U.S. Air
f. Eastern
g. TWA
h. Delta
i. American
j. Pan American World Airlines
k. United Airlines
l. Air Wisconsin

Ten special interest groups that support various segments of the aviation industry were surveyed for information about aviation safety databases. The special interest groups included lobby groups, unions, and service organizations. A commercial aviation safety database was also surveyed. The following special interest groups were contacted:

a. General Aviation Manufacturing Association (GAMA)
b. Helicopter Association International (HAI)
c. National Business Aircraft Association (NBAA)
d. Regional Airline Association (RAA)
e. Aircraft Owners and Pilot Association (AOPA)
f. Air Line Pilots Association (ALPA)
g. Allied Pilots Association (APA)
h. Air Transport Association (ATA)
i. Flight Safety Foundation (FSF)
j. Robert Breiling Associates

Two international organizations with aircraft accident or incident databases were contacted concerning their databases. The following international organizations were contacted:

a. International Air Transport Association (IATA)
b. International Civil Aviation Organization (ICAO)

2.3 FACTORS AFFECTING DATA COLLECTION

U.S. civil government agencies readily provided information about their aviation safety databases. The U.S. military services volunteered some information concerning aviation safety databases, and some information was obtained through the Freedom of Information Act. The two international organizations freely discussed their databases.

All nongovernment organizations that were contacted showed varying degrees of reluctance to furnish aviation safety information relative to their organizations. All contacted personnel involved in aviation safety recognized the value of sharing aviation safety information to preclude or

minimize the recurrence of future accidents and incidents, and all recognized the need for research into human factors in aviation. However, specific aviation safety information relating to their own organization is considered proprietary information. Three common factors that created this reluctance to furnish information about aviation safety and their organizations appeared to be:

a. Fear of litigation
b. Fear of bad publicity
c. Fear of violation action

2.3.1 Fear of Litigation

During the data collection process, it soon became apparent that a fear of litigation restricted a free flow of safety information in the aviation industry. A clear reluctance exists on the part of aircraft manufacturers and airlines to divulge any information that may in some way relate to product or service safety. During the study several requests for information about aviation safety databases were referred to the corporate legal offices. While aviation safety personnel seem eager to support efforts to enhance aviation safety and associated research, these same personnel are stymied by an ever-present fear of litigation. The influence of litigation was corroborated by several FAA aviation safety database managers who reported that from 70 to 90 percent of data requests came from lawyers.

2.3.2 Fear of Bad Publicity

In the opinion of many interviewed aviation safety database managers, there is an industry-wide apprehension of the effects of bad publicity on a corporation's image and profits. Any information about aviation accidents or incidents can be interpreted as having a negative impact on a manufacturer's product or an airline's service and, consequently, such information is not readily available. Many of the sources interviewed said that even though statistics prove that flying is safer than ever, the public media may bias the general public into thinking otherwise. Many aviation safety personnel believe that occurrences that were considered a normal part of the operational environment in aviation now have become newsworthy items. While the benefits to be gained from shared information about aviation incidents to prevent similar future occurrences is recognized by aviation safety personnel, the possibility of bad press and a negative impact on a company has inhibited the release of aviation safety information.

2.3.3 Fear of Violation Actions

Good flight safety programs use the experience of others to preclude the same occurrence from happening again. Airline safety managers are hesitant to promulgate aircraft incident information to their flight crews for fear that the FAA may become aware of the incident and initiate violation action against the personnel or company involved in the incident. Several examples were quoted by frustrated safety managers. The FAA's perceived violation policy may act as a deterrent to the free flow of aviation safety information.

SECTION 3

DATABASES

This section contains formatted information about aviation safety databases that may contain human factor data. For purposes of this study, human factor data are defined as information about a human being, or factors affecting a human being, that influence a human being's performance.

As a method of classification and presentation, the surveyed databases were placed into the following categories:

a. U.S. civil government aviation safety databases
b. U.S. military aviation safety databases
c. U.S. aircraft manufacturers aviation safety databases
d. U.S. airlines aviation safety databases
e. Other U.S. organizations' aviation safety databases
f. International aviation organizations' aviation safety databases

Section 3.1 contains information about U.S. civil government aviation safety databases. Section 3.2 presents information about the U.S. military aviation safety databases. Section 3.3 includes information about U.S. aircraft manufacturers aviation safety databases. Section 3.4 contains information about aviation safety databases maintained by U.S. airlines. Section 3.5 consists of information about other U.S. organizations that have aviation safety databases. Section 3.6 presents information about two international organizations that maintain aviation safety databases.

3.1 U.S. CIVIL GOVERNMENT AVIATION SAFETY DATABASES

Within the U.S. civil government the following agencies were contacted regarding aviation safety databases:

a. FAA
b. NTSB
c. U.S. Coast Guard
d. U.S. Customs Service
e. DoI
f. NASA
g. FBI

Information about the FAA aviation safety databases is contained in Section 3.1.1. Section 3.1.2 provides information about the NTSB aviation safety database. Since the FAA and the NTSB generally maintain data only about civil aircraft accidents and incidents, a broad sample was taken of public aircraft operators. Public aircraft are noncivil, nonmilitary aircraft used only in the service of a government or political subdivision. Section 3.1.3 presents information about the aviation safety database of the U.S. Coast Guard. Section 3.1.4 consists of information about the aviation safety database of the U.S. Customs Service. Section 3.1.5 contains information about the DoI aviation safety database. NASA operates approximately 106 public aircraft. It does not maintain a centralized aviation accident or incident database, but information concerning those

occurrences are maintained at the location where the aircraft are situated. Since each database on the NASA aircraft would be small, no further information is presented about NASA aviation safety databases. The FBI does not maintain an accident or incident database.

3.1.1 FAA

The FAA maintains several databases that may offer information pertinent to human factors research. Some of the databases are subsystems of a broader data base system. Those databases are described under their respective broader systems. The systems examined and the pertinent subsystems are listed below:

a. Aviation Safety Analysis System (ASAS)

   1. Accident/Incident Data Subsystem (AIDS)
   2. Enforcement Information Subsystem (EIS)
   3. Service Difficulty Reporting Subsystem (SDRS)
   4. Comprehensive Airmen Information Subsystem (CAIS)

b. National Airspace Incident Monitoring System (NAIMS)

   1. Pilot Deviation (PD)
   2. Operational Error (OE)
   3. Near-Mid-Air Collision (NMAC)

c. Air Carrier Accident Data System (ACADS)

d. Aviation Safety Reporting System (ASRS)

Section 3.1.1.1 contains information about the ASAS and its subsystems. Section 3.1.1.2 provides information about the databases that constitute the NAIMS. Section 3.1.1.3 contains information about the ACADS. Section 3.1.1.4 presents information about the ASRS.

3.1.1.1 FAA ASAS

The ASAS was established in 1982 to support the Office of Aviation Standards. The ASAS is the FAA program for collecting and organizing various types of aviation safety data into an integrated system and for using sophisticated analysis methods to analyze the data. The goal of ASAS is to implement an integrated, automated, comprehensive certification and safety information system. The ACAS intends to encompass a single-point access to all databases, standardize data elements across all databases, provide easy access into subject areas, and furnish the capability to perform safety analysis. The ASAS initialized automation to various FAA safety data. The ASAS lists 28 subsystem databases. These databases were examined, and only four contained any significant, potential human factors information. Section 3.1.1.1.1 contains information about the AIDS. Section 3.1.1.1.2 provides information about the EIS. Section 3.1.1.1.3 includes information about the SDRS. Section 3.1.1.1.4 contains information about the CAIS.

3.1.1.1.1 FAA AIDS Database

A. Source Information

1. Database Name: Accident/Incident Data Subsystem (AIDS)

2. Database Sponsor/Manager: The AIDS database is sponsored by the FAA and managed by the FAA National Safety Data Branch (AVN-120) at the Mike Monroney Aeronautical Center in Oklahoma City, OK.

3. Database Purpose: The purpose of the AIDS database is to record and account for all civil aircraft accidents, and to record civil aircraft incidents for safety analysis.

4. Implementation/Guiding Directive: FAA Order 8020-11, Aircraft Accident and Incident Notification, Investigation, and Reporting, contains guidelines for FAA personnel to investigate and report aircraft accidents and incidents.

5. Type of Records: Records of all civil aircraft accidents and known incidents are contained on the AIDS database. An aircraft accident is defined in Chapter 14 Code of Federal Regulations, Part 830, paragraph 830.2, as an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which any person suffers death or serious injury as a result of being in or upon the aircraft or by direct contact with the aircraft or anything attached thereto, or the aircraft received substantial damage. An aircraft incident is defined in FAA Order 8020-11, Aircraft Accident and Incident Notification, Investigation, and Reporting, as an occurrence involving the operation of one or more aircraft in which a hazard or potential hazard to safety is involved but which is not classified as an aircraft accident due to the degree of injury or extent of damages.

6. Record Source: Civil aviation accident record information is obtained from the NTSB Form 6120-4 titled Factual Report Aviation Accident/Incidents (see Appendix F). Civil aviation incident record information is obtained from the NTSB Form 6120-4 for the civil aircraft incidents that the NTSB chooses to investigate. The preponderance of civil aviation incident record information is obtained from FAA Form 8020-5, titled Aircraft Incident Record (see Appendix A).

7. Investigation By: All civil aircraft accidents and incidents are investigated either by NTSB investigators or by FAA air carrier or general aviation inspectors.

8. Criteria for Entry: Reports of all civil aircraft accidents and all reported civil aircraft incidents are entered into the AIDS database.

B. Contents

1. General Structure: The AIDS database records are structured in 161 different fields. See Appendix A for a list of the database fields and the description of those fields. Data are stored on a Data General MV15000 computer. The S2000 Database Management System is used.

2. Type of Operations: The AIDS database contains records of civil aircraft involved in an aircraft accident or incident.

3. Types of Aircraft: The AIDS database includes accidents or incidents involving any type of fixed- or rotary-wing civil aircraft.

4. Database Population Characteristics: The database manager estimates that more than one-half of the incidents on file are air carrier or air taxi incidents since the reporting procedure for air carrier or air taxi operations is more structured than the general aviation reporting procedure.

5. Total Records: The AIDS database currently has approximately 37,000 records on file at the Oklahoma City facility.

6. Time Period(s) Covered: The current year plus the two preceding years of data are stored on a Data General MV15000 computer at Oklahoma City. Records before that time are stored with Boeing Computer Services. The database contains records dating to 1973.

7. Rate Information Available: Rate information is not available in the AIDS database.

8. Fields/Data Coding: The AIDS database stores information concerning civil aircraft accidents and incidents in 161 fields. A list of those fields and their definitions is contained in Appendix A. Those fields having potential human factors information and a list of the coding elements in those pertinent fields is contained in Appendix A.

9. Recommendations: Recommendations are not available.

10. Clear Text Available: A clear text is available in field 119 of the AIDS database.

C. Utility of Data

1. Finding/Causal Format: The AIDS database records contain primary and secondary causal factors and primary and secondary contributing factors for each accident or incident. Causes are categorized as operational or technical. Remedial actions are listed.

2. Focused Human Factors Information: Limited direct human factors information is available. Some flight crew information is available, such as age, medical status, total pilot time, pilot time in type of aircraft involved in report, currency of pilot, and training currency. Environmental factors are also listed, when known. The narrative may contain the best human factor information contained in the AIDS report.

3. Raw Text Available for Review, In-depth Study: The raw text of the reports are available for review for a period of 3 years.

4. Limitations/Caveats/Biases: Usefulness of information from the AIDS database appears to be restricted due to inadequacies of the incident reporting form, particularly in the area of human factors. This opinion was expressed by FAA Headquarters personnel and by non-government accident/incident database managers. There are no known biases in the AIDS database.

5. Potential Duplication in Other Databases: Civil aircraft accident reports are also contained in the NTSB Aviation Accident Database. An incident reported in the PD database may also be in the AIDS database.

D. Retrieval Information

1. Reports/Summaries Available: Routine reports are not issued.

2. Accessibility: Direct access to the database is available by written request to the database manager.

3. Turnaround Time for Requests: The turnaround time for data requests is approximately 2 to 3 weeks.

4. Data Use Limitations: No limitations are placed on data furnished by the FAA.

5. Cost Per Request: A fee for the cost of retrieval and duplication may be charged.

6. Contact Point for Requests: Requests for data or database access should be made to the FAA National Safety Data Branch (AVN-120), (405) 686-4173.

3.1.1.1.2 FAA EIS Database

A. Source Information

1. Database Name: Enforcement Information Subsystem (EIS)

2. Database Sponsor/Manager: The FAA is the database sponsor. The FAA's National Safety Data Branch (AVN-120) is the database manager.

3. Database Purpose: The purpose of the database is to track all FAA violation action against persons, corporations, or other organizations.

4. Implementation/Guiding Directive: FAA Instruction 2150.3, Compliance and Enforcement Program Handbook, offers guidelines for processing FAA violations.

5. Type of Records: The database consists of records of all violation actions or administrative actions initiated against organizations or personnel suspected of violating a Federal Aviation Regulation (FAR).

6. Record Source: FAA Form 2150-5, FAA Enforcement Investigation Report, is the source of data for entry into the database.

7. Investigation By: Suspected violations of the FARs are investigated by FAA air carrier or general aviation inspectors before processing a violation or an administrative action.

8. Criteria for Entry: All violation actions and administrative actions are entered into the database.

B. Contents

1. General Structure: Data are stored on a Data General MV15000 computer at Oklahoma City. Data entry and access is available at FAA Headquarters, regional and selected field offices. The database management system is an internally FAA-developed system.

2. Type of Operations: The database contains information about violations of any FAR.

3. Types of Aircraft: The violation data on file may or may not directly involve an aircraft.

4. Database Population Characteristics: The database contains enforcement action information about any actions taken against any person, including passengers, or any company or entity suspected of violating a FAR. Population counts of the frequency of violations of each FAR are available.

5. Total Records: An estimate of the total records on file was not available.

6. Time Period(s) Covered: The current year plus the 2 previous years of data are stored on a Data General MV15000 computer at Oklahoma City. Data before that are stored with Boeing Computer Services, dating back to 1963.

7. Rate Information Available: Rate information is not available.

8. Fields/Data Coding: The database is designed to capture information directly from the reporting form and includes fields such as name, address, date of birth, license type and number, aircraft data, alleged violation, FAR involved, etc.

9. Recommendations: The investigating FAA inspector's recommendations are included in the report.

10. Clear Text Available: A small remarks section is available.

C. Utility of Data

1. Finding/Causal Format: Findings as to a violation of an FAR are contained in the records.

2. Focused Human Factor Information: The database manager believes that there is little focused human factor information available in the database. Violation histories of pilots are available.

3. Raw Text Available for Review, In-depth Study: The raw text reports are maintained at the field office that conducted the investigation.

4. Limitations/Caveats/Biases: No known biases exist in this database.

5. Potential Duplication in Other Databases: There is no duplication of the information in this database in other databases.

D. Retrieval Information

1. Reports/Summaries Available: No reports are issued. Requests for data are honored.

2. Accessibility: Requests for information from this database are accepted under the Freedom of Information Act.

3. Turnaround Time for Requests: A turnaround time is based on the extent of the request, but a nominal time is considered to be 10 to 12 working days.

4. Data Use Limitations: No limitation is placed on any furnished data.

5. Cost Per Request: The cost of computer time used, plus the cost of data reproduction may be accessed.

6. Contact Point for Requests: For further information or requests for any data, contact the FAA's National Safety Data Branch (AVN-120) at (405) 686-4173.

3.1.1.1.3 FAA SDRS Database

A. Source Information

1. Database Name: Service Difficulty Report Subsystem (SDRS)

2. Database Sponsor/Manager: The FAA is the sponsor of the database. The FAA's National Safety Data Branch (AVN-120) is the database manager.

3. Database Purpose: The purpose of the database is to provide assistance to aircraft owners, operators, maintenance organizations, manufacturers, and the FAA in identifying aircraft problems encountered during aircraft service. The program provides for the collection, organization, analysis, and dissemination of aircraft service information to improve service reliability of aeronautical products.

4. Implementation/Guiding Directive: FAA Order 8010.2, Flight Standards Service Difficulty Program, provides guidelines for FAA personnel involved in the SDRS program. FAA Advisory Circular 20-109, Service Difficulty Program (General Aviation), provides guidelines for general aviation activities in the SDRS program.

5. Type of Records: Reports are voluntarily submitted by general aviation operators. Air taxi operators and commercial operators are required to submit reports in accordance with FAR 135.415. Air carriers are required to submit reports in accordance with FAR 121.703. FAA-certified aircraft repair stations are required to submit reports in accordance with FAR Part 145.

6. Record Source: The primary sources of the record information are aircraft maintenance facilities, owners, and aircraft operators.

7. Investigation By: Submitted Malfunction and Defect Reports or Mechanical Reliability Reports are reviewed by the local FAA Flight Standards District Office for items of immediate concern before forwarding to the office that incorporates the data into the database.

8. Criteria for Entry: All received Malfunction and Defect Reports and Mechanical Reliability Reports are entered into the database.

B. Contents

1. General Structure: Data are stored on a Data General MV15000 computer at Oklahoma City.

2. Type of Operations: Data are applicable to any type of aircraft under any operating conditions.

3. Types of Aircraft: Data are applicable to any type of single-engine or multiengine reciprocating or turboprop- or turbojet-powered fixed-wing or rotary-wing aircraft.

4. Database Population Characteristics: The database manager reports that approximately 50 percent of the reports are concerned with general aviation aircraft, and 50 percent of the reports relate to air carrier or air taxi aircraft. General aviation aircraft reports are voluntary. Air carrier and air taxi reports are mandated by federal regulations in many instances and solicited in those instances that are not mandated. The data may or may not relate to aircraft accidents or incidents. A report may be submitted to the SDRS in the course of an accident or incident investigation if service difficulty information is discovered.

5. Total Records: New records are accumulated at a rate of approximately 20,000 per year. Approximately 60,000 records are on file at the Oklahoma City facility.

6. Time Period(s) Covered: The current year plus the preceding 2 years are stored at Oklahoma City. Data before that are stored with Boeing Computer Services, dating back to 1973.

7. Rate Information Available: Rate information is not available. Population counts are available.

8. Fields/Data Coding: FAA Form 8070-1 is used to submit reports to the SDRS program. This form is also used to encode data directly into the SDRS database.

9. Recommendations: Recommendations are not available in this system.

10. Clear Text Available: A clear text is not available. If a text was submitted by the reporter, it is not entered into the database.

C. Utility of Data

1. Finding/Causal Format: Findings and causes of the failure of the parts or equipment are not recorded.

2. Focused Human Factor Information: Since the database is entirely mechanical failure and product defect information, there is little or no focused human factor information available. The frequency of failure for aviation parts and equipment is available.

3. Raw Text Available for Review, In-depth Study: The submitted reports are saved for a period of 3 years.

4. Limitations/Caveats/Biases: No known biases exist in the SDRS database.

5. Potential Duplication in Other Databases: Manufacturers of aircraft parts, components, and equipment receive data from the SDRS database.

D. Retrieval Information

1. Reports/Summaries Available: Daily reports of significant service difficulty reports are issued. Other periodic reports of varying frequency are also issued. Reports contain no statistics and no analysis is made of the data.

2. Accessibility: All reports issued are available. Any data contained in the database are available.

3. Turnaround Time for Requests: The FAA database manager reports that a 15-day turnaround time is normal for data requests.

4. Data Use Limitations: No limitation is placed on any furnished data.

5. Cost Per Request: A charge for the direct cost of the computer time used, plus a direct cost for data reproduction may be assessed.

6. Contact Point for Requests: For further information and requests for data, contact the FAA's National Safety Data Branch (AVN-120) at (405) 686-4391.

3.1.1.1.4 FAA CAIS Database

A. Source Information

1. Database Name: Comprehensive Airmen Information Subsystem (CAIS)

2. Database Sponsor/Manager: The FAA is the database sponsor. The database manager is the FAA's Office of Airmen Certification (AVN-460).

3. Database Purpose: The purpose of the database is to support the airmen certification process.

4. Implementation/Guiding Directive: There are no known or guiding directives concerning the database.

5. Type of Records: The records are airmen certificate applications.

6. Record Source: The source of the record information is an airman's application for a certificate or a medical report of an airman's medical status. The applications of nonflying personnel for an FAA certificate are also entered into the database.

7. Investigation By: FAA inspectors or FAA-designated examiners test the applicants for FAA certificates. Applicants for FAA medical certification are examined by FAA-certified medical examiners.

8. Criteria for Entry: As airmen and nonflying aviation personnel apply for certificates, medical certification, or change in status, information on received applications is entered into the database.

B. Contents

1. General Structure: The CAIS has certificate history of information and medical certification information on the applicants and holders of FAA certificates. The FAA issues 22 different types of certificates. The medical history information is stored separately from the airmen certification records and is kept with more confidentiality than the airmen certificate records. Data are maintained on an IBM 3084 computer at Oklahoma City. An internally FAA-developed program is used for data manipulation.

2. Type of Operations: Type of operations is not applicable to this kind of database.

3. Types of Aircraft: The CAIS database involves information about airmen. The types of aircraft that individual airmen are certified to fly is available information.

4. Database Population Characteristics: A complete certificate history for every certificate-holding person is available. A complete medical certification history is available concerning those people required to maintain an FAA medical certificate. Demographic information available includes statistics on active pilot and nonpilot certificates held by state or region, by type of certificate, and by age of the certificate holder.

5. Total Records: More than 3 million records are on file in the CAIS.

6. Time Period(s) Covered: Some certificates date back to 1927. The database was automated in 1973.

7. Rate Information Available: Rate information is not available in this database. Extensive population counts are available.

8. Fields/Data Coding: Fields are established to ease entry and retrieval of information. Fields include name, address, social security number, date of birth, height, weight, and certificate information such as type of certificate, pilot limitations, aircraft type ratings, license date, etc.

9. Recommendations: Recommendations are not applicable or available to this type of database.

10. Clear Text Available: A clear text is not available in this database.

C. Utility of Data

1. Finding/Causal Format: Findings or causes are not pertinent to this type of database.

2. Focused Human Factor Information: Other than statistical and demographic information, there is limited human factor information available in the database.

3. Raw Text Available for Review, In-depth Study: Certificate applications are microfilmed for retention.

4. Limitations/Caveats/Biases: There are no known biases in these data.

5. Potential Duplication in Other Databases: The information in this database is not duplicated in other databases.

D. Retrieval Information

1. Reports/Summaries Available: Routine reports are not issued. Information from the CAIS database is used to assist in issuing annual airmen statistics reports.

2. Accessibility: Information from the database is available upon proper request.

3. Turnaround Time for Requests: Requests for readily available data are answered in 2 to 5 working days.

4. Data Use Limitations: No limitations are placed on any furnished data.

5. Cost Per Request: A minimal cost for computer time and data reproduction may be charged.

6. Contact Point for Requests: For further information and requests for data, contact the FAA's Office of Airmen Certification (AVN-460) at (405) 686-2207.

3.1.1.2 FAA NAIMS

The NAIMS was established in 1985 to provide the FAA with a better basis for monitoring events that occurred in the National Airspace System that could impact aviation safety. NAIMS is a family of automated databases that consists of PDs, OEs, and NMACs.

According to FAA personnel, the events in each of the NAIMS databases are a result of human error. The data are primarily statistical and contain limited information as to why the human error occurred. The database managers attribute part of this lack of causal factor information to deficiencies in the data collection forms. The FAA has initiated action to revise the data collection forms to incorporate more causal factor and human factor information. Information from the NAIMS is used by the FAA to monitor the well being of the National Airspace System.

Section 3.1.1.2.1 contains information about the PD database. Section 3.1.1.2.2 provides information about the OE database. Section 3.1.1.2.3 contains information about the NMAC database.

3.1.1.2.1 FAA PD Database

A. Source Information

1. Database Name: Pilot Deviation (PD)

2. Database Sponsor/Manager: The PD database is sponsored by the FAA and managed by the FAA's Office of Aviation Safety.

3. Database Purpose: The purpose of the PD database is to provide insight into the characteristics of PDs and monitor PD trends. The FAA uses information from the PD database as a partial measurement of national airspace safety.

4. Implementation/Guiding Directive: FAA Order 2150.5, Compliance and Enforcement Handbook, specifies procedures for inspecting and reporting PDs.

5. Type of Records: The records from which the PD database is constructed are incident reports. The type of incidents in the PD database are one or more of four general categories:

   - Surface Deviations

     — Take-off or landing without clearance
     — Take-off or landing on wrong runway or taxiway
     — Entering a runway or taxiway without clearance
     — Other, e.g., take-off or landing below weather minimums, landing at wrong airport, and operating contrary to missed approach procedures

   - Air Traffic Control Clearance Deviations

     — From altitude, with or without loss of separation
     — From course, with or without loss of separation

   - Airspace Violated

     — Terminal Control Area, Airport Radar Advisory Area, Airport Traffic Area, Control Zone, Positive Control Area, Special Use Airspace

   - Other Deviations

     — Flying visual rules in instrument conditions, missed reporting point, careless or reckless operation, etc.

6. Record Source: Initial reports of a PD are made by air traffic controllers on an FAA Form 8020-11 (see Appendix B). A final report of a PD is submitted on FAA Form 8020-5 (see Appendix A) by an FAA air carrier or general aviation inspector.

7. Investigation By: An investigation into a reported PD is conducted by an FAA air carrier inspector or by an FAA general aviation inspector.

8. Criteria for Entry: A PD is defined by the FAA as the actions of a pilot that result in the violation of an FAR or a North American Aerospace Defense Command (NORAD) Air Defense Identification Zone tolerance. Air traffic controllers should report any observed PDs. All reported PDs are entered into the database.

B. Contents

1. General Structure: The PD data are stored on an IBM personal computer. dBASE III is used as the database management system.

2. Type of Operations: PD reports are submitted on all civil and military pilots operating aircraft under visual flight rules or instrument flight rules.

3. Types of Aircraft: PD reports are submitted on all fixed- or rotary-wing aircraft.

4. Database Population Characteristics: Some population characteristics of the PD database include pilot type of certificates, type of aircraft, type of flight plan, phase of flight, area of the country, time of day, month, total pilot time, and pilot age. A 1987 report titled, "Selected Statistics Concerning Reported Pilot Deviations" (1985-1986) showed that:

   - Most PDs involved a general aviation operation
   - Noncompliance with Air Traffic Control clearance or wrongful penetrations of certain airspaces were the most frequent occurrences
   - Most PDs occurred during climb or cruise
   - Most PDs occurred from July to October
   - Surfaces deviations comprised 17 percent of the total deviations
   - Altitude deviations comprised 63 percent of reports that involved a loss of standard separation

5. Total Records: The PD database has more than 9,000 incidents on file.

6. Time Period(s) Covered: The PD database was started in 1985 and runs to the present. New PD incidents are added at approximately 250 to 300 per month.

7. Rate Information Available: Rate information is not directly available in the PD database.

8. Fields/Data Coding: Appendix B contains a copy of the data dictionary in use with the PD database.

9. Recommendations: Recommendations are not available.

10. Clear Text Available: A short clear text is available.

C. Utility of Data

1. Finding/Causal Format: The PD database can be used to determine if a loss of standard separation between aircraft in flight resulted from the PD. The PD data also indicate if violation action was initiated.

2. Focused Human Factor Information: The database manager reports that there is currently very little focused human factor information in the data. The information requested on the two data input forms, FAA Forms 8020-5 and 8020-11 (see Appendixes A and B) are not human factor oriented but captures information on what happened, where, and when. The FAA has stated that a new report form, dedicated specifically to PDs, is under development and will include more human factor information such as pilot knowledge, fatigue, workload, medical problems, preflight planning, crew coordination, and cockpit communications.

3. Raw Text Available for Review, In-depth Study: The raw text of the incident reporting forms is available for review.

4. Limitations/Caveats/Biases: In the statistical analysis of the PD data the Office of Aviation Safety has become aware of biases in the data. Reported PDs increased 1063 percent after a well-publicized 1986 midair collision between a general aviation aircraft, which had deviated into a Terminal Control Area, and a commercial airliner over Cerritos, CA. Controller workload is thought to have an influence on the number of reported PDs in the early stages of the PD database. The existing feeling of the Office of Aviation Safety personnel and interviewed air traffic controllers is that more deviations are now being reported due to the automatic recording of nonstandard separation between aircraft. Since air traffic controllers must report all automatically recorded nonstandard aircraft separations, those nonstandard separations caused by PDs are now reported. The automatic recording system also induces the air traffic controllers to report any observed PDs, which raises the probability that most of the observed PDs are being reported.

5. Potential Duplication in Other Databases: The possibility exists that PD incidents are duplicated in the FAA's AIDS since the same report form, FAA Form 8020-5, is used in both reporting processes. Also, if the PD resulted in an NMAC with another aircraft, the same occurrence would be recorded in both databases.

D. Retrieval Information

1. Reports/Summaries Available: The FAA's Office of Aviation Safety issues daily reports of PDs to the FAA Administrator. Quarterly summaries are also reported to the FAA Administrator. Monthly reports of PDs are sent to Congress. An annual statistical summary is prepared. Special reports and studies are made periodically.

2. Accessibility: No direct access to the database is available. The FAA honors requests for information through the manager of the database, the Office of Aviation Safety. Issued periodic reports are available.

3. Turnaround Time for Requests: Turnaround time for requests is approximately 2 to 5 days.

4. Data Use Limitations: The FAA places no limitations on any furnished data.

5. Cost Per Request: A small fee for the cost of data retrieval may be charged for a request.

6. Contact Point for Requests: The contact point for requests and further information about the PD database is the FAA's Office of Aviation Safety at (202) 267-9610.

3.1.1.2.2 FAA OE Database

A. Source Information

1. Database Name: Operational Error (OE)

2. Database Sponsor/Manager: The FAA is the OE database sponsor. The FAA's Office of Aviation Safety is the database manager.

3. Database Purpose: The OE database was established to monitor OEs and provide insight into the conditions that existed at the time of the error to establish a basis for reducing the occurrence of the OEs. The FAA also uses OEs as a partial indicator of national airspace safety.

4. Implementation/Guiding Directive: FAA Order 7210.4, Air Traffic (AT) Operational Error/Deviations Investigating and Reporting, offers guidelines and defines procedures for the investigation and reporting of OEs/deviations that occur in the air traffic system.

5. Type of Records: OEs are records of occurrences that take place while in the control of air traffic. An OE is defined as an occurrence attributable to an element of the air traffic control system that results in less than the applicable minimal separation between two or more aircraft or between an aircraft and terrain, obstacles, and obstructions. These errors generally involve human error by an air traffic controller that could lead to potentially hazardous situations.

   An operational deviation is defined as an occurrence where applicable separation minima (as referenced in FAA Handbook 7110.65, Air Traffic Control) was maintained, but when less than the applicable separation minima exists between an aircraft and protected airspace, without prior approval, or when an aircraft penetrates airspace that is delegated to another position of operation or another facility without prior approval, or when an aircraft or controlled vehicle/equipment encroaches on a landing area that is delegated to another position of operation without prior approval.

   Separation minima are defined in the FAA Handbook 7110.65, Air Traffic Control. At domestic Air Route Traffic Control Centers (ARTCC), loss of required separation between aircraft triggers an automatic error detection system.

6. Record Source: The formal reporting of an OE begins with the filing of a Preliminary Operational Error/Deviation Report, FAA Form 7210-2.1 (see Appendix C). A final report, FAA Form 7210-3, Final Operational Error/Deviation Report (see Appendix C), is filed within 90 days.

7. Investigation By: The investigation into a reported OE is conducted by personnel at the facility where the reported error occurred.

8. Criteria for Entry: OEs and operational deviations are entered into the OE database.

B. Contents

1. General Structure: The OE database consists of four subset databases:

   - A database containing general information regarding reported OEs and operational deviations
   - A database containing information regarding the employees involved in the reported OEs and operational deviations
   - A database containing information regarding the aircraft involved in OEs and operational deviations
   - A facility database containing facility names, regions, and related data

   Occurrences that become classified as an operational deviation are also retained in the database. Statistical reports and references to the database only discuss OEs.

   The data are maintained on a personal computer. dBASE III is used as the data management system.

2. Type of Operations: Any FAA facility providing separation services to aircraft may be involved in an OE.

3. Types of Aircraft: Any aircraft, civil or military, operating in the National Airspace System may be involved in an OE.

4. Database Population Characteristics: The FAA reports that the 1986 OEs showed the following characteristics:

   - 75 percent of errors reported from ARTCCs involved aircraft flying between 12,500 and 34,500 feet, an area of almost exclusive radar control.
   - 85 percent of ARTCC errors involved at least one aircraft climbing or descending.
   - Less than 5 percent of ARTCC errors involved aircraft separated by 1 mile or less.
   - Pilot contribution did not appear to be a significant factor in the cause of OEs.
   - For terminal facilities, 64 percent of the OEs involved aircraft flying between 3,000 and 10,000 feet; 85 percent of errors at towers occurred when the aircraft were below 3,000 feet.
   - At towers, the number of errors involving climbing aircraft exceeded by a factor 6 the number of errors involving descending aircraft.
   - About 15 percent of the OEs involved controller training activities.

5. Total Records: The present OE database contains more than 4,000 records. OEs are reported at the rate of 75 to 100 per month.

6. Time Period(s) Covered: The OE database was established in 1985 and contains records from that time to the present. Before 1985, information on OEs was maintained by the FAA's Air Traffic Service. Those records were not transferred to the OE database. Statistics concerning OEs are available back to 1976, but the raw data reports are not available.

7. Rate Information Available: OE rates can be reported as errors per 100,000 operations per facility or per controller, by using FAA activity information from other databases.

8. Fields/Data Coding: The database is designed to conform with the design of the reporting forms and contains essentially all of the information reported. (See Appendix C for a copy of the reporting forms.)

9. Recommendations: Recommendations are available on the raw data forms.

10. Clear Text Available: A brief clear text is available.

C. Utility of Data

1. Finding/Causal Format: OEs and operational deviations are classified as:

   - Human OEs or operational deviations resulting from nonadherence to procedures, individual misinterpretation of instructions, or substandard employee performances.
   - Procedural OEs or operational deviations resulting from facility misinterpretation of national or regional policies, procedures, or instructions; regional misinterpretation of national policies, procedures, or instructions; or inadequate national, regional, facility policies, procedures, or instructions.
   - Equipment OEs or operational deviations where the failure, malfunction, or substandard performance of pertinent equipment or aircraft avionics results in an error or deviation.

   After a preliminary report of an OE has been submitted, upon investigation by personnel at the facility concerned, the occurrence may be classified as an operational deviation.

2. Focused Human Factor Information: The FAA has stated that 96 percent of all OEs reported in 1986 showed human factors to be the primary cause of OEs as opposed to procedural or equipment factors.

   The OE database probably contains more focused human factor information than any other FAA accident or incident database. The database section containing information about employees involved lists data on the following areas:

   - Date of birth
   - Employment history as a controller
   - Position certification
   - Performance evaluation
   - Proficiency training
   - Medical certification
   - Work schedule
   - Activity profile
   - Assistance before the occurrence
   - Employee corrective actions
   - Distractions

   Other human factor information listed in other sections of the report includes workload data, supervision, environmental influences, equipment layout, radar in use, and communications involved.

   Human factor-related causal factors evaluated in the OE report form and database include the following:

   - Data posting
     - Computer entry incorrect
     - Flight progress strip not prepared or incorrect

- Radar display
  - Misidentification
  - Inappropriate use of data

- Aircraft observation
  - Improper use of visual data

- Communications error

- Coordination

- Position relief briefing deficiency

The FAA reports that the 1986 OEs showed the following human performance characteristics:

- Occurred when traffic complexity was average
- Occurred during the first 60 minutes of the controller's time on position
- Occurred after the controller involved had returned to the position following a work break
- Occurred on the employee's first work day after time off
- Was attributed to human error
- Involved full-performance-level controllers
- Involved employees who had been certified on position for less than 4 years

3. Raw Text Available for Review, In-depth Study: The raw text in the submitted reports is available for a period of 3 years.

4. Limitations/Caveats/Biases: In 1984 an automatic error detection system was introduced at all domestic ARTCCs. This is a software program that automatically records the incident when two airplanes being tracked by radar violate minimal separation criteria. According to FARs all air traffic must be at least 1,000 feet apart vertically (2,000 feet at flight levels above 29,000 feet) or separated laterally by distance or time minima. Whenever these minima are violated for aircraft being tracked by radar, the automatic alerting system is triggered. Before the automatic error detection system was in place, some small separation infractions may have gone undetected, and fewer errors were reported. The peak value of 1,888 OEs in 1984 decreased to about 1,200 per year in 1986 and 1987 as controllers apparently adjusted to the automatic error detection system and are avoiding the minimal aircraft separation distance that triggers an alert by a wider margin. Note the following statistics:

1982	353 OEs
1983	723 OEs
1984	1,888 OEs
1985	1,402 OEs
1986	1,203 OEs
1987	1,213 OEs

5. Potential Duplication in Other Databases: An NMAC report may also describe the same event as an OE report if the OE caused an NMAC. The same event may appear in both the NMAC and the OE databases.

D. Retrieval Information

1. Reports/Summaries Available: OEs that occurred the previous 24 hours are a subject of the FAA Administrator's daily briefing. A monthly statistical summary is prepared and a monthly report is sent to Congress. Annual statistical summaries are prepared. Special reports are also periodically prepared.

2. Accessibility: Direct access to the OE database is unavailable. Prepared reports and information from the database are available.

3. Turnaround Time for Requests: The turnaround time for requests is 2 to 5 working days.

4. Data Use Limitations: The FAA places no limitations on any furnished data.

5. Cost Per Request: A small fee for the cost of reproducing data may be charged.

6. Contact Point for Requests: Requests for further information and data should be made to the FAA Office of Aviation Safety at (202) 267-9610.

3.1.1.2.3 FAA NMAC Database

A. Source Information

1. Database Name: Near Mid-Air Collision (NMAC)

2. Database Sponsor/Manager: The FAA is the NMAC database sponsor. The FAA Office of Aviation Safety is the NMAC database manager.

3. Database Purpose: The purpose of the NMAC database is to provide a basis for developing remedial actions that may reduce the occurrence of mid-air collisions and NMACs. The FAA uses the NMAC data as a partial indicator of national airspace safety.

4. Implementation/Guiding Directive: FAA Orders 8440.5, General Aviation Operations Inspectors Handbook, and 8430.1, Air Carrier Operations Inspector Handbook, contain guidelines and procedures for FAA inspectors in the investigation and reporting of NMACs.

5. Type of Records: The record types contained in the NMAC database are voluntary reports from air crew members and actual mid-air collision information taken from the NTSB Aviation Accident Database.

6. Record Source: An NMAC report is initially reported on FAA Form 3556, Near Mid Air Collision Preliminary Report (see Appendix D). A final report is prepared on FAA Form 8020-15, Investigation of Near Mid-Air Collision Incident (see Appendix D).

7. Investigation By: All initial reports of an NMAC are investigated by either an FAA air carrier inspector or an FAA general aviation inspector, usually within 90 days of the initial report. The investigating inspector fills out the final report, FAA Form 8020-15.

8. Criteria for Entry: The FAA defines an NMAC as an incident associated with the operation of an aircraft in which a possibility of collision occurs as a result of proximity of less than 500 feet to another aircraft, or a report is received from a pilot or flight crew member stating that a collision hazard existed between two or more aircraft. The pilot or flight crew member reports are voluntary. All reported NMACs are entered into the database.

B. Contents

1. General Structure: NMAC data are stored on an IBM personal computer. dBASE III is used as the data management system.

2. Type of Operations: Any pilot or flight crew member operating any civil or military aircraft under visual or instrument flight rules may report an NMAC.

3. Types of Aircraft: NMAC reports are applicable to any fixed- or rotary-wing aircraft.

4. Database Population Characteristics: The FAA Office of Aviation Safety states that a typical NMAC event:

   - Is classified as potential (less than 500 feet but more than 100 feet separation)
   - Occurs between 1300 to 1700 local time
   - Involves a general aviation operation (87 percent)
   - Has one aircraft operating under visual flight rules and one operating under instrument flight rules (60 percent)
   - Occurs between 1000 to 5000 feet altitude
   - Occurs when weather is not a factor (84 percent)
   - Does not involve PDs or controller errors

5. Total Records: The NMAC database has more than 3,000 incidents on file from 1985 to present. The database also lists information on more than 100 mid-air collisions, extracted from the NTSB Aviation Accident Database.

6. Time Period(s) Covered: The current NMAC database was started in 1985 and runs through the present day. NMAC information is available from 1973 to 1985 but is stored separately.

7. Rate Information Available: By using information from reports of U.S. aviation activity, NMAC reports per 100,000 flight hours is available.

8. Fields/Data Coding: NMAC data fields include:

   - Date, time, location
   - Aircraft make, model, type, transponder equipped
   - Operational area or airspace
   - Type of air traffic control
   - Phase of flight
   - Type of flight plan or none
   - Weather
   - Sighting information - distance, evasive action taken
   - Pilot information - certificate type, flight hours
   - Controller or OE error involved
   - Violation data

Basically, every item on FAA Form 8020-15 (see Appendix D) is put into the database.

9. Recommendations: Recommendations are not available.

10. Clear Text Available: A small clear text of an NMAC incident is available. A brief description of the incident is incorporated in the NMAC form, FAA Form 8020-15.

C. Utility of Data

1. Finding/Causal Format: The FAA inspector who investigates the reported NMAC categorizes the occurrences into one of three hazard categories:

   - Critical: a situation where collision avoidance was due to chance rather than action on the part of the pilot. Less than 100 feet of aircraft separation would generally be considered as critical.

   - Potential: an incident that probably would have resulted in a collision if no action had been taken by either pilot. Closest proximity of less than 500 feet would usually be required in this case.

   - No Hazard: when direction and altitude would have made a mid-air collision improbable regardless of evasive action taken.

2. Focused Human Factor Information: The NMAC database manager reports that there is little focused human factor information available in the NMAC database. The data records what happened and where, but has limited causal factor information. Information about pilot type of certificate and total pilot time is recorded. The FAA has an effort in progress to revise the NMAC data collection form to include more causal factor and human factor information. The new NMAC data report form is expected to include information on pilot workload, preflight planning, pilot experience, knowledge of air traffic control procedures, fatigue, stress, and complacency.

3. Raw Text Available for Review, In-depth Study: The raw text of the NMAC report forms are available for review for a period of 3 years.

4. Limitations/Caveats/Biases: The FAA reports that limitations of the current NMAC database are related to the fact that reporting of NMACs is voluntary and in many cases subjective. An NMAC report may only be a pilot-perceived incident that may not involve a violation of regulations, an air traffic control error, or even a truly unsafe condition. Judgment of separation distances in a moving airplane is subjective. Conversely, some NMACs involving unsafe conditions may go unreported because the pilots involved failed to see each other in poor visibility conditions, were afraid of being penalized, or did not know the reporting procedures.

   Another data limitation may be due to the subjectivity of the FAA inspector investigating the reported NMAC. The inspector categorizes the reported NMAC as critical, potential, or no hazard, based on his opinion of the criticality of the event. This determination is made on the basis of the inspector's judgment or perception.

In 1985 new data procedures were implemented, and data were audited beginning with 1983. Therefore, annual NMAC data for years before 1983 may not be directly comparable to data subsequent to that date.

5. Potential Duplication in Other Databases: NMAC events may be in the PD database or the OE database if an OE or PD report involved an aircraft separation of less than 500 feet.

D. Retrieval Information

1. Reports/Summaries Available: The FAA sends Congress a monthly report of NMACs. A monthly statistical summary is also prepared. Statistical summaries of NMACs are included in an annual report. Special reports are periodically prepared.

2. Accessibility: No direct access to the database is available. All published reports and database information are available.

3. Turnaround Time for Requests: The turnaround time for data requests is approximately 2 to 5 working days.

4. Data Use Limitations: The FAA imposes no restrictions on any furnished data.

5. Cost Per Request: A fee for the cost of retrieving and reproducing data may be charged.

6. Contact Point for Requests: The FAA Office of Aviation Safety should be contacted for data requests and further information at (202) 267-9610.

3.1.1.3 FAA ACADS Database

A. Source Information

1. Database Name: Air Carrier Accident Data System (ACADS)

2. Database Sponsor/Manager: The FAA is the database sponsor. The FAA Office of Accident Investigation is the database manager.

3. Database Purpose: The purpose of the database is to assist the Office of Accident Investigation in tracking all air carrier and scheduled commuter aircraft accidents.

4. Implementation/Guiding Directive: There are no written directives pertaining to this database.

5. Type of Records: The records of this database are notifications of aircraft accidents.

6. Record Source: FAA Air Traffic Control facilities submit a notification of an air carrier or scheduled commuter accident to the FAA's Office of Accident Investigation.

7. Investigation By: Aircraft accidents are investigated by NTSB personnel. The FAA AIDS and the NTSB Aviation Accident Database contain investigated aircraft accident reports. The ACADS is a database to track the accountability of reported air carrier or scheduled commuter accidents.

8. Criteria for Entry: All notifications of air carrier or commuter accidents are entered into the database.

B. Contents

1. General Structure: The database is maintained on an IBM personal computer. dBASE III is used as a data management system.

2. Type of Operations: This database contains data only on scheduled air carrier aircraft operating in accordance with FAR Part 121 or scheduled commuter aircraft operating in accordance with FAR Part 135.

3. Types of Aircraft: The aircraft involved in the operations listed in 2 above are multiengine turbojet, turboprop, or reciprocating powered aircraft.

4. Database Population Characteristics: The information in the database only pertains to scheduled airlines or scheduled commuter airlines.

5. Total Records: The database contains approximately 1,600 records. Approximately 200 records per year are entered.

6. Time Period(s) Covered: Data were initially automated in 1981. Before 1981, the information was maintained in a handwritten file.

7. Rate Information Available: Rate information is not available in this database.

8. Fields/Data Coding: Database fields are established to capture basic information about a reported air carrier or scheduled commuter aircraft accident. The fields include time, date, place, aircraft type, phase of flight, whether or not fire was involved in flight or post-crash, number of people involved, number of injuries, degree of injuries, damage to aircraft (substantial, minor, none). New fields are being added to record information regarding pilot flight time and pilot experience.

9. Recommendations: Recommendations are not available in this database.

10. Clear Text Available: A clear text narrative is not available in this database.

C. Utility of Data

1. Finding/Causal Format: No findings or causal information is available.

2. Focused Human Factor Information: The database manager reported that no focused human factor information is available.

3. Raw Text Available for Review, In-depth Study: The aircraft accident notification forms are retained for a period of 3 years.

4. Limitations/Caveats/Biases: The data are used for numerically accounting for scheduled air carrier and scheduled commuter aircraft accidents. The database manager reported that the information is all contained in greater depth in other databases.

5. Potential Duplications in Other Databases: All accidents listed in the ACADS database are also listed and reported on in the NTSB's Aviation Accident Database and in the FAA's AIDS.

D. Retrieval Information

1. Reports/Summaries Available: Reports are not issued from information in this database.

2. Accessibility: Access to this database is not available.

3. Turnaround Time for Requests: Data have never been requested from outside the immediate office managing this database, therefore, an estimate of a turnaround time was not available.

4. Data Use Limitations: No limitations would be placed on any furnished data.

5. Cost Per Request: A fee for the duplication of information may be charged.

6. Contact Point for Requests: For further information concerning this database, contact the FAA's Office of Accident Investigation at (202) 267-9624.

3.1.1.4 FAA ASRS Database

A. Source Information

1. Database Name: Aviation Safety Reporting System (ASRS)

2. Database Sponsor/Manager: The FAA is the database sponsor. NASA is the program manager. Battelle Columbus Division is the database manager.

3. Database Purpose: The purpose of the ASRS is to provide information to the FAA and the aviation community to assist the FAA in reaching its goal of eliminating unsafe conditions and preventing avoidable accidents.

4. Implementation/Guiding Directive: FAA Advisory Circular ACC 00-46C, Aviation Safety Reporting Program, is a guiding directive for the ASRS program.

5. Type of Records: Records are all voluntary reports of occurrences that could impact aviation safety. Reporters are guaranteed anonymity and immunity from FAA actions.

6. Record Source: Reports are submitted by pilots, controllers, mechanics, other interested parties, and users of the National Airspace System. Reports are submitted on a postage-free, pre-addressed NASA Form ARC 277 (see Appendix E). After initial screening for information concerning criminal offenses and accidents and time-critical information, the reports are de-identified by removal of a tear-off strip, which is mailed back to the report originator. The tear-off strip contains information that identifies the person submitting the report. Prompt return of the identification strip is a primary element of the de-identification process and ensures reporter anonymity.

7. Investigation By: Reports needing amplification are followed up by analysts making contact with the originator of the report. No investigation of the occurrence is conducted.

8. Criteria for Entry: All received reports are entered into the database after initial screening for reports concerning aviation accidents or reports concerning criminal activity. Reports containing aviation accidents or criminal activities are referred to the proper authorities and not retained in the ASRS database.

B. Contents

1. General Structure: Each document in the computer exists as a complete record and contains all administrative and fixed-field entries, diagnostic terms, and the narrative for each record. This information is contained in a file that cannot be inadvertently altered while the data are being used. Reports in this protected file are addressed by accession number of each record.

   A second file contains all indexed terms. Each term is associated with a list of accession numbers of all records indexed by that term. The index file lists the attributes coded by the ASRS analysts and serves as a locator of all reports containing the attributes.

   Data are stored on a computer at a contractor's facilities in Columbus OH; Battelle is the contractor. Research, data analysis, report generation, and responses to database inquiries are accomplished at Battelle's ASRS office in Mountain View, CA, under the monitoring of NASA. Battelle's BASIS is used for information management for the ASRS database.

2. Type of Operations: The ASRS program is concerned with safety reports relating to any person or aircraft functioning in the National Airspace System. The operations covered by the program include departure, en route, approach, and landing operations and procedures; air traffic control procedures and equipment; pilot/controller communications; aircraft movement on an airport; and NMACs.

3. Types of Aircraft: The ASRS is applicable to any type of civil, public, or military aircraft operating in the National Airspace System.

4. Database Population Characteristics: The report forms provide information on the type of operation (air carrier, military, corporate, etc.), type of aircraft, type of flight plan, type of airspace, weather factors, type of air traffic control, flight conditions, day or night, pilot currency and experience level, and phase of flight. Population counts in those areas of information are available. More than 90 percent of the ASRS reports currently being received are originated by pilots. Approximately 10 percent are received from controllers. In the early years of ASRS, the report population was approximately 50 percent pilot, 50 percent controller.

5. Total Records: More than 101,000 reports are currently on file in the ASRS system. Reports are presently received at a rate of 1,800 to 2,000 per month.

6. Time Period(s) Covered: The current operational database was implemented in 1978 and contains records from 1976 to the present.

7. Rate Information Available: Rate information is not available, but population counts reflect frequencies of occurrences in areas under study, e.g., numbers of reports with communications difficulties or air traffic procedures.

8. Fields/Data Coding: Records are arranged into the field groups, including administrative, time, aircraft, location, person, weather, software, conflicts, major classifications, text, and diagnostics. The report narrative is free form. Each of the field groups has several fields under the group heading. A copy of a graphic portrayal sheet of the field grouping, taken from a 1986 report, "The Development of the NASA Aviation Safety Reporting System," is contained in Appendix E. Field number 204, labeled Behavior, contains some coded terms directly related to human factor information. A list of the descriptive terms is contained in Appendix E. The list of key coding words exceeds 300 pages in a coding manual.

9. Recommendations: Analysts send immediate alert bulletins to the FAA of a reported hazard if the hazard is a continuing risk and is correctable. Program or quarterly reports and contractor reports and technical papers are issued. These bulletins and reports focus on specific safety hazards and, although they make no recommendations per se, they indicate a course of action to alleviate the safety problems.

10. Clear Text Available: A clear text of each report is available.

C. Utility of Data

1. Finding/Causal Format: The ASRS system is not designed to pinpoint findings or causes of accidents or incidents. Some reporters may report causal factors as they perceive them, which appear in the narrative.

2. Focused Human Factor Information: The ASRS reports contain human factor information in the narrative section of the report. Key word search of the narratives is available. A list of key words with human factor information, as taken from a 1986 report, "The Development of the NASA Aviation Safety Reporting System," is contained in Appendix E. The searching technique is complicated and much cross referencing and indexing is available.

3. Raw Text Available for Review, In-depth Study: The raw text narrative of the ASRS report is transcribed into the report narrative.

4. Limitations/Caveats/Biases: The ASRS reports are voluntary. The population of the reports cannot be used to measure the extent of similar occurrences. The data under-represents the types of occurrences or problems reported.

   ASRS reports reflect only the point of view of the reporter, as he perceived the situation. The ASRS reports are not verified by further investigation. After the initial screening and the return of the tear-off strip, the reporter becomes anonymous and further inquiry into circumstances surrounding the report are not possible.

   ASRS reports offer immunity to reporters from FAA disciplinary action resulting from the reported event. For example, pilots may file an ASRS report for an occurrence that they feel could lead to a violation of the FARs. The FAA, in the course of the inspection, has to consider if a report of the subject occurrence is on file in the ASRS. If a report is on file, verified by the returned tear-off strip, and the event was not intentional, no violation action is consummated. Therefore, it behooves suspected offenders to file an ASRS report. How many reports can be attributed to this immunity program is unknown.

5. Potential Duplication in Other Databases: The possibility exists that the occurrence reported to the ASRS program may also be recorded in the FAA's PD, OE, or NMAC databases if one of those occurrences is what is being reported to the ASRS program.

D. Retrieval Information

1. Reports/Summaries Available: The ASRS issues alert bulletins whenever credible data are received that a continuing aviation hazard is correctible and still exists. These bulletins are normally addressed to the authority or organization in the best position to investigate and correct the problem if the investigation revealed the need for a remedy. Several hundred alert bulletins have been issued by the ASRS program.

   Program Reports are issued quarterly. These reports present several samplings of de-identified reports addressing common aviation issues. Program Reports also present samples of recent alert bulletins and list other recently released research reports.

   Special reports, labeled NASA Technical Papers, NASA Technical Memoranda, or Contractor Reports are issued periodically and address a variety of aviation safety issues. These reports often are devoted to human factor problems in aviation safety. A partial list of some typical reports includes:

   - Cleared for the Visual Approach: Human Factor Problems in Air Carrier Operations
   - Information Transfer Problems in the Aviation System
   - Human Factors in Aviation Operations: The Hearback Problem
   - Fatigue and Associated Performance Decrement in Air Transport Operations
   - Non-Airborne Conflicts: The Causes and Effects of Runway Transgressions

   A monthly safety newsletter is published and distributed by the ASRS program. It is a 1-page instructive document that addresses an aviation safety subject in easy-to-read terms. This newsletter, called "Callback", is intended to inform readers of informative reports received through the ASRS program. The mailing list includes more than 40,000 recipients.

   The ASRS program also responds to special requests for aviation safety data contained in the data bank.

2. Accessibility: Because of the complex searching techniques and the necessity for appropriate caveats, the only way to obtain information from the ASRS is to explain what is desired to the ASRS office. ASRS personnel who are familiar with the database develop a search program tailored to respond to the request. Issued reports are readily available.

3. Turnaround Time for Requests: The turnaround time for requests is dependent on the type of request and the ASRS workload.

4. Data Use Limitations: A caveat is placed on any data furnished to a requester that stipulates that the data have not been validated, and any conclusions reached cannot be validated.

5. Cost Per Request: No cost is charged for serviced requests.

6. Contact Point for Requests: Requests for data and further information can be obtained from Battelle's ASRS office in Mountain View, CA at (415) 969-3969.

3.1.2 NTSB Aviation Safety Database

A. Source Information

1. Database Name: NTSB Aviation Accident Data System

2. Database Sponsor/Manager: The NTSB is the database sponsor and database manager.

3. Database Purpose: The NTSB is tasked by Congress to investigate transportation accidents to determine cause(s) or probable cause(s) and to make safety recommendations aimed at preventing future accidents. To assist in carrying out this task, the NTSB established a computerized database.

4. Implementation/Guiding Directive: The NTSB was established by Public Law 93-633. NTSB Order 6200.1A, Manual of Aircraft Accident Investigation, is the guiding directive for NTSB investigators involved in the investigation and reporting of aircraft accidents.

5. Type of Records: The database consists of records of U.S. civil aviation accidents and selected U.S. civil aviation incidents. An aircraft accident is defined as an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which any person suffers death or serious injury as a result of being in or upon the aircraft or by direct contact with the aircraft or anything attached thereto, or the aircraft receives substantial damage.

   An aircraft incident is defined as an occurrence other than an accident, associated with the operation of an aircraft, that affects or could affect the safety of operations.

6. Record Source: Civil aircraft accidents and incidents of interest to the NTSB are investigated by trained NTSB investigators in the field. A factual report of the investigation is prepared on NTSB Form 6120.4, Factual Report Aviation Accident/Incident, and forwarded to NTSB Headquarters (see Appendix F for a copy of NTSB Form 6120.4). NTSB Form 6120.4 facilitates the investigators' recording of factual information about an accident or incident in a format easily stored and retrieved. Also used in the investigation is a findings worksheet for use by the investigator to aid in the identification and structuring of findings in a chronological sequence of events format. (A Sequence of Events Worksheet is contained in Appendix F.)

7. Investigation By: Civil aircraft accidents and selected incidents involving civil aircraft are investigated by trained NTSB field investigators. Major air carrier accidents or any civil aircraft accident or incident that the NTSB feels is of significance to the NTSB are investigated by a team of investigators dispatched from the NTSB Headquarters in Washington, DC. The NTSB may delegate the investigation of an aircraft incident to the FAA, in which case the incident is investigated by an FAA air carrier or general aviation inspector and reported to the NTSB and FAA.

   Experienced analysts at the NTSB Headquarters review and verify submitted aircraft accident and incident reports before review and final determination of findings and causes by senior NTSB management.

8. Criteria for Entry: All U.S. civil aircraft accidents and aircraft incidents of interest to the NTSB are entered into the database. The database does not include accidents or incidents involving military or most public use aircraft.

B. Contents

1. General Structure: The NTSB Aviation Accident Database is composed of three files. One file is the factual report file, which captures all of the factual information about an aviation accident or incident as recorded on NTSB Form 6120.4. A second file, the sequence of events file, lists information from an aviation accident or incident as reported on a Sequence of Events Worksheet. The sequence of events file lists the sequence of events in the accident or incident that began as an initial occurrence and progressed through the final occurrence. A maximum of five occurrences numbered sequentially can be stored in the database for each accident. Investigative findings are listed with the pertinent occurrence. Identified direct and indirect underlying factors are listed with the findings, along with any appropriate modifiers. Causal factors or contributing factors are assigned to findings, if appropriate. A third file is a narrative file, which captures the investigators' narrative as reported on the preliminary report or on the factual report of the aircraft accident or incident. The three files can be coordinated by use of a code number identifying an individual accident or incident.

   Data are stored on a DEC 10 computer. A Compuserve 1022 system is used for data management.

2. Type of Operations: All civil aircraft operations are included in the database. This includes air carrier, air taxi, pleasure flying, cargo, commercial, helicopter agriculture, pipeline patrol, medical evacuation, and all aircraft operations not involving military aircraft. The NTSB does have interagency agreements with some Federal agencies that have the NTSB investigate some aircraft accidents of public aircraft.

3. Types of Aircraft: The database contains information on all types of civil aviation aircraft. Military aircraft and most public use aircraft accident or incident information is not contained in the NTSB database.

4. Database Population Characteristics: The database consists primarily of aircraft accidents involving general aviation aircraft. From 1983 to the present, there are approximately 19,000 records on file, of which approximately 700 are aircraft incidents (about 4 percent). Of the 19,000 records, approximately 1,560 are air carrier or air taxi accidents or incidents (about 8 percent). Of these 19,000 records, approximately 1,450 are rotorcraft accidents or incidents (7.6 percent).

5. Total Records: The database consists of approximately 108,000 civil aviation accidents and incidents on file. New records are added at a rate of about 3,000 per year.

6. Time Period(s) Covered: The NTSB has maintained a computer-based civil aircraft accident/incident database since 1967. In 1982 the NTSB upgraded the database and its coding procedures. The total NTSB civil aircraft accident/incident database has three different coding formats: pre-1982, 1982, and post-1982. Since 1983, approximately 19,000 records were filed.

7. Rate Information Available: Rate information is not directly available in the NTSB database. Statistical information is available from other Government sources, and rate information can be generated.

8. Fields/Data Coding: The database fields of the factual report file are structured to capture the information directly from the Factual Report Aviation Accident/Incident, NTSB Form 6120.4 (see Appendix F). Pertinent pages of the Aviation Coding Manual used with the sequence of events file are contained in Appendix F.

9. Recommendations: The NTSB may make recommendations to the FAA for the improvement of aviation safety based on the findings of the investigation of a singular accident, or recommendations may be made based on observed trends. The FAA studies the recommendations and implements them in total or in part, or rejects them as the FAA's analysis deems proper.

10. Clear Text Available: A 200-word clear text brief of each accident or incident is available.

C. Utility of Data

1. Finding/Causal Format: Each civil aviation accident or incident is treated as a sequence of events that take place in specified phases of an operation and that are associated with pertinent investigative findings. Each accident or incident begins with an initial occurrence. A Sequence of Events Worksheet (see Appendix F) is used to help the investigator identify and structure the findings in a chronological sequence of events, and to help identify underlying factors that could suggest remedial or preventive measures to improve aviation safety. The findings are classified as:

   - Non people-related

     — Aircraft: structures, systems, power plants, miscellaneous
     — Environment: ATC system, terrain, light, object, miscellaneous,

   - People-related

     — Airport, maintenance, weather, ATC

   Each of the above classifications may have an associated modifier such as bent, collapsed, fractured, inadequate, nonsuitable, sun glare, etc.

   The events or findings labeled as nonpeople-related or people-related are further explained by direct underlying factors or indirect underlying factors. Each finding may have one or more direct underlying factors, such as overconfidence in personal ability, inattention, diverted attention, interpersonal relations, habit interference, and others. Direct underlying factors may also include inadequacies in aircraft design, flight manuals, operating procedures, operator training, and information. See Appendix F for the NTSB coding of direct underlying factors. Indirect underlying factors are used to address institutional factors that may be involved in the accident or incident, such as inadequate surveillance of an operation, insufficient standards or requirements, inadequate certification or approval, and inadequate substantiation process. Institutional modifiers for these underlying factors include company or operator management, the FAA, the manufacturer, other Government organizations, and other institutions. See the coding manual contained in Appendix F for a list of direct and indirect modifiers used in the classification scheme.

   Each finding of nonpeople-related or people-related, plus each direct or indirect underlying factor may then also be classified as a causal finding or a contributory finding.

2. Focused Human Factor Information: The sequence of events file contains focused human factor information related to any accident or incident on file. The Sequence of Events Aviation Coding Manual contains a list of human factor terms used in the database (see Appendix F).

3. Raw Text Available for Review, In-depth Study: The raw text of civil aviation accident or incident reports is available in the NTSB for further review.

4. Limitations/Caveats/Biases: The investigative and reporting system is complex and requires substantial investigator indoctrination and familiarization. Investigation of the human factor aspects of an aviation accident or incident is labor intensive and time consuming. NTSB Headquarters personnel report that the workload of field investigators does not allow time to carry out exhaustive investigation into human factor aspects of the civil aviation accidents that are not air carrier accidents. Human factor aspects of a civil aviation accident often are not adequately documented, if they are even documentable. Also, according to NTSB Headquarters personnel, since the NTSB report of a civil aircraft accident may often be used in litigation cases, the investigator may be reluctant to encode human factor information since such underlying factors are difficult to prove.

5. Potential Duplication in Other Databases: The NTSB Aviation Accident Database is the most comprehensive civil aircraft mishap database available. Other databases, such as those maintained by aircraft manufacturers or airlines, or the FAA, use the NTSB database as a major source of information. Other databases concerned with aviation accidents may have duplicate information of the NTSB records concerning civil aviation accidents or incidents of interest to the individual database sponsors. U.S. military aviation safety databases contain information regarding U.S. military aviation mishaps.

D. Retrieval Information

1. Reports/Summaries Available: The NTSB publishes reports of civil general aviation accidents or incidents in a two-page computer-generated brief format. The brief format presents only the most frequently requested factual information about a civil general aviation accident or incident. The brief format does present the investigative findings, probable causes, and contributing factors. See Appendix F for a copy of a two-page general aviation accident brief as issued by the NTSB.

   Approximately 200 such briefs are compiled into a volume and issued periodically by the NTSB as investigations are completed. Approximately 18 such volumes are issued annually by the NTSB.

   Civil aircraft accident reports of U.S. air carrier accidents are issued in individual reports as the investigations are completed.

   Annual aviation statistics are issued depicting accident rates, accident types, trends, etc.

   Special reports are issued periodically on aviation safety topics as the NTSB deems appropriate.

2. Accessibility: All NTSB reports are readily available. Information from the database is available, either in paper or in a tape. Direct access to the database is not available.

3. Turnaround Time for Requests: The anticipated turnaround time for requests for information is 2 to 5 working days.

4. Data Use Limitations: The NTSB reports and database are considered public information. No limitations are placed on information supplied by the NTSB.

5. Cost Per Request: A fee of $.11 per page is charged for report reproduction. The cost of making any taped information is also charged for taped data.

6. Contact Point for Requests: For further information and to request any data, contact the NTSB at (202) 382-6570.

   For further information regarding human factor information in the NTSB database, contact the NTSB Human Performance Division at (202) 382-6835.

3.1.3 U.S. Coast Guard Aviation Safety Database

A. Source Information

1. Database Name: U.S. Coast Guard AVINK

2. Database Sponsor/Manager: The U.S. Coast Guard is the database sponsor. The U.S. Coast Guard Office of Aviation Safety, located at U.S. Coast Guard Headquarters, Washington, DC, is the database manager.

3. Database Purpose: The purpose of the database is to assist the U.S. Coast Guard in tracking the trends in aviation occurrences to eliminate aviation mishaps.

4. Implementation/Guiding Directive: U.S. Coast Guard Commandant Instruction 5100.29, the U.S. Coast Guard Safety Manual, publishes guidelines for the investigation and reporting of aviation mishaps.

5. Type of Records: The database consists of aviation mishaps. The U.S. Coast Guard classifies aviation mishaps as:

   - A Class A mishap is a mishap involving total property damage, injury, or occupational illness of $500,000 or more; a fatality or permanent total disability; or the total loss of an aircraft.

   - A Class B mishap is a mishap involving a total cost of $100,000 or more but less than $500,000 for injury, occupational illness, or property damage; a permanent partial disability; or hospitalization of five or more personnel.

   - A Class C mishap is a mishap resulting in a total damage cost of $10,000 or more but less than $100,000, or any injury resulting in 1 or more lost workdays.

   - A Class D mishap is a hazardous occurrence in which no damage or injury was incurred.

6. Record Source: Message reports are received at U.S. Coast Guard Headquarters describing any mishap or hazard reports. These messages are initiated by the local command experiencing the mishap or by the command forwarding the hazard report. Analysts at U.S. Coast Guard Headquarters interpret and enter data into the database.

7. Investigation By: U.S. Coast Guard mishaps are investigated by U.S. Coast Guard personnel who are trained in accident investigations. These personnel are attached to the various U.S. Coast Guard Air

Stations. Class A and B mishaps are investigated by the trained personnel from another location other than where the mishap occurred. The U.S. Coast Guard does not have a trained team of investigators as a go team from U.S. Coast Guard Headquarters. Class C and D mishaps are investigated by locally assigned trained personnel.

8. Criteria for Entry: All Class A, B, C, and D aviation mishaps are entered into the U.S. Coast Guard database. The U.S. Coast Guard uses the same classification scheme as the military services to categorize mishaps as Class A, B, or C. The U.S. Coast Guard classifies a Class D mishap as a hazardous occurrence in which no damage or injury was incurred.

B. Contents

1. General Structure: Data are stored on a Digital VAX 11785 computer at the Transportation Systems Center in Cambridge, MA. A S1032 system is used as the database management system.

2. Type of Operations: U.S. Coast Guard aircraft operate in search and rescue missions, ice patrols, drug interdiction missions, off-shore patrols, and other missions, as assigned. U.S. Coast Guard aircraft are considered public aircraft.

3. Types of Aircraft: The U.S. Coast Guard operates both fixed wing turboprop and turbojet aircraft and helicopters.

4. Database Population Characteristics: The database has averaged 1 Class A mishap per year for the past 6 years and 1.5 Class B mishaps for the past 6 years. Most of the records are minor mishap records and hazard reports. The U.S. Coast Guard database manager reports that approximately 50 percent of the Class D or hazard reports are related to helicopters or helicopter operations.

5. Total Records: The current database has more than 4,500 records. New records are added at a rate of about 700 records per year.

6. Time Period(s) Covered: The database was established in 1981, and includes data from 1981 to the present.

7. Rate Information Available: Rate information is not directly available from the database but can be generated by using statistical data from another data source.

8. Fields/Data Coding: The fields contained in the reporting form include:

   - U.S. Coast Guard District
   - Unit
   - Primary cause
   - Secondary cause
   - Location
   - Mission of aircraft
   - Date/time
   - Aircraft identification
   - Government parts involved
   - Cost
   - Nonaircraft costs
   - Weather
   - Number of fatalities
   - Number of incidents
   - Narrative

9. Recommendations: Recommendations are frequently made in the reports narratives.

10. Clear Text Available: A clear text narrative is available regarding each stored mishap.

C. Utility of Data

1. Finding/Causal Format: The U.S. Coast Guard categorizes aviation mishap causal factors into primary causes and secondary causes. Primary causes are either personnel, mechanical, or environmental. Secondary causes are described in a narrative of up to 35 words. Causes of the mishap may also be discussed in the report narrative.

2. Focused Human Factor Information: The U.S. Coast Guard's database manager stated that the U.S. Coast Guard is interested in human factors and conducts cockpit resource management training for their pilots. However, there is no focused human factor information on the mishap report forms. Any human factor information would appear in the report narrative.

3. Raw Text Available for Review, In-depth Study: Raw text reports are available for an in-depth review.

4. Limitations/Caveats/Biases: There are no known biases in the database.

5. Potential Duplication in Other Databases: The U.S. Coast Guard mishaps are not duplicated in any other database.

D. Retrieval Information

1. Reports/Summaries Available: Periodic reports are forwarded to the U.S. Coast Guard management. Special reports are prepared as needed.

2. Accessibility: Information from the database can be requested through the database manager.

3. Turnaround Time for Requests: A turnaround time for a data request would depend on the request and the workload at the time of the request.

4. Data Use Limitations: The U.S. Coast Guard will only release data to be used in the enhancement of aviation safety.

5. Cost Per Request: The direct cost of data retrieval and reproduction may be charged.

6. Contact Point for Requests: For further information and for any requests for data, contact the U.S. Coast Guard Office of Aviation Safety at (202) 267-1883.

3.1.4 U.S. Customs Service Aviation Safety Database

A. Source Information

1. Database Name: U.S. Customs Service Aviation Safety Database

2. Database Sponsor/Manager: The U.S. Customs Service is the database sponsor. The U.S. Customs Service Office of Aviation Operations is the database manager.

3. Database Purpose: The purpose of the database is to record U.S. Customs Service aviation accidents and incidents to aid in the analysis and reduction of them.

4. Implementation/Guiding Directive: The U.S. Customs Service Aviation Handbook offers guidance to U.S. Customs Service personnel in reporting and investigating aviation accidents and incidents.

5. Type of Records: The database contains records of aircraft incidents. The U.S. Customs Service uses an internally designed form to aid in aircraft incident investigation and reporting. The U.S. Customs Service considers an aircraft incident as any occurrence, other than an accident, associated with the operation of an aircraft, that affects or could affect the safety of operations.

6. Record Source: Message reports of U.S. Customs Service aircraft accidents or incidents are received at the Aviation Operations office. Written reports of a follow-up incident investigation are also forwarded to the U.S. Customs Service Aviation Operations office. The U.S. Customs Service has an interagency agreement with the NTSB so that the NTSB investigates U.S. Customs Service aircraft accidents. Records of aircraft accidents are reported on NTSB forms.

7. Investigation By: U.S. Customs Service aircraft accidents are investigated by NTSB personnel as per an interagency agreement. Trained U.S. Customs Service personnel assist in any U.S. Customs Service aircraft accident investigation. Aircraft incidents are investigated by trained U.S. Customs Service personnel. All aviation safety personnel of the U.S. Customs Service are graduates of an aviation safety program at the University of Southern California.

8. Criteria for Entry: All received aviation incident reports are entered into the database. Records of aviation accidents are in the NTSB format and are retained.

B. Contents

1. General Structure: No information was available regarding the database structure. The data are stored on the U.S. Customs Service mainframe computer.

2. Type of Operations: The U.S. Customs Service operates its aircraft in accordance with FAR, Part 91. The flight operations are conducted in support of drug interdiction programs, border patrols, and other U.S. Customs Service missions.

3. Types of Aircraft: The U.S. Customs Service currently operates a fleet of 107 aircraft, which includes large and small fixed-wing turboprop- and turbojet-powered aircraft, small fixed-wing twin reciprocating-powered aircraft, and turbojet-powered rotary-wing aircraft.

4. Database Population Characteristics: The database manager reports a higher frequency of incident reports involving helicopter operations than fixed-wing operations.

5. Total Records: Information regarding the total number of records was not available.

6. Time Period(s) Covered: Records of aviation accidents and incidents involving U.S. Customs Service aircraft date back to 1980. The database was automated in 1987. Data before 1987 remain in paper files.

7. Rate Information Available: Rate information depicting accidents or incidents per 100,000 flight hours is available. The database manager reported an aviation accident rate of five aircraft accidents per 100,000 flight hours.

8. Fields/Data Coding: The data fields include information about the incident, such as location, aircraft type and number, date, damage to the aircraft, extent of any personnel injuries, actions taken, remarks, etc.

9. Recommendations: Recommendations regarding aviation incidents are made by the investigating personnel. Follow-up actions are tracked and the reported incident closed out with a closure statement.

10. Clear Text Available: A brief narrative is available regarding each incident.

C. Utility of Data

1. Finding/Causal Format: Causes of aviation incidents are attributed to mechanical, human, or other causes.

2. Focused Human Factor Information: The database manager reported that most human factor information contained in the aviation incident reports would appear in the narrative. Focused human factor information is coded into the database under the causal factors. Human factor phrases used to enter or retrieve data include training, lack of skills, fatigue, communications problems, negative habit transfer, pilot deviated from basic procedures, inadequate cross check by second pilot, pilot incapacitation, inability to execute a successful go around, operational procedures not followed, and pilot inexperience in the aircraft.

3. Raw Text Available for Review, In-depth Study: The raw text copies of aviation accident or incident reports are available for possible further review.

4. Limitations/Caveats/Biases: There are no known biases in the database.

5. Potential Duplication in Other Databases: Reports of U.S. Customs Service aircraft accidents investigated by NTSB personnel are also contained in the NTSB aviation accident database.

D. Retrieval Information

1. Reports/Summaries Available: The database manager forwards reports of the U.S. Customs Service aviation accident and incident statistics to higher management on a quarterly basis.

2. Accessibility: Access to the information is not available without written approval of higher U.S. Customs Service personnel.

3. Turnaround Time Requests: If approved by higher U.S. Customs Service management, data requests could be answered in a few working days.

4. Data Use Limitations: No limitations would be placed on any data that the U.S. Customs Service release.

5. Cost Per Request: Since data have never been requested or furnished to personnel outside of the U.S. Customs Service, a cost schedule has not been developed. A minimal fee for the cost of duplicating any data may be charged.

6. Contact Point for Requests: For further information and any requests for data, contact the U.S. Customs Service Office of Aviation Operations at (202) 535-9320.

3.1.5 DOI Aviation Safety Database

A. Source Information

1. Database Name: Department of Interior Aviation Safety Database

2. Database Sponsor/Manager: The DoI is the database sponsor. The DoI Office of Aircraft Services is the database manager.

3. Database Purpose: The purpose of the database is to monitor DoI aviation operations with respect to safety and analyze aviation accidents and incidents to help reduce their recurrence.

4. Implementation/Guiding Directive: DoI Manual 352DM-6 presents guidelines to personnel concerning the DoI aviation program and the reporting and investigations of accidents or incidents involving aircraft operated by the DoI.

5. Type of Records: The records are voluntary and mandatory reports of aviation incidents and accidents. Records are paper files of aircraft accidents or incidents involving aircraft operated by the DoI. The DoI uses the Code of Federal Regulations Part 830 definition of aircraft accident or incident (see Section 3.1.1.1.1.A.5).

6. Record Source: The DoI Office of Aircraft Services receives notification of aviation accidents or incidents by telephone or telex. A standard DoI form is used to guide an incident investigation and report the incident. A standard DoI form is also used for aircraft accident investigation.

7. Investigation By: DoI-operated aircraft accidents that involve fatalities are investigated by the NTSB through an interagency agreement. Nonfatal accidents and aircraft incidents are investigated by trained DoI personnel. Aircraft incidents are investigated and reported by personnel at the location of the incident. All reports are reviewed by trained DoI personnel at the Office of Aircraft Services.

8. Criteria for Entry: All aircraft accident or incident reports involving aircraft operated by the DoI are retained on file.

B. Contents

1. General Structure: The database consists of paper records. The DoI has plans to automate the database, but it is anticipated that automation is 2 to 3 years in the future.

2. Type of Operations: Although public aircraft are not required to operate under the provisions of any FAR the DoI operates aircraft in accordance with FAR Part 135. The DoI contracts for approximately 90 percent of the aircraft used in support of DoI missions. The DoI reported having 87 aircraft owned by the agency, and another 400 aircraft available on short- and long-term contracts. All firefighting aircraft are contracted. Airplanes under contract to the DoI are considered public aircraft.

3. Types of Aircraft: The DoI contracts to operate multiengine turbojet-, turboprop- and reciprocating engine-powered aircraft, and multiengine rotary-wing aircraft.

4. Database Population Characteristics: No characteristics of the database were available. Since many different types of aircraft are operated on diverse missions, trend analysis would probably be difficult.

5. Total Records: The DoI has 137 accident reports on file and receives approximatly 170 incident reports per year. The database manager estimated that he receives reports of about 50 percent of the aircraft incidents that actually occur.

6. Time Period(s) Covered: Aircraft accident and incident data are on file dating back to 1975.

7. Rate Information Available: Rate information is available comparing number of accidents per 100,000 flight hours. The database manager reported that the accident rate is currently 5.5 accidents per 100,000 hours of flight time. Statistics are not available by aircraft type.

8. Fields/Data Coding: The database is not automated.

9. Recommendations: Corrective actions may be identified by personnel investigating the incident or accident, or by the aviation-trained supervisors at the Office of Aircraft Services. Recommendations and corrective actions are then forwarded to the appropriate field office.

10. Clear Text Available: All records are paper files. A narrative or remarks section is available on the written reports.

C. Utility of Data

1. Finding/Causal Format: Aircraft incidents are reviewed at the Office of Aircraft Services. If findings identify some needed corrective action(s), the corrective action is directed to the pertinent office. Aircraft accident investigations are conducted by specially trained Office of Aircraft Services personnel. These personnel are trained in the NTSB method of findings and causal factors and assign causes using the NTSB methodology.

2. Focused Human Factor Information: The database manager reports that any human factor information would be obtained by reading the narrative of the incident or accident report. The database manager reported that, in his opinion, fatigue may be a factor in DoI incidents because most incidents were occurring in the last day or two of a 5- or 6-day pilot work cycle.

3. Raw Text Available for Review, In-depth Study: The raw text reports constitute the database and are available for review.

4. Limitations/Caveats/Biases: No known biases exist in the database.

6. Potential Duplication in Other Databases: Aircraft accidents involving fatalities are investigated by the NTSB per an interagency agreement. Therefore, the NTSB would have a duplicate record in its database for any DoI aircraft accident that involved a fatality.

D. Retrieval Information

1. Reports/Summaries Available: The Office of Aircraft Services issues a quarterly report that includes aviation safety information. Safety alerts on specific safety items are promulgated as needed.

2. Accessibility: Published reports are available. Information from the database could be obtained via the Freedom of Information Act and Secretary of Interior approval.

3. Turnaround Time for Requests: A minimum turnaround time is anticipated for any approved requests for data.

4. Data Use Limitations: No limitations would be placed on any released data.

5. Cost Per Request: The cost of data reproduction may be charged.

6. Contact Point for Requests: For further information and any requests for data, contact the DoI's Office of Aircraft Service at (208) 334-9682.

3.2 U.S. MILITARY AVIATION SAFETY DATABASES

The U.S. Armed Forces operate the largest fleet of aircraft in the free world. All of the U.S. Armed Forces aircraft are considered military aircraft. Each service has an established aviation safety program that includes a centrally located safety center and a large aviation safety database.

Also, each service has established a lessons learned database to record past program management experiences for use in improving future program management and material acquisitions. Human factors is an area in the lessons learned databases.

The DoD established an office to aid in assigning military air charter contracts to commercial air carriers after the crash of a chartered DC-8 in Gander, Newfoundland. The office established a database to help perform that function.

Section 3.2.1 contains information about the U.S. Air Force aviation safety database. Section 3.2.1.1 contains information about the U.S. Air Force Lessons Learned Database. Section 3.2.2 provides information about the U.S. Naval Aviation safety database. Section 3.2.2.1 has information about the U.S. Naval Aviation Lessons Learned Database. Section 3.2.3 contains information about the U.S. Army aviation safety database. Section 3.2.3.1 provides information about the U.S. Army Lessons Learned Database. Section 3.2.4 contains information about the DoD Air Carrier Analysis Support System Database.

3.2.1 U.S. Air Force Aviation Safety Database

A. Source Information

1. Database Name: U.S. Air Force Flight Mishap Database

2. Database Sponsor/Manager: The U.S. Air Force is the database sponsor. The database manager is the U.S. Air Force Safety Center at Norton Air Force Base, CA.

3. Database Purpose: The purpose of the database is to record U.S. Air Force aviation mishaps for analysis and to aid in searching for methods to eliminate mishaps.

4. Implementation/Guiding Directive: U.S. Air Force Regulation 127-4 Investigations and Reporting of U.S. Air Force Mishaps, provides guidelines for investigation and reporting of U.S. Air Force mishaps.

5. Type of Records: The database includes records of all Class A, B, or C aviation mishaps and high accident potential (HAP) mishaps. The U.S. Air Force classifies mishaps as:

   - A Class A mishap is a mishap resulting in a total cost of $500,000 or more for injury, occupational illness, and property damage; a fatality or permanent total disability; or the destruction of or damage beyond economical repair to a U.S. Air Force aircraft.

   - A Class B mishap is a mishap resulting in a total cost of $100,000 or more but less than $500,000 for injury, occupational illness, and property damage; a permanent partial disability; or hospitalization of five or more personnel.

   - A Class C mishap is a mishap resulting in a total damage cost of $10,000 or more but less than $100,000 or an injury or occupational illness that results in a lost workday.

   - A Class D mishap is a mishap involving an injury or occupational illness resulting in a loss of a partial workday for civilian personnel or a nonfatal case without lost workdays.

   A HAP mishap is an aircraft mishap that has a high potential for causing injury, occupational illness, or damage if the mishap should recur.

6. Record Source: Message reports of aviation mishaps are received at the U.S. Air Force Safety Center. Those mishaps requiring further investigation, generally all Class A and some Class B mishaps, are followed up by an extensive report of an investigation. HAP mishap preliminary reports may be followed by one or more progress messages. Reporting formats are in accordance with U.S. Air Force Regulation 127-4.

7. Investigation By: All Class A mishaps and most Class B mishaps are investigated by a formal board of trained investigators. Depending on the circumstance of the mishap, some Class B mishaps are not investigated by a formal board. The board of trained investigators is provided by the major command that was accountable for the aircraft, e.g., Military Airlift Command, Tactical Air Command. Technical expertise is available from the U.S. Air Force Safety Center. Class C aviation mishaps and HAP mishaps are investigated by trained personnel locally assigned to the unit or airbase concerned.

8. Criteria for Entry: All Class A, B, and C aviation mishap reports and all HAP entry reports are entered into the database. Class D aviation mishap reports are not entered into the database.

B. Contents

1. General Structure: The U.S. Air Force Flight Mishap Database contains several sections. These sections are General Data Identification, Mishap Aircraft Data, Category I Material Deficiency Report, Hazardous Air Traffic Report, F-16 Multinational Fighter Data, Recommendations, and Life Sciences. The Mishap Aircraft Data section has several files, which include general data, aircraft and mission data, activity at time of flight data, system cause data, how malfunctioned data, engine data, unsafe act data, unsafe act cause data, and category 1 data. Each of these files contains multiple fields. The data are stored on an IBM mainframe computer. A U.S. Air Force-developed software system is used for database management.

2. Type of Operations: U.S. Air Force operations are considered military flight operations that include transport of personnel and material, training, combat training, and any other operations to support the U.S. Air Force mission.

3. Types of Aircraft: The U.S. Air Force records mishap data concerning any type of aircraft in their inventory, which includes single-engine or multiengine reciprocating-, turbojet- or turboprop-powered fixed- and rotory-wing aircraft.

4. Database Population Characteristics: The U.S. Air Force Safety Center reports that about 67 percent of the recorded aviation mishaps are related to operational problems. The majority of mishaps are in the fighter and attack category of aircraft. The data elements appear to be hardware-oriented or descriptive of what occurred in the accident.

5. Total Records: The database contains from 400,000 to 500,000 mishaps on file. New records are added at a rate of 55 Class A mishaps, 200 to 250 Class B mishaps, 2,600 Class C mishaps, and about 900 HAP mishaps per year.

6. Time Period(s) Covered: The U.S. Air Force Safety Center claims to have data on all U.S. Air Force mishaps since 1908.

7. Rate Information Available: Various types of rate information can be generated by the Safety Center. Mishap rates by flight hour, aircraft type, pilot experience level, type of mission, and many other comparisons are available. U.S. Air Force flying hours statistics are available at the Safety Center but are not directly part of the mishap database.

8. Fields/Data Coding: Many data fields are used throughout the files of the Mishap Aircraft Data Elements Section. Most of the fields and data codes are related to aircraft equipment. Some human factor information is available in various fields throughout the Mishap Aircraft Data Elements Section. See Appendix G for a list of those terms from the U.S. Air Force Inspection and Safety Center Safety Aircraft File Classification Elements and Factors Manual that have potential human factor interest.

9. Recommendations: Recommendations are made in most of the mishap reports. These recommendations are available in a brief of the mishap report.

10. Clear Text Available: A clear text brief of the mishap is available.

C. Utility of Data

1. Finding/Causal Format: The U.S. Air Force considers findings to be conclusions of a board of investigation or of the investigating body. Findings are statements of significant events or conditions leading to the mishap. Each finding is not necessarily a causal factor. Causes are those findings that resulted in the damage or injury. The U.S. Air Force classifies causes as:

   - Operations
   - Logistics
   - Support
   - Environment
   - Undetermined
   - Other

2. Focused Human Factor Information: Human factor information is limited throughout the Mishap Aircraft Data Elements Section. A list of data coding from the Mishap Aircraft Data Elements that has potential human factor interest is contained in Appendix G. The Life Sciences Elements Section of the database contains more human factor information. Information from the Life Sciences Elements Section is considered unreleasable since it contains personal information.

3. Raw Text Available for Review, In-depth Study: Mishap reports are saved for a period of 10 years, however, the reports are not considered releasable.

4. Limitations/Caveats/Biases: Safety Center personnel report that all mishap investigative personnel are trained in mishap investigative techniques, but their mishap investigative experience is limited. Many major mishaps are conducted with personnel doing their first investigation. Before the investigators can gain experience, they are transferred to other duty.

5. Potential Duplication in Other Databases: Manufacturers of U.S. Air Force aircraft may have information regarding U.S. Air Force mishaps in their databases.

D. Retrieval Information

1. Reports/Summaries Available: Many reports and summaries are forwarded through the U.S. Air Force chain of command.

2. Accessibility: Report distribution is limited to U.S. Air Force or DoD use. Direct access to the database is not available.

3. Turnaround Time for Requests: Requests for reports or data are not honored.

4. Data Use Limitations: Data are releasable for DoD use.

5. Cost Per Request: No cost figures were available.

6. Contact Point for Requests: Requests for data should be made to the Reports Branch of the Reports and Analysis Division, U.S. Air Force Inspection and Safety Center, Norton Air Force Base, CA at (714) 382-4192.

3.2.1.1 U.S. Air Force Lessons Learned Database

A. Source Information

1. Database Name: U.S. Air Force Lessons Learned

2. Database Sponsor/Manager: The U.S. Air Force sponsors the database. The U.S. Air Force Acquisition Logistics Center located at Wright-Patterson Air Force Base is the database manager.

3. Database Purpose: The purpose of the database is to improve the reliability and supportability of new weapon systems coming into the U.S. Air Force by compiling and implementing past program management experiences in the form of lessons learned.

4. Implementation/Guiding Directive: U.S. Air Force Regulation 800-13 originally implemented the U.S. Air Force Lessons Learned Program.

5. Type of Records: The lessons learned database is composed of recorded experiences that may be of value in the conduct of future programs.

6. Record Source: Lessons learned are submitted by various U.S. Air Force Commands. Lessons learned are also exchanged with the U.S. Army and the U.S. Navy Lessons Learned Programs.

7. Investigation By: Due to the type of records on file, an investigation of the record is not applicable.

8. Criteria for Entry: Lessons Learned are submitted by various U.S. Air Force Commands. The submitted lessons are reviewed by U.S. Air Force management personnel and personnel who are considered expert in the respective subject of concern. Applicable lessons are included in the database.

B. Contents

1. Handbook/Summary of Record Structure: Lessons learned are available in four formats. In a Lessons Learned format six data fields can be displayed. The data fields are call numbers, topic, lesson learned, problem, discussion, and appropriate action. An abstract format is available. The abstract displays a call number, topic, and lessons learned statement. A brief format displays everything but the discussion. A topics and numbers format displays call numbers and lesson topics in a tabular presentation. The lessons learned database is hosted on a DEC VAX 11/780 computer located at Wright-Patterson Air Force Base, OH. Data manipulation is accomplished using Battelle's Automatic Searching and Indexing System (BASIS).

2. Type of Operations: Lessons learned are management experiences.

3. Types of Aircraft: Lessons learned do not necessarily involve aircraft; however, where aircraft are involved, the lessons learned data may be applicable to any type aircraft in the U.S. Air Force inventory.

4. Database Population Characteristics: Each lesson learned displays a cause and effect relationship, that is, if an action is or is not taken, what event will or will not occur. The lessons learned database is indexed into 36 categories, one of which is human factors engineering.

5. Total Records: Approximately 2,000 active lessons learned records are currently in the data bank.

6. Time Period(s) Covered: The U.S. Air Force Lessons Learned Database was established in 1977 and automated in 1978. The database includes lessons from 1978 to the present. Lessons are culled periodically for currency and applicability.

7. Rate Information Available: Rate information is not applicable to this kind of database.

8. Fields/Data Coding: Six fields are available in the lessons learned database format:

   - Call Number: An office-assigned sequential number by which each unique lesson can be identified and retrieved.

   - Topic: A brief description of the content of the lesson.

   - Lesson Learned: One or two sentences showing a cause and effect relationship and stating the single most important finding.

- Problem: One or two sentences defining the problem.
- Discussion: One to three paragraphs defining the situation.
- Appropriate Action: This details who should accomplish what task and when best to accomplish it.

9. Recommendations: Each lesson learned in the data bank is a recommendation.

10. Clear Text Available: The stored data are all clear text.

C. Utility of Data

1. Finding/Causal Format: Each lesson learned has a finding as to what went wrong and a cause listed in a narrative format.

2. Focused Human Factor Information: The human factors engineering category of topics is listed in Appendix H. Selected topics from that human factors engineering list are contained in Appendix H. These list are outdated and presented only as examples.

3. Raw Text Available for Review, In-depth Study: Each lesson learned in the data bank is in clear text. Contact with the originator of the lesson can be established if further information is desired. This contact can be established by contacting the lessons learned office at (513) 255-3161.

4. Limitations/Caveats/Biases: No known biases exist in the lessons learned data.

5. Potential Duplication in Other Databases: The same lessons learned may appear in each of the other military services lessons learned databases. The three military services exchange data on their own lessons learned. Each service may individually decide to retain another service's lessons learned record if it is deemed pertinent.

D. Retrieval Information

1. Reports/Summaries Available: The lessons learned database is composed only of narrative summaries of lessons, and they are available individually or by the summary of a subject.

2. Accessibility: Direct access to the lessons learned database is available. Individual lessons may be requested by the lessons learned call number, as identified in the abstract, or the U.S. Air Force will search the database via key words and compile a package of lessons to suit a requester.

3. Turnaround Time for Requests: Requested data can be furnished in 1- to 2-work days.

4. Data Use Limitations: The U.S. Air Force imposes no limitations on furnished data.

5. Cost Per Request: No charge is made for direct access to the database or for data requests.

6. Contact Point for Requests: Requests for information and for data should be made to Mr. Bob Kerr at (513) 255-3161.

3.2.2 U.S. Naval Aviation Safety Database

A. Source Information

1. Database Name: U.S. Naval Aviation Mishap File

2. Database Sponsor/Manager: The U.S. Navy is the database sponsor. The database is managed by the U.S. Naval Safety Center located in Norfolk, VA.

3. Database Purpose: The purpose of the Naval Aviation Safety Program is to preserve human and material resources. The database assists this purpose by providing a basis for collection and analysis of aviation mishap information with the intent of reducing naval aviation mishaps.

4. Implementation/Guiding Directive: The U.S. Navy's aviation safety programs are guided by OPNAV Instruction 3750.6.

5. Type of Records: The database consists of records of aviation mishaps and hazard reports. The U.S. Navy classifies aviation mishaps as:

   - A Class A mishap is a mishap in which the total cost of property damage and/or injury is $500,000 or greater, or a naval aircraft is destroyed or missing, or any fatality or permanent total disability occurs.

   - A Class B mishap is a mishap in which the total cost of property damage and/or injury is $100,000 or greater but less than $500,000, a permanent partial disability occurs, or a hospitalization of five or more personnel is involved.

   - A Class C mishap is a mishap in which the total cost of property damage and/or injury is greater than $10,000 but less than $100,000 or an injury results in 1 or more lost workdays.

   An event involving naval aircraft in which there are no personnel injuries and the total cost of property damage is less than $10,000 is not considered a naval aircraft mishap. Hazard reports are defined as a potential cause of damage or injury.

6. Record Source: Aviation mishap information and hazard reports are received at the Naval Safety Center by messages. Mishaps that are investigated further are reported to the Naval Safety Center in a written report.

7. Investigation By: Mishaps that involve fatalities are investigated by a trained team of investigators from the Naval Safety Center. Any mishaps of special interest are also investigated by the Safety Center investigators. Trained personnel from local aviation squadrons or bases assist the Naval Safety Center team in investigations and conduct the investigations of mishaps not conducted by the Safety Center team.

8. Criteria for Entry: All U.S. Naval aviation mishaps are entered into the database. Hazard reports are also entered into the database.

B. Contents

1. General Structure: The Naval Safety Center is the focal point for all U.S. Navy safety programs, surface, subsurface, shore, and aviation. The aviation safety data are stored separately on part of a Honeywell computer. An internal Navy-developed software program is used for data management.

2. Type of Operations: The database contains information about aviation mishaps involving any U.S. Navy aircraft involved in any type of flight, ground, or shipboard operation.

3. Types of Aircraft: Information on all mishaps involving every type of U.S. Navy-operated fixed- or rotary-wing aircraft is included in the data base. This includes single- and multiengine turbojet aircraft, single- and multiengine turboprop aircraft, and single- and multiengine rotary-wing aircraft.

4. Database Population Characteristics: The Navy maintains that pilot error accounts for slightly less than 50 percent of their aircraft mishaps. The database contains extensive information on pilot time, pilot currency, training, total flight hours, total hours in aircraft type, and aircrew coordination factors. See Appendix I for a detailed breakdown of this type of information available in the database. The U.S. Navy is unique in that in many of the mishaps involving an aircraft accident the aircraft is lost at sea and the wreckage is not available.

5. Total Records: The Naval Safety Center reports that the total number of records on file is in the millions. Maintenance and product defect reports represent a large portion of those records. In 1988 the Naval Safety Center stopped collecting defect data and now only stores mishap data.

6. Time Period(s) Covered: The database includes mishaps from 1956 to the present. The Naval Safety Center reports receiving approximately 2,400 hazard reports per year and approximately 300 aviation mishap reports per year. Class A mishaps are averaging about 50 per year for the past few years.

7. Rate Information Available: Extensive rate information is available. Rate information is available on mishaps by phase of flight, operation, flight hour, aircraft type or model, age of the pilot, pilot experience, and many other comparisons.

8. Fields/Data Coding: Data fields include information on mishap location, aircraft damage, phase of flight, weather, type of flight operation, combat maneuvering, etc. A section of the Naval Safety Data Coding Manual that contains the fields and data coding with potential human factors information is contained in Appendix I.

9. Recommendations: Recommendations are made in the mishap reports for each causal factor listed.

10. Clear Text Available: A clear text brief of the mishap is available.

C. Utility of Data

1. Finding/Causal Format: U.S. Navy mishap reports include information on mishap causes, as determined by the investigative body. The U.S. Navy states in its guiding directive, OPNAV Instruction 3750.6, that mishaps often result from two or more causal factors but that it is difficult and not logical to attempt to classify causal factors as direct, primary, principal, or contributing, so they do not classify causal factors. The Navy also states that environmental conditions are not causal factors and that all causal factors are under human control and may be eliminated; therefore, all mishaps are preventable.

2. Focused Human Factor Information: Appendix I contains a copy of the coding manual used by the Naval Safety Center to capture human factor information. That information is retrievable by use of a search using the codes as listed in Appendix I.

3. Raw Text Available for Review, In-depth Study: An edited version of the raw text reports is available on microfiche. The U.S. Navy does not release personal data of those individuals involved in mishaps, nor does it release information regarding deliberations on how findings were reached.

4. Limitations/Caveats/Biases: According to personnel at the Naval Safety Center human factors information is not well documented in the mishap reports. Information on what happened and when it happened is recorded, but limited information on why things happened is recorded.

5. Potential Duplication in Other Databases: Recorded U.S. Navy mishap data is not duplicated in other databases. Manufacturers of U.S. Navy aircraft and equipment do acquire data from the U.S. Navy database related to product improvement.

D. Retrieval Information

1. Reports/Summaries Available: Statistical reports are prepared and forwarded to U.S. Navy Management.

2. Accessibility: Direct access to the database is not available. A select few manufacturers, who are involved in improving the products they supply to the U.S. Navy, do receive periodic reports.

3. Turnaround Time for Requests: The Naval Safety Center reports that a minimum of 120 days is needed for most requests for data or information from records.

4. Data Use Limitations: The U.S. Navy puts a caveat on released data of only being used for the enhancement of aviation safety.

5. Cost Per Request: A small fee for the cost of data retrieval and cost of reproduction may be charged.

6. Contact Point for Requests: Further information and requests for data can be made to the Naval Safety Center at (804) 444-6278.

3.2.2.1 U.S. Naval Aviation Lessons Learned Database

A. Source Information

1. Database Name: Naval Aviation Lessons Learned

2. Database Sponsor/Manager: The U.S. Navy sponsors the database. The Naval Air Systems Command is the database manager.

3. Database Purpose: The purpose of the database is to record verified experiences of value that were learned in acquisition programs so that their experiences can be applied to future programs.

4. Implementation/Guiding Directive: A guiding directive is under development in the Naval Air Systems Command.

5. Type of Records: The Naval Aviation Lessons Learned are composed of recorded experiences that may be of value to future or current programs.

6. Record Source: Lessons learned are received from many sources in the Naval Air Systems Command, the Naval Safety Center, and U.S. Navy fleet and shore activities.

7. Investigation By: Due to the type of records, an investigation of the record is not applicable.

8. Criteria for Entry: Lessons learned are submitted by various U.S. Navy commands. An experienced team of retired Navy, active duty Navy, and civil service personnel research each potential lesson. After local verification and review, it is forwarded to the Naval Air Systems Command for comment and approval before it is placed in the databank.

B. Contents

1. Handbook/Summary of Record Structure: Records are stored on a mainframe AMDAHL computer. The database is managed using the System 2000 Data Base Management System.

2. Type of Operations: Lessons learned are management and systems acquisition experiences.

3. Types of Aircraft: Naval aviation lessons learned are applicable to any aircraft or weapons system in the U.S. Navy inventory. This includes fixed- and rotary-wing, single- and multiengine-, turbojet-, and turboprop-powered aircraft.

4. Database Population Characteristics: The Naval Aviation Lessons Learned database has 44 impact areas, or areas that each lesson may affect.

5. Total Records: The total number of lessons learned on file is approximately 1,500. The lessons are annually culled for currency and applicability.

6. Time Period(s) Covered: The Naval Aviation Lessons Learned program started in 1982 and includes lessons from 1982 to the present.

7. Rate Information Available: Rate information is not applicable to this type of database.

8. Fields/Data Coding: There are 10 sections with the Naval Aviation Lessons Learned format:

   - Call Number: an office-assigned number when the lesson is entered into the computer. The call number can be used for tracking and retrieval.

   - Access Number: A number assigned by the researcher and used for tracking the lesson through its validation cycle.

   - Impact Areas: The areas that the lesson affects. Up to 6 can be assigned to each lesson pertaining to that area. There are 44 impact areas listed, one of which is human factors.

   - Topic: The subject matter of the lesson.

   - Lesson Learned: The actual lesson learned, its cause and effect.

   - Problem: A statement of what went wrong.

- Discussion: An account of the findings of the research.

- Appropriate Action: The recommendations of the researcher on ways to avoid the problem.

- Work Unit Code: A code used to identify the peculiar system under consideration. The codes can be used for retrieval of lessons on a specific system. Human factors is a listed work unit code.

- Aircraft Type - A 2-letter code denoting aircraft type as fixed-wing, fighter, helicopter, etc.

9. Recommendations: Each lesson in the databank is a recommendation.

10. Clear Text Available: The stored data are all clear text.

C. Utility of Data

1. Finding/Causal Format: Each lesson has a finding as to what went wrong in a section labeled Problem.

2. Focused Human Factor Information: Human factors is listed as one of the 44 impact areas that lessons may affect. Direct access to the database was established to acquire an index of lessons learned in the human factors impact area. That index and a selected few lessons from the index are contained in Appendix J.

3. Raw Text Available for Review, In-depth Study: Each lesson is in clear text. Contact with the database manager can lead to the originator of the lesson if further information is desired.

4. Limitations/Caveats/Biases: No caveats or biases exist in the Lessons Learned data.

5. Potential Duplication in Other Databases: The same lesson may appear in each of the military services lessons learned databases. The three military services exchange data on their lessons learned. Each service may decide to incorporate another service's lessons learned if deemed pertinent.

D. Retrieval Information

1. Reports/Summaries Available: The Naval Aviation Lessons Learned Database is composed of narratives of lessons, available individually or by the summary of a subject.

2. Accessibility: Direct access to the database is available, or written lessons may be furnished upon request.

3. Turnaround Time for Requests: Three to four working days are required to respond to a data request.

4. Data Use Limitations: No limitations are imposed on furnished data.

5. Cost Per Request: No charge is made for direct access to the database or for data requests.

6. Contact Point for Requests: For further information and data requests, contact the database manager at (301) 863-3929.

3.2.3 U.S. Army Aviation Safety Database

A. Source Information

1. Database Name: U.S. Army Safety Management Information System (ASMIS)

2. Database Sponsor/Manager: The U.S. Army is the database sponsor. The U.S. Army Safety Center at Fort Rucker, AL, is the database manager.

3. Database Purpose: The purpose of the ASMIS database is to record U.S. Army mishaps for study and analysis to provide the basis for reduction of future mishap occurrences.

4. Implementation/Guiding Directive: U.S. Army Regulation 385-40 presents guidelines for the conduct of U.S. Army mishap investigation and reporting.

5. Type of Records: The ASMIS database maintains records of all U.S. Army aviation mishaps. The database also maintains records of aviation equipment or parts malfunctions. The U.S. Army categorizes aviation mishaps into five categories:

   - A Class A mishap is a mishap that involves aircraft damage of $500,000 or more, a fatality, or the total loss of an aircraft.

   - A Class B mishap is a mishap that involves aircraft damage of more than $100,000 but less than $500,000, injuries resulting in a permanent disability, or hospitalization of more than five people.

   - A Class C mishap is a mishap that involves aircraft damage of more than $10,000 but less than $100,000, injuries, or illness that results in the loss of 1 workday.

   - A Class D mishap is a mishap that involves aircraft damage of less than $10,000, injuries, or illness that results in the loss of work time.

   - A Class E mishap relates to the premature failure of a part or component.

6. Record Source: Initial reports of a U.S. Army aviation mishap, a mechanical part malfunction, or premature material failure arrive at the U.S. Army Safety Center in a message, the format of which is prescribed in U.S. Army Regulation 385-40. Final reports of U.S. Army mishaps arrive on Department of the Army Form 2397, Technical Report of U.S. Army Aircraft Accident (see Appendix K).

7. Investigation By: The U.S. Army Safety Center dispatches a trained team to investigate all Class A mishaps and selected Class B and Class C mishaps. The Safety Center team is supplemented by field personnel. Those Class B and Class C mishaps not investigated by the U.S. Army Safety Center teams, and all Class D mishaps, are investigated by field personnel who have received specialized training.

8. Criteria for Entry: All U.S. Army aviation mishaps are entered into the database.

B. Contents

1. General Structure: The ASMIS database contains records of all U.S. Army mishaps, ground and aviation. Ground mishaps and aviation mishaps are stored separately. The aviation mishap section of ASMIS has records structured into five files:

   - A general file contains information regarding what happened, where, unit identification data, type of flying, phase of flight, causal factors, etc.

   - A personnel file contains information regarding pilot time, flight hours, training time, personnel injuries, etc.

   - A miscellaneous file contains information regarding the aircraft, fire damage, weather, environmental conditions, etc.

   - An impact file contains detailed information on the aircraft impact, such as g loading, speeds, vertical speeds, and angle of impact.

   - A narrative file contains a releasable summary of the mishap.

   The U.S. Army Safety Center stores the aviation mishap data on an IBM 4381 computer. An Army developed system, called The Army Safety Management Information System Retrieval and Processing System (ARPS), is used for data management.

2. Type of Operations: Operations of the U.S. Army aircraft are considered military operations.

3. Types of Aircraft: The ASMIS database contains mishap information on any type of aircraft in the U.S. Army inventory. The U.S. Army fleet is composed of helicopters and small multiengine and single-engine, reciprocating- and turboprop-powered, and a few small turbo jet-powered aircraft for VIP transport.

4. Database Population Characteristics: More than 50 percent of the database contains records of parts or equipment malfunctions. Within the aviation mishap population, the U.S. Army estimates that 70 percent of the records are rotary-wing aircraft, and 30 percent are of fixed-wing mishaps. Approximately 45 Class A mishaps per year are recorded. In a 1987 analysis the U.S. Army identified between 87 to 94 percent of all Class A mishaps, occurring between 1982 and 1987, as having a human error influence. In available 1987 data the U.S. Army classified 52 percent of the human errors in Class A mishaps as self-generated, that is, inattention, improper attitude, over-confidence, or lack of composure. The remaining 48 percent of the human errors were classified as system-generated, that is, equipment design, written procedures, supervision, or lack of experience with equipment.

5. Total Records: There are more than 50,000 aviation mishaps on file in the ASMIS database. Mishaps are added to the database at a rate of approximately 5,000 per year.

6. Time Period(s) Covered: Aviation mishap data are available from 1972 to the present.

7. Rate Information Available: Statistical information is available for the past 5 years. Rate information can be developed from that statistical information. Rate information includes mishap rate by type of mishap, type of aircraft, causal factor rates, cost rates, various command rates, and many other types of rate information.

8. Fields/Data Coding: An extensive list of fields and data coding is used in the ASMIS. A list of fields and their coded events that may have human factors information is contained in Appendix K.

9. Recommendations: Recommendations are available in the mishap reports.

10. Clear Text Available: Releasable clear text narratives are available.

C. Utility of Data

1. Finding/Causal Format: Causal factor information in the ASMIS database is listed in three categories:

   - Personnel: (flight crew, ground, supervisory)
   - Material
   - Environmental

   These three categories are further modified by several code descriptions.

2. Focused Human Factor Information: The U.S. Army Safety Center Aviation Coding Manual lists key words needed to retrieve specific information, including human factor information from the ASMIS database. A summary of those key words with potential human factor interest is contained in Appendix K.

3. Raw Text Available for Review, In-depth Study: The aircraft mishap reports are microfiched and saved for a period of 3 years. Much of the report may not be releasable.

4. Limitations/Caveats/Biases: In 1983 the aviation mishap reporting form was changed, which resulted in a different coding structure and processing system. This difference may cause older data to be interpreted differently than new data. The U.S. Army Safety Center puts a caveat on the possibility of different interpretation with any data furnished.

5. Potential Duplication in Other Databases: Manufacturers of U.S. Army aircraft may have some data from the ASMIS database in their database for the purpose of product improvement.

D. Retrieval Information

1. Reports/Summaries Available: The U.S. Army Safety Center states that they prepare many reports for internal U.S. Army usage.

2. Accessibility: Direct access to the ASMIS database is available, with U.S. Army approval.

3. Turnaround Time for Requests: Depending on the amount of research needed to satisfy a request, the turnaround time is approximately 10 working days.

4. Data Use Limitations: The U.S. Army puts a caveat on furnished data that stipulates that the information can only be used for the enhancement of aviation safety.

5. Cost Per Request: A direct cost fee for data retrieval and reproduction may be charged.

6. Contact Point for Requests: For further information and any data, contact Ms. Frankie Davis at (205) 255-6485.

3.2.3.1 U.S. Army Lessons Learned Database

A. Source Information

1. Database Name: U.S. Army Lessons Learned

2. Database Sponsor/Manager: The U.S. Army is the database sponsor. The U.S. Army Material Readiness Support Activity, located at Lexington, KY, is the database manager.

3. Database Purpose: The purpose of the database is to help improve the acquisition process of U.S. Army material.

4. Implementation/Guiding Directive: U.S. Army Regulation 700-127 contains guidelines for the U.S. Army lessons learned program.

5. Type of Records: Lessons learned are recorded experiences that may assist future acquisitions.

6. Record Source: The various U.S. Army commands forward lessons learned to the Material Readiness Support Activity for screening and incorporation into the data file.

7. Investigation By: Due to the type of records, an investigation of the record is not applicable.

8. Criteria for Entry: Submitted lessons are reviewed by personnel at the Army Material Support Activity for content and applicability to the lessons learned program. Applicable records are entered into the database.

B. Contents

1. Handbook/Summary of Record Structure: The data are not automated, it is a paper record file.

2. Type of Operations: Lessons learned are management and material acquisition experiences.

3. Types of Aircraft: Lessons learned involve lessons regarding any U.S. Army material, which may include any aircraft in the U.S. Army inventory.

4. Database Population Characteristics: No characteristics of the database were available. It can be assumed that the U.S. Army lessons learned database population is similar to that of the other two military services.

5. Total Records: There are 13 books of lessons learned, with approximately 65 to 70 lessons per book.

6. Time Period(s) Covered: The U.S. Army Lessons Learned program commenced in 1980 and covers the time from 1980 until the present.

7. Rate Information Available: Rate information is not applicable to this type of data.

8. Fields/Data Coding: The data file is not automated, but is a file of recorded lessons categorized by subject. There are 12 basic elements or categories in the data files.

9. Recommendations: Each lesson learned is a recommendation.

10. Clear Text Available: The file is all clear text.

C. Utility of Data

1. Finding/Causal Format: Each lesson has a statement as to what went wrong.

2. Focused Human Factor Information: There are no focused human factor categories per se. However, a recent category is labeled Manpower and Personnel Integration (MANPRINT). The MANPRINT process seeks to strengthen six human performance areas: manpower, personnel, health hazards, systems safety, human factors engineering, and training. The last three areas may provide useful lessons as items are added to this new category. The database manager reports that approximately 10 to 15 lessons applicable to MANPRINT are on file.

3. Raw Text Available for Review, In-depth Study: The data are maintained in a paper file. That file may be reviewed upon request and proper approval.

4. Limitations/Caveats/Biases: No limitations are placed on furnished information.

5. Potential Duplication in Other Databases: Some U.S. Army lessons learned may appear in the databases of the other two military services.

D. Retrieval Information

1. Reports/Summaries Available: The U.S. Army prints a lessons learned abstract every 2 years.

2. Accessibility: Individual copies of lessons or customized reports of lessons in a subject area may be requested from the database manager. The information in the data file is not automated.

3. Turnaround Time for Requests: Requests for data or information are responded to within 3 to 5 working days.

4. Data Use Limitations: No limitations are placed on any released information.

5. Cost Per Request: There is no cost for released reports.

6. Contact Point for Requests: For further information and for any requests for data, contact Barbara Stone at (606) 293-3340.

3.2.4 Department of Defense Air Carrier Analysis Support System Database

A. Source Information

1. Database Name: Air Carrier Analysis Support System (ACASS)

2. Database Sponsor/Manager: The DoD and the Department of Transportation (DOT) jointly sponsor the ACASS database. The database manager is the DoD Air Carrier Survey and Analysis Office at Scott Air Force Base, IL.

3. Database Purpose: The purpose of the database is to assist the DoD in assigning air charter contracts to civil carriers.

4. Implementation/Guiding Directive: DoD regulation 4500.53 is the guiding directive for the Air Carrier Survey and Analysis Office. This office was established in response to Public Law 99-66. The ACASS database was established to better perform the function of the office.

5. Type of Records: The records on file consist of financial statements, violation history reports, aircraft accident and incident data, on-time performance information, contracting officers' reports, and in-flight and ramp inspection reports.

6. Record Source: Information is received from many sources, including the FAA AIDS Database, the NTSB Aviation Accident Database, the FAA EIS Database, DoD contractor inspection reports, Dun and Bradstreet reports, DOT on-time departure reports, and U.S. Air Force and U.S. Army en route inspection and ramp inspection reports.

7. Investigation By: U.S. Air Force and U.S. Army personnel conduct en route inspections on DoD-contracted carriers. Before the departure of each DoD-contracted flight, a U.S. Air Force or U.S. Army inspector conducts a ramp check of the departing aircraft.

8 Criteria for Entry: Any information pertinent to the safety, operations, maintenance, service quality, or financial fitness of the carriers involved is reviewed and entered into the database.

B. Contents

1. Handbook/Summary of Record Structure: Records are constructed to retain information in five major areas: safety, operations, maintenance, service quality, and financial fitness. Data are stored on a Digital VAX-1185 computer at the DOT's Transportation Systems Center. The data management system was uniquely developed for ACASS and is currently undergoing modification.

2. Type of Operations: The ACASS is designed to monitor air carriers or commercial operators of aircraft operating in accordance with FAR Part 121 or air taxi operators of aircraft operating in accordance with FAR Part 135.

3. Types of Aircraft: Any turbojet, turboprop, or reciprocating engine-powered aircraft that is contracted to the DoD is monitored by the ACASS.

4. Database Population Characteristics: The database is not oriented to aviation mishaps.

5. Total Records: Information regarding the total number of records on file was not available.

6. Time Period(s) Covered: The database contains information for a running 4-year period.

7. Rate Information Available: Rate information is not applicable to this type of database.

8. Fields/Data Coding: The database is a complex meshing of many subset sources of data. Information about the fields is not available.

9. Recommendations: Recommendations are not available in the records, but analysts review database information to make recommendations about individual carrier fitness.

10. Clear Text Available: Some clear text narrative is available on some records.

C. Utility of Data

1. Finding/Causal Format: Information from ACASS assists analysts in making decisions regarding contracted carrier fitness.

2. Focused Human Factor Information: There is no focused human factor information available in the database. The feasibility and desirability of including human factor information in the database is being explored with human factor experts at the U.S. Air Force Safety Center, Norton AFB, CA.

3. Raw Text Available for Review, In-depth Study: Raw texts of reports is not applicable to this type of database.

4. Limitations/Caveats/Biases: There are no known biases in the database.

5. Potential Duplication in Other Databases: Many pieces of information are obtained from other databases, but the overall structure of the ACASS database is not duplicated in other databases.

D. Retrieval Information

1. Reports/Summaries Available: Periodic reports are generated for internal DoD use.

2. Accessibility: No reports are generated for non-DoD use. The FAA is investigating the usefulness of ACASS information for purposes of their inspections of operators.

3. Turnaround Time for Requests: Requests are not honored, therefore, the turnaround time is not applicable.

4. Data Use Limitations: Data are only used for DoD purposes of surveying contract carriers for fitness to safely perform DoD air charters.

5. Cost Per Request: Requests for data are not honored.

6. Contact Point for Requests: For further information contact the Air Carrier Survey and Analysis Office, Scott Air Force Base, IL at (618) 256-3092.

3.3 U.S. MANUFACTURERS AVIATION SAFETY DATABASES

Seven U.S. aircraft manufacturers were surveyed concerning aviation safety databases. Four manufacturers did not care to respond other than to acknowledge the existence of an aviation safety database. We can reasonably assume that all major aircraft manufacturers maintain an aviation safety database for liability purposes or for purposes of product improvement.

Lockheed Aircraft Corporation, Beech Aircraft Corporation, Cessna Aircraft, and Learjet Corporation did not provide any information concerning their aviation safety databases. Section 3.3.1 contains information about the Boeing Commercial Airplane Company aviation safety database. Section 3.3.2 contains information about the Douglas Aircraft Company aviation safety database. Section 3.3.3 contains information about the Gulfstream Aircraft Corporation aviation safety database.

3.3.1 Boeing Commercial Airplane Company Aviation Safety Database

A. Source Information

1. Database Name: Boeing Safety Data System

2. Database Sponsor/Manager: The Boeing Commercial Airplane Company is the database sponsor. The Boeing Product Safety Organization is the database manager.

3. Database Purpose: The purpose of the database is to provide aircraft accident and incident data for safety appraisals within Boeing, and to provide support for product improvement.

4. Implementation/Guiding Directive: The database was established under the authority of Boeing Corporate Policy 4E1, Boeing Operating Procedure Directive 6-1001-002, and Boeing Operating Procedures Agreement B-7000-089.

5. Type of Records: The database contains information on commercial jet aircraft accidents and known incidents for aircraft heavier than 60,000 pounds gross weight.

6. Record Source: Boeing uses information from NTSB accident reports, the FAA's Service Difficulty Reports Program, the FAA's Aviation Safety Reporting System, the FAA AIDS database, foreign government accident reports, Flight Safety Foundation, Boeing field service representatives, International Civil Aviation Organization (ICAO) reports, Aviation Insurance Underwriters Reports, various operators' flight operations safety periodicals, and miscellaneous press and periodical sources. Boeing reports that they are acquiring the IATA-sponsored Cardbox data system. See Section 3.6.1 for a description of Cardbox.

7. Investigation By: Commercial jet aircraft accidents and incidents involving aircraft heavier than 60,000 pounds are usually investigated by a government body. Boeing participates in most accident investigations involving Boeing-manufactured aircraft.

8. Criteria for Entry: Any information deemed pertinent to the database is added to the database. The information is about any type of commercial jet aircraft heavier than 60,000 pounds gross weight.

B. Contents

1. General Structure: The Boeing Safety Data System contains two sets of files. One file is a historical file called the safety event file. It is a computerized index and accessing system to help locate the correct report or reports, which are maintained in paper files in the form of reports. The safety event file classifies events into three categories, A, B, and C, by level of the seriousness of the occurrences. A-level events are classified aircraft accidents, using the NTSB definition of an accident (see Section 3.1.2). B-Level events are serious events that Boeing considered were potentially very serious, or near accidents. C-level events are low-risk events that were due to multiple malfunctions or that have significant operational factors involved.

   A second set of files is called the support files. The support files maintain operational data and statistics regarding flight hours, departures, airframe and engine times, airport data, configuration data, and other statistical information pertinent to commercial jet operations.

   The EKS system is used for data management.

2. Type of Operations: The Boeing Safety Data System gathers data on heavy jet commercial operations. Military operations of commercial aircraft are excluded.

3. Types of Aircraft: The database encompasses information on any commercial jet aircraft heavier than 60,000 pounds, made by any manufacturer. Turboprop aircraft information is not included.

4. Database Population Characteristics: The database includes information on 54 different aircraft types. Information on aircraft manufactured in Eastern bloc countries is incomplete. The data are all oriented to heavy jet transport operations. Boeing has reported that in its study of commercial jet aircraft accidents from 1959 to 1987 49 percent of the accidents occurred during final approach and landing, 21 percent occurred during take-off and initial climb, and only 6 percent occurred during cruise, so that 70 percent of the accidents occurred during an exposure time of 6 percent of the total flight time. For those accidents having known causes over that same 1959 to 1987 timeframe, 65 percent of the primary causal factors was listed as flight crew caused.

5. Total Records: There are more than 35,000 events on file in the database. Of the 35,000 events, approximately 1,800 are A-level or accidents, 1,200 are B-level or potentially serious events, and the remainder are C-level or low-risk events.

6. Time Period(s) Covered: The database covers commercial heavy jet events starting in 1959 to the present. A-level events are added at a rate of approximately 40 per year, B-level events at approximately 80 per year, and C-level events at approximately 1,200 per year.

7. Rate Information Available: Using the data from the support file, the data system is able to generate aviation safety statistics concerning heavy jet commercial operations on many types of analysis, such as:

   - Accidents vs. aircraft departures
   - Hull loss rates
   - 2-man vs. 3-man cockpit crew accident rates
   - Take-off abort probabilities
   - Accident rate by regions of the world
   - Phase-of-flight event rate

8. Fields/Data Coding: The safety event file has more than 500 characteristic codes used to sort events in that file. Events can be sorted in more than 40 standards sorts, some of which are airplane type, causal factor, phase of flight, type of accident, date, airline, etc. Events can be sorted into various categories. Further research into certain events can then be conducted by consulting the correct paper file.

9. Recommendations: Recommendations are not available directly from the database.

10. Clear Text Available: An abbreviated clear text is available regarding events on file.

C. Utility of Data

1. Finding/Causal Format: Aircraft accident causal factor information is listed using the NTSB causal factors. The database manager reports that, as the database has matured, the NTSB causal factors are further amplified by Boeing personnel for ease of retrieval.

2. Focused Human Factor Information: The Boeing database manager reported that some human factor information is available in the A-level events, with less to no human factor information available at the B- or C-level events. Appendix L contains a list of key words with human factor information used in the retrieval of data from the database in a recent study.

3. Raw Text Available for Review, In-depth Study: The safety event file has paper files or reports available for in-depth study. Certain events of interest are found by using the computer sorting capability, and then the paper files referenced in the sort can be consulted for further in-depth review.

4. Limitations/Caveats/Biases: The event file is a computerized index. Detailed information regarding various events must be obtained by reference to the paper files.

5. Potential Duplication in Other Databases: Aircraft accident reports in the Boeing database are taken from NTSB reports or foreign government reports. The ICAO accident/incident database should have the same aircraft accident on record as the Boeing database. Boeing acquires event information from many customer airlines, therefore, most of those events are also on record with the operating airlines supplying the information to Boeing.

D. Retrieval Information

1. Reports/Summaries Available: Weekly summaries of newly accessed A and B events are provided to management. Monthly reports of newly accessed A and B events are provided to the technical staff. An annual summary of statistics is prepared for in-house and limited external distribution. Special studies are made and reports issued on aviation safety matters. One such study by Lautman and Gallimore in 1987 found that 12 percent of the aircraft operators accounted for 90 percent of the total aircraft accidents. The key elements of a good safety record in approaching aviation safety from the viewpoint of what some operators are doing right vs. what others are doing wrong were found to be:

   - Management emphasis
   - Standardization and discipline
   - Recurrent training
   - Stabilized flight path control
   - Specific first officer and Captain flying rules
   - Line-oriented flight training (LOFT)

   The conclusion reached was that an improvement in crew-caused accident rates was possible by emphasis of those key elements.

2. Accessibility: Boeing allows very limited access to the information contained in its database. Published reports and safety studies are readily available.

3. Turnaround Time for Requests: A turnaround time for requests depends on the request.

4. Data Use Limitations: Any supplied information should only be used toward the advancement of aviation safety.

5. Cost Per Request: Depending on the request and the computer time involved, a fee for reports may be charged.

6. Contact Point for Requests: For further information and requests for data, contact Les Lautman at (206) 237-3383.

3.3.2 Douglas Aircraft Company Aviation Safety Database

A. Source Information

1. Database Name: Douglas Aircraft Company Safety Information System (SIS)

2. Database Sponsor/Manager: The Douglas Aircraft Company is the database sponsor. The Design Assurance Branch of the Douglas Aircraft Company is the database manager.

3. Database Purpose: The SIS Database is designed to identify, track, and project aviation safety trends, and then assist in appropriate actions for product improvement at Douglas Aircraft Company.

4. Implementation/Guiding Directive: A guiding directive manual is being prepared.

5. Type of Records: The database consists of records of commercial jet transport accidents and incidents and other events that could impact safety.

6. Record Source: Record information is received from NTSB accident reports, the FAA's Service Difficulty Reports Program, ICAO reports, Flight Safety Foundation materials, and Douglas Aircraft field representatives.

7. Investigation By: Jet transport aircraft accidents are usually investigated by Government personnel. Douglas personnel are usually a party to any accident investigation involving Douglas aircraft.

8. Criteria for Entry: Information on all non-Eastern bloc commercial jet transports is entered into the database. Any other events or incidents that could impact the safety of flight or ground operations of commercial jet transport aircraft is also entered into the database. The determination as to what events could impact flight safety is made by the Douglas analysts. Turboprop aircraft information is excluded.

B. Contents

1. General Structure: Data are stored on an IBM mainframe computer. A Nomad 2 database management system is used for data manipulation. The Statistical Analysis System (SAS) is used for statistical analysis of the data. Personal computers are used to work on selected portions of the database.

2. Type of Operations: Information on commercial jet transport aircraft engaged in commercial or private flight operations is included in the database.

3. Types of Aircraft: The database includes information on all non-Eastern bloc country commercial jet transport category aircraft.

4. Database Population Characteristics: Data are all related to heavy commercial jet operations. The SIS Database allows analysts to identify the first source in a chain of events that may lead to an accident. In a study performed on wide-body aircraft accidents that occurred before 1986, using the first-source concept, Wiegers and Rosman found that flight crews accounted for 23 percent of the accidents, instead of the often-quoted 60 to 70 percent pilot error causes. This indicated to Wiegers and Rosman that in many cases, if something had not gone wrong in the first place, the crew would not have had the opportunity to improperly conduct a procedure and no accident would have occurred.

5. Total Records: The total records in the database approximate 90,000 events. Approximately 5,000 records per year are added to the database.

6. Time Period(s) Covered: Data from 1958 to the present are included. The data include commercial jet transport accidents and other events that Douglas analysts believe could have an impact on flight safety.

7. Rate Information Available: Rate information is available in several comparisons, including phase of flight, and accidents or exposure per flight hour.

8. Fields/Data Coding: The database manager reports that a 10-page coding form is used to encode data into the system. Fields contain information regarding event identification, type of mishap, event symptoms (visual or aural) event source (thing, person, or circumstance), causes, description of conditions, consequences of the event, a narrative, aircraft history (hours, flights) any recommendations made, corrective action taken, and analysts' comments.

9. Recommendations: Some recommendations are incorporated into the database.

10. Clear Text Available: A clear text brief of the event or accident is available.

C. Utility of Data

1. Finding/Causal Format: Individual causal factors are not listed as primary, secondary, or contributing. The chain of events in a sequential order are listed along with corresponding condition descriptions, such as unsafe acts or failure modes. The Douglas database manager believes this type of presentation yields a more complete picture of the event and sequence of malfunctions or errors that lead to an accident.

2. Focused Human Factor Information: The database manager reported that the SIS database is very limited on human factor information because human factor information is not well defined.

3. Raw Text Available for Review, In-depth Study: The raw data hard copy reports of accidents and other events are available.

4. Limitations/Caveats/Biases: No known biases exist in the data.

5. Potential Duplication in Other Databases: Aircraft accidents data are duplicated in the NTSB and ICAO databases, but in different formats.

D. Retrieval Information

1. Reports/Summaries Available: Quarterly and annual reports are prepared for Douglas Aircraft Company management.

2. Accessibility: Douglas is planning on marketing the information of the SIS database.

3. Turnaround Time for Requests: A turnaround time depends on the request. Douglas has not yet marketed the SIS database.

4. Data Use Limitations: No limitations would be imposed on any furnished data.

5. Cost Per Request: Costs for requests will be based on the type of requests and how much computer and analyst time is involved in fulfilling the request.

6. Contact Point for Requests: For further information, contact James Agar at (213) 593-4410.

3.3.3 Gulfstream Aircraft Corporation Aviation Safety Database

A. Source Information

1. Database Name: Gulfstream Aircraft Accident/Incident Database

2. Database Sponsor/Manager: Gulfstream Aircraft Corporation is the database sponsor. The Legal Department in Gulfstream is the database manager.

3. Database Purpose: The purpose of the database is to track accidents and incidents involving Gulfstream aircraft for possible litigation involvement.

4. Implementation/Guiding Directive: No information is available regarding written company directives concerning the database.

5. Type of Records: The records consist of reports of all NTSB accident investigations of Gulfstream aircraft and all known incidents involving Gulfstream aircraft.

6. Record Source: The NTSB aircraft accident reports, supplemented by Gulfstream field representatives' reports, are the source of information for the aircraft accident reports on file. FAA reports, aircraft operation reports, and Gulfstream field representative reports are the source of information for the aircraft incident reports.

7. Investigation By: Gulfstream aircraft accidents are investigated by NTSB investigators. Gulfstream aircraft incidents are investigated by FAA inspectors. Gulfstream field representatives may participate in the investigation of accidents or incidents.

8. Criteria for Entry: All aircraft accidents and any known aircraft incidents involving Gulfstream aircraft are entered into the database.

B. Contents

1. General Structure: The data are maintained on an IBM personal computer. The database management system was a joint development by Gulfstream and an insurance company.

2. Type of Operations: Gulfstream aircraft are operated in accordance with FAR Parts 91 and 135. Gulfstream aircraft are used in air taxi, air charter, private, and business operations.

3. Types of Aircraft: Gulfstream tracks accidents and incidents on all Gulfstream-produced aircraft. This includes multiengine turbojet-, and multiengine turboprop-powered fixed-wing aircraft.

4. Database Population Characteristics: No database characteristics information was available.

5. Total Records: No estimate was available of the total number of records.

6. Time Period(s) Covered: The database has been automated for 3 to 4 years, but has been in its present form on an IBM personal computer for approximately 1 year. Records before that time were manually maintained.

7. Rate Information Available: Rate information is not available in this database.

8. Fields/Data Coding: The database fields present basic information such as date of occurrence, owner of aircraft, pilot, passenger names, phase of flight, weather, and type of operation.

9. Recommendations: Recommendations are not available in the database. Recommendations may be available in the NTSB accident reports.

10. Clear Text Available: An abbreviated clear text is available.

C. Utility of Data

1. Finding/Causal Format: The NTSB causal factors are considered the causes of accidents involving Gulfstream aircraft.

2. Focused Human Factor Information: Information was not available concerning any human factor information in the database.

3. Raw Text Available for Review, In-depth Study: Raw texts of the reported accidents or incidents are maintained at least until the statute of limitations expires in the state in which the accident or incident occurred.

4. Limitations/Caveats/Biases: Information was not available regarding database biases.

5. Potential Duplication in Other Databases: The NTSB Aviation Accident Database contains records of all Gulfstream accidents that occurred in the United States. Aircraft accidents that are in the NTSB Aviation Accident Database are also in the FAA AIDS database. If the incident was inspected by the FAA, a report of an incident involving a Gulfstream aircraft would also be in the AIDS database.

D. Retrieval Information

1. Reports/Summaries Available: No reports are published or are available.

2. Accessibility: Information is not available to anyone outside of Gulfstream.

3. Turnaround Time for Requests: Requests for data are not honored.

4. Data Use Limitations: Data are not furnished.

5. Cost Per Request: Requests for data are not honored.

6. Contact Point for Requests: For further information, contact Gulfstream Aircraft Corporation at (912) 964-3000.

3.4 U.S. AIRLINES AVIATION SAFETY DATABASES

Most major U.S. airlines have a safety office. The typical airline safety office consists of one safety-educated person and one assistant. In many situations the safety-educated person is also a line pilot, or a management person who has other duties to perform. The typical airline safety office gathers flight safety information about the airline's operation. The safety information is used for trend analysis, spotting potentially hazardous situations, and collecting, assembling, and disseminating safety information to management and flight crew members. The airline safety office functions as a focal point for matters of aviation safety. In the performance of these functions a safety database generally was established.

Twelve airlines were contacted concerning aviation safety databases. Ten airlines acknowledged the existence of an internal aviation safety database. One airline would not discuss anything related to aviation safety. A large regional airline did not have an aviation safety database. The contacted airlines are listed below.

Airline	Automated Data Base	Remarks	Point of Contact
Continental	No		(713) 630-9722
Northwest	No		(612) 726-6076
Flying Tigers		Privileged information would not discuss	(213) 646-5942
Piedmont	No		(919) 767-5378
U.S. Air	No		(412) 747-5156
Eastern	Yes	PDP 11/34, FORTRAN	(305) 873-2011
TWA	Yes	PC, dBASE III	(212) 692-3496
Delta	No		(404) 765-4084
American	Yes	PC, dBASE III	(817) 355-1066
PanAm	Yes	PC, dBASE III	(718) 632-5218
United	Yes	Cardbox system	(312) 952-4557
Air Wisconsin	No	Regional carrier, No database	(414) 739-5123

Information is presented about three of the contacted airlines that have automated databases and which were willing to disclose information about their databases. The information about those three airlines is considered typical of all airlines. Information about the Eastern Airlines aviation safety database is contained in Section 3.4.1. Information about the Pan American World Airways aviation safety database is contained in Section 3.4.2. Information about the United Airlines aviation safety database is contained in Section 3.4.3.

3.4.1 Eastern Airlines Aviation Safety Database

A. Source Information

1. Database Name: Eastern Airlines Incident Database

2. Database Sponsor/Manager: Eastern Airlines is the database sponsor. The Eastern Airlines Flight Safety Office is the database manager.

3. Database Purpose: The purpose of the database is to gather statistics and information regarding aviation incidents that occur within the airline for the purpose of analysis and the reduction of future incidents.

4. Implementation/Guiding Directive: No written guidelines pertain to the implementation or use of the database.

5. Type of Records: The records are reports of aviation incidents and occurrences that happen in the day-to-day flight operations of the company's aircraft.

6. Record Source: Initial information is received from aircraft dispatcher delay reports, maintenance malfunction reports, pilot reports, and other reports that relate to flight schedule disruptions. Most of the information is required to be reported to the company.

7. Investigation By: Any investigation needed into a particular incident is conducted by the Flight Safety Office or by a designee of a Chief Pilot's Office. Most investigations are conducted by establishing contact with the personnel involved in the event.

8. Criteria for Entry: Any operational event that involved Eastern Airlines aircraft and could have an aviation safety impact is entered into the database. The Manager of the Flight Safety Office makes any needed final determination as to what is included the database based on his experience in evaluating the significance of the event.

B. Contents

1. General Structure: Data are stored on a PDP 11/34 personal computer. The Manager of Flight Safety developed a data management program using FORTRAN.

2. Type of Operations: Eastern Airlines operates turbojet aircraft in passenger-carrying operations in accordance with FAR Part 121.

3. Types of Aircraft: Eastern Airlines operates heavy multiengine turbojet aircraft.

4. Database Population Characteristics: The database manager believed that the data covered most of the day-to-day events that caused a delay to the flight schedule, although he recognized that the data may not be a 100 percent accurate record of what occurred throughout the company. He had no way of knowing how many events occurred that did not require reporting unless a voluntary report was received by the company.

5. Total Records: More than 10,000 records are on file in the database. Approximately 1,400 records were entered for 1981. Approximately 2,000 records were added to the database in 1988.

6. Time Period(s) Covered: The database was automated in 1986. Data from 1981 to 1986 were classified and entered into the database. Data from 1986 to the present are entered when received.

7. Rate Information Available: Rate information is available regarding incidents that occur per flight hour or per departure.

8. Fields/Data Coding: The fields are established to capture information concerning daily flight operations that the Manager of Flight Safety has determined, through experience, may be of interest to management personnel. The fields include information regarding rejected take-offs, engine problems, passenger evacuations, bird strikes, emergency descent, etc.

9. Recommendations: Recommendations are not available in the database. The Manager of the Flight Safety Office may make recommendations to management as needed.

10. Clear Text Available: A small clear text is available concerning each incident on file.

C. Utility of Data

1. Finding/Causal Format: No findings or causal factor information were available.

2. Focused Human Factor Information: The database manager reported that the database contained very little human factor information. Information is reported as to what happened. The Manager of Flight Safety or other personnel did not have time to analyze incidents for human factor information.

3. Raw Text Available for Review, In-depth Study: The raw data forms are retained.

4. Limitations/Caveats/Biases: The Manager of Flight Safety reported no known bias in the database.

5. Potential Duplication in Other Databases: If the incident was investigated by the FAA, the same incident could appear in the FAA AIDS database. If the incident was reported by a pilot to the FAA ASRS, the same incident could appear in the ASRS database.

D. Retrieval Information

1. Reports/Summaries Available: Weekly reports concerning the preceding week's aircraft delays and incidents are forwarded to company management.

2. Accessibility: Information concerning Eastern Airlines aircraft incidents is considered proprietary information and is not releasable. The database manager stated that properly de-identified information could be shared with a common incident database if a satisfactory immunity program is established.

3. Turnaround Time for Requests: Requests for information are not honored.

4. Data Use Limitations: Data are not releasable to personnel outside of Eastern Airlines.

5. Cost Per Request: Since information is not available, no cost schedule has been developed.

6. Contact Point for Requests: For further information contact the Eastern Airlines Manager of Flight Safety at (305) 873-2001.

3.4.2 Pan American World Airways Aviation Safety Database

A. Source Information

1. Database Name: Pan Am Flight Incident Database

2. Database Sponsor/Manager: Pan American World Airways is the database sponsor. The Pan American Flight Safety Office is the database manager.

3. Database Purpose: The purpose of the database is to gather statistics and information regarding aviation incidents that occur in the airline so that the occurrence of future incidents may be reduced and the schedule disruptions tracked and analyzed.

4. Implementation/Guiding Directive: No written guidelines pertain to the establishment or use of the database.

5. Type of Records: Records are reports of incidents and events that happen in daily flight operations that interrupt the scheduled operation.

6. Record Source: Initial information is received from delay reports, pilot reports, dispatcher reports, and maintenance department reports of mechanical malfunctions.

7. Investigation By: Those events that may have a direct safety implication, such as bird strike, smoke or fire, aborted take-off, and engine shutdown, are investigated by the airline safety office. Investigation is generally made by establishing contact with the personnel involved in the event.

8. Criteria for Entry: Any operational event that occurred involving Pan American aircraft that could have affected aviation safety is entered into the database. The determination of entry or nonentry of events into the database is made by the company's Manager of Flight Safety, who is the database manager.

B. Contents

1. General Structure: Flight operations incident data have been gathered for several years, but the data were not automated until mid-1988. Before then, the information was maintained in paper files and categorized by event, such as aborted take-off, diversion, bird strike, fuel dump, or evacuation. The automated database uses the same categories as fields and can sort the events by phase of flight, injury, probable cause, weather, and damage. Data before 1988 were not loaded into the automated database. The automated data are stored on a personal computer. dBASE III is used for database management.

2. Type of Operations: Pan American World Airways operates aircraft in domestic or international flight operations in accordance with FAR Part 121.

3. Types of Aircraft: Pan American World Airways operates multiengine turbojet passenger-carrying aircraft.

4. Database Population Characteristics: The database manager reports that it is usually a mechanical problem that initiates an event that leads to a flight incident report that gets entered into the database. Flight incident reports are generated at an approximate rate of 1 per 100 aircraft departures. The database manager reported that the majority of the incidents on file are initially caused by a mechanical malfunction.

5. Total Records: Since the database automation in mid-1988, new incidents are being added at the rate of approximately 100 incidents per month. No estimate was available on the size of the pre-automated database.

6. Time Period(s) Covered: Flight operations mishap data date to 1978. The database was automated in mid 1988 and contains data from 1988 to the present.

7. Rate Information Available: Rate information is available based on events per 100 departures and events per 100,000 block hours.

8. Fields/Data Coding: The fields are designed to incorporate events that the database manager has considered significant to the airline's operation and airline management personnel. The fields with some significant elements in each field are:

- Aborted take-off: above 100 kts, below 100 kts, false warning
- Air turn back: engines, hydraulic, flt controls, gear, other
- Diversion: equipment, illness, other
- Navigation: ATC, nav error, equipment, other
- Engine S/D: stall, component failure, fire, false fire warning
- Smoke/fire: cockpit, cargo compt, airframe, APU, galley, lav.
- Bird strike: nose, wings, engines, tail, other
- Emergency descent: equipment malfunction, other
- System failure:
- Foreign object damage: engines, tires, airframe, other
- Fuel irregularities: loading, management, system failure
- Fuel dumps: equipment malfunction, pass illness, crew illness
- Weather: hail, turbulence, windshear, icing, other
- Ground damage: ground equipment, collision with aircraft
- Near miss: evasive action taken, ATC facility
- Terrain/obstruction avoidance: ground prox activated
- Loading irregularities: shifting cargo, weight/balance error
- Misconduct: hijacking, pax disturbance, false bomb warning
- Evacuation: initiated by ___, exits used _____
- Air quality: ozone, ventilation, other
- Remarks:

9. Recommendations: Recommendations are not available in the database. The Manager of Flight Safety may make recommendations to higher management regarding events that occurred, as he sees fit.

10. Clear Text Available: A small amount of clear text is available with each record.

C. Utility of Data

1. Finding/Causal Format: The Pan American Flight Incident Database classifies probable causes of recorded flight incidents as crew procedural, crew technique, crew other, maintenance/material, airport/ramp operations, weather, ATC, and unknown/other. The probable cause is determined by the Manager of Flight Safety.

2. Focused Human Factor Information: The database manager reports that there is very little focused human factor information in the Flight Incident Database. In the opinion of the database manager, human error-initiated events go unnoticed unless voluntarily reported. Of more human factor interest to the database manager is a recently automated database that records data concerning flight crew performance during en route flight checks administered to flight crews by company check airmen. Each crew task, from initially reporting to work to leaving an aircraft upon completion of a flight, has been coded. Each airman is graded in the performance of these tasks. The grades are entered directly onto an optically scanned form. The data are then computer-monitored for repeated low grades in any of the tasks. The Training Department is made aware of the results so that training may be improved in demonstrated areas of weaknesses. The database manager believes that each graded area is a measure of human performance, which is a part of human factors. Information from this database is strictly confidential.

3. Raw Text Available for Review, In-depth Study: The flight incident report forms, which are used to provide the basis for records in the automated database, are available for company personnel to review.

4. Limitations/Caveats/Biases: The database manager believes that most flight incidents are reported but realizes that some events are probably taking place in the day-to-day flight operations that are not being recorded. The incidents in the database should be considered typical, but the minimum of events, in the opinion of the database manager.

5. Potential Duplication in Other Databases: If the incident was investigated by the FAA, the same incident could appear in the FAA AIDS database. If the incident was reported by a pilot to the ASRS, the same incident could appear in the ASRS database.

D. Retrieval Information

1. Reports/Summaries Available: Periodic reports are prepared for airline management. Special reports are prepared upon request or upon initiation by the Manager of Flight Safety.

2. Accessibility: Company reports regarding aviation flight incidents are not available. De-identified information could become available to a common database.

3. Turnaround Time for Requests: Requests for data are not honored.

4. Data Use Limitations: Data from the Pan American World Airways Flight Incident Database are not releasable to people outside of the company.

5. Cost Per Request: Since information is not available, no cost schedule has been developed.

6. Contact Point for Requests: For further information contact the Pan American Airways Flight Safety Office at (718) 632-5218.

3.4.3 United Airlines Aviation Safety Database

A. Source Information

1. Database Name: United Airlines Flight Incident Database

2. Database Sponsor/Manager: United Airlines is the database sponsor. The Flight Safety Office of United Airlines is the database manager.

3. Database Purpose: The purpose of the database is to aid in recording aircraft incident information by facilitating the analysis of that information and disseminating the information in an effort to reduce the recurrence of similar incidents or accidents.

4. Implementation/Guiding Directive: There are no known written directives concerning the database.

5. Type of Records: Records are voluntary and mandatory reports of aircraft incidents. Most reports come from United Airlines pilots as they operate aircraft in daily flight operations.

6. Record Source: Incident records are written reports from United pilots reporting on events that occurred in daily operations.

7. Investigation By: Incidents that appear to have a direct and possible major impact on aviation safety are investigated by experienced personnel of the Flight Safety Office.

8. Criteria for Entry: Incidents that are considered to have a possible impact on flight safety are entered into the database. The judgment as to what incidents are entered into the database is made by the Office of Flight Safety.

B. Contents

1. General Structure: The Flight Safety Office maintains two databases. One database includes significant Captain reports, as collected and screened throughout the year. The significant Captain reports are encoded and stored on a personal computer. A second database, called the Cardbox, contains only the most critical of the significant Captain reports. The Cardbox database contains the incident reports that the Director of Flight Safety has investigated thoroughly and makes available for safety information exchange with other airlines or with the IATA.

2. Type of Operations: United Airlines operates heavy multiengine turbojet-powered aircraft in accordance with FAR Part 121.

3. Types of Aircraft: United Airlines operates heavy multiengine turbojet transport aircraft.

4. Database Population Characteristics: Approximately 7,000 Captain reports are received each year. Those reports are screened for operational safety significance, and approximately 3,000 of the annual reports are coded and entered into a database. Eliminated reports may contain items pertaining to aircraft service or cleanliness. Within the 3,000 operationally significant reports, approximately 100 per year are considered to have greater safety implications. These 100 are thoroughly investigated and are coded and entered into another database called Cardbox. The Cardbox records are considered to have the most human factor value, according to the database manager.

   Cardbox is an IATA-sponsored database system that has recently become available for airline purchase. The United Airlines Director of Flight Safety reported that 12 airlines throughout the world have ordered Cardbox and more are considering Cardbox. Boeing and the Air Transport Association have acquired Cardbox. The Director of Flight Safety anticipates many U.S. airlines will adopt Cardbox, and a program to exchange aircraft incident data among airlines may evolve. A standardized terminology for use in Cardbox incident reports is under development and may be adopted worldwide.

   The database manager believes he receives reports of about 95 percent of any serious incidents that occur, but he estimates he receives a smaller percentage of the less serious incidents. Of the 7,000 Captain reports received each year, the database manager estimates less than 5 percent are pilot error situations.

5. Total Records: The Cardbox database has approximately 300 records on file. New records are added at an approximate rate of 100 per year.

6. Time Period(s) Covered: The Cardbox database incorporates data for the past 3 years.

7. Rate Information Available: Rate information is not directly available in the Cardbox database, but the database manager is planning on incorporating that capability.

8. Fields/Data Coding: The Cardbox system has approximately 30 fields that describe the incident. Fields include identification, aircraft type, flight from-to, date, location, weather, altitude, phase of flight, cause, action, title of incident, flight number, registration, operator, engine type, type of operation, status of incident, aircraft system, severity of incident, people on board, fatalities, reference number, summary, recommendations, events, factors.

   Approximately 75 key words can be used to search the summary.

9. Recommendations: Recommendations are a significant part of the Cardbox system and are included in each record.

10. Clear Text Available: A large clear text of 1,200 words is available.

C. Utility of Data

1. Finding/Causal Format: One of the fields in the Cardbox database is labeled cause. That field is used to encode what was determined to be the primary cause of the incident. The basic causes are classified into three categories:

   - Technical: logistical, maintenance, etc.
   - Environmental: air traffic control, weather, airport, etc.
   - Human: active error, proficiency error, passive error, incapacitation, etc.

   The summaries are written so that causes are apparent. The two fields labeled events and factors also offer key words that point to causes.

2. Focused Human Factor Information: The database manager believes that the Cardbox incident reports contain a lot of human factor value. The report field labeled factors is a list of the factors involved in the incident. The factors contain focused human factor terminology. The database manager believes that since the Cardbox incidents are thoroughly investigated, the human factor information is of good quality.

3. Raw Text Available for Review, In-depth Study: The raw text of the reports is available for review.

4. Limitations/Caveats/Biases: There are no known biases in the database.

5. Potential Duplication in Other Databases: If the incident report in United Airlines database was investigated by the FAA, the FAA AIDS would also contain a report of the incident.

D. Retrieval Information

1. Reports/Summaries Available: The database manager prepares periodic reports for United Airlines management. Reports of aircraft incidents are also posted on flight safety bulletin boards located in operations offices throughout the system so that as many flight crews as possible will see the reports. The database manager believes there is a real need to disseminate aircraft incident and accident information to flight crews. The gathering and analysis of aircraft accident and incident data are of little use if the lessons to be learned from such efforts cannot be made available to flight crews, in the opinion of the database manager.

   Incident data are exchanged with the IATA. The database manager anticipates that, in the future, aircraft incident data will be exchanged electronically among Cardbox databases. The database manager believes that in the United States the information will have to be sanitized to preclude airline identification and that an agency like the Air Transport Association (ATA) or the IATA should function as a data clearing house. He believes the FAA could act as the focal point if proper immunity guarantees could be arranged.

2. Accessibility: De-identified incident reports could be made available for appropriate research.

3. Turnaround Time for Requests: Requests for data or information would be answered immediately.

4. Data Use Limitations: No limitations would be placed on released de-identified data if being used in research that benefits aviation safety.

5. Cost Per Request: No fees would be charged for released data.

6. Contact Point for Requests: For further information and any requests for data, contact the United Airlines Director of Flight Safety at (312) 952-4557.

3.5 OTHER U.S. ORGANIZATIONS' AVIATION SAFETY DATABASES

Many organizations represent or service various aviation interests. Some of these organizations are lobby groups, unions, or service organizations. Ten of these aviation organizations were surveyed as to the maintenance of an aviation safety database. The surveyed organizations were the following:

- Aircraft Owners and Pilots Association (AOPA)
- Airline Pilots Association (ALPA)
- Allied Pilots Association (APA)
- Air Transport Association (ATA)
- Flight Safety Foundation (FSF)
- Robert Breiling Associates
- General Aviation Manufacturing Association (GAMA)
- Helicopter Association International (HAI)
- National Business Aircraft Association (NBAA)
- Regional Airline Association (RAA)

Section 3.5.1 contains information about the aviation safety database of the AOPA. Section 3.5.2 contains information about the aviation safety database of the ALPA. Section 3.5.3 includes information about the aviation safety database of the APA. Section 3.5.4 contains information about the proposed aviation safety database of the ATA. Section 3.5.5 presents information about the aviation safety database for the FSF. Section 3.5.6 contains information about a commercial aviation safety database owned by Robert Breiling Associates.

Organizations reporting no aviation safety databases include:

- GAMA (202) 393-1500
- HAI (703) 683-4646
- NBAA (202) 783-9000
- RAA (202) 857-1170

3.5.1 AOPA Aviation Safety Database

A. Source Information

1. Database Name: Aircraft Owners and Pilots Association (AOPA) Accident/Incident Database

2. Database Sponsor/Manager: AOPA is the database sponsor. The Air Safety Foundation, an affiliate of AOPA, is the database manager. AOPA is an organization formed to educate the public and government officials about general aviation. AOPA has more than 280,000 members.

3. Database Purpose: The database is used in the training seminars that AOPA conducts for its members. AOPA conducts many seminars and training sessions throughout the United States for AOPA members and for any other interested people. By analyzing data in the database, AOPA can tailor the seminar to safety problem areas that may be unique to the area in which they are conducting the seminar.

4. Implementation/Guiding Directive: No written directives establish or guide the use of the AOPA database.

5. Type of Records: The records are general aviation accident and incident reports.

6. Record Source: The AOPA database uses official NTSB reports of aircraft accidents and incidents.

7. Investigation By: The accidents and incidents on file in the AOPA database are all investigated by NTSB investigators or FAA inspectors in those cases where the NTSB delegated the investigation to the FAA. In the future AOPA hopes to be able to participate in selected general aviation accident investigations.

8. Criteria for Entry: Reports of general aviation single-engine or multiengine aircraft accidents or incidents are entered into the database as they are received from the NTSB.

B. Contents

1. General Structure: The data are stored on a personal computer. dBASE III is used as the database management system. The database was initiated in 1988.

2. Type of Operations: The accident and incident reports involve general aviation aircraft operating under visual or instrument flight rules in accordance with FAR Part 91.

3. Types of Aircraft: The database contains information about the types of aircraft most frequently operated by AOPA members, that is, single-engine reciprocating-powered aircraft and light twin-engine reciprocating- or turboprop-powered aircraft.

4. Database Population Characteristics: Currently, accident and incident information involving single-engine aircraft is in the database. The database manager anticipates having all the light twin-engine-powered aircraft and incident information in the database by late 1989.

5. Total Records: The database currently has approximately 2,400 records on file.

6. Time Period(s) Covered: The database includes information dating from 1982 through 1987. 1988 data will be added as they are finalized.

7. Rate Information Available: Rate information is not directly available in the database. The database manager reports that FAA statistical data are used to generate rate information when desired.

8. Fields/Data Coding: The database fields are set up to capture the information directly from an NTSB 2-page brief of an aircraft accident or incident. The fields and data coding in the fields include:

   - Basic information: type of operation, flight conduct, injuries, phase of flight, aircraft damage, etc.

   - Aircraft information: make, model, landing gear, maximum gross weight, number of seats, engine make/model, etc.

   - Environment information: weather briefing, basic weather, itinerary, destination, airport data, etc.

- Personnel information: pilot certificates, age, medical valid, flight times, currency, instrument rating, etc.

- Narrative:

- Findings:

- Probable cause:

9. Recommendations: Recommendations are not available.

10. Clear Text Available: The clear text narrative, as published in the NTSB reports, is captured in the AOPA database.

C. Utility of Data

1. Finding/Causal Format: Findings and causal factors are listed as reported on the NTSB report. The NTSB reporting format is reproduced.

2. Focused Human Factor Information: The same human factor information as contained in the NTSB Aviation Accident Database is contained in the AOPA database. See Section 3.1.2 for information about the NTSB database.

3. Raw Text Available for Review, In-depth Study: Raw text copies of the NTSB accident or incident reports are maintained on file.

4. Limitations/Caveats/Biases: The same limitations or biases as contained in the NTSB Database are carried over into the AOPA database. The NTSB data are not re-analyzed, therefore, no new biases are introduced into the AOPA data.

5. Potential Duplication in Other Databases: Every accident or incident listed in the AOPA database is also on file with the NTSB and the FAA databases.

D. Retrieval Information

1. Reports/Summaries Available: Reports are not being issued currently. AOPA plans on publishing reports using information from the database in the near future.

2. Accessibility: Once the database is fully operational, information and data will be available. Published reports will also be available.

3. Turnaround Time for Requests: The anticipated turnaround time for requests is minimal. Requests are not honored until such time as the database manager feels the database is fully operational, anticipated to be late 1989.

4. Data Use Limitations: No limitations would be placed on any furnished information.

5. Cost Per Request: The expense of the data reproduction may be charged.

6. Contact Point for Requests: For further information and for any requests for data, contact the Air Safety Foundation, an affiliate of the AOPA, at (301) 695-2000.

3.5.2 ALPA Aviation Safety Database

A. Source Information

1. Database Name: Air Line Pilots Association (ALPA) Aircraft Accident/ Incident Database

2. Database Sponsor/Manager: The ALPA is the database sponsor. The accident investigation section within ALPA is the database manager. The ALPA is a union that represents more than 41,000 pilots employed by 47 U.S. airlines. The union maintains a full-time staff of employees in the Washington, DC, area. ALPA has an accident investigation staff of four engineers who, among other duties, maintain the ALPA Aircraft Accident/Incident Database.

3. Database Purpose: The purpose of the database is to store information regarding transport category aircraft accidents and incidents to be used for the benefit of ALPA union members.

4. Implementation/Guiding Directive: No written directives are provided for the accident/incident database.

5. Type of Records: Records are reports of aviation accidents or incidents involving turbojet-, turboprop-, or reciprocating-powered multiengine transport aircraft.

6. Record Source: Information is received from NTSB reports, the FAA AIDS database, the ICAO, aviation insurance companies, and the FAA's SDRS, NMAC, and PD databases.

7. Investigation By: ALPA members and ALPA investigators participate in the investigation of accidents involving ALPA members. The ALPA also is invited to participate in accident investigations involving aircraft operated by ALPA members.

8. Criteria for Entry: Information regarding any transport category aircraft accident or incident is entered into the database.

B. Contents

1. General Structure: Data are stored on a personal computer. Rbase is used as the database management system. The data are used as a master indexing system. Data are searched for accidents or incidents of interest, then the raw data on file are used for any further review.

2. Type of Operations: Only information regarding transport aircraft, foreign or domestic, operating in domestic or international operations is included in the database.

3. Types of Aircraft: The database contains information on accidents or incidents involving any type of aircraft that may be piloted by ALPA members. This includes multiengine turbojet-, turboprop-, or reciprocating-powered aircraft.

4. Database Population Characteristics: The data on file are related to transport category aircraft that may be operated by ALPA members.

5. Total Records: An estimate of the size of the database was not available.

6. Time Period(s) Covered: The database includes information on transport aircraft dating back to the mid-1950s.

7. Rate Information Available: Rate information is not directly available in the database. Rate information can be generated by using statistical information available from other sources.

8. Fields/Data Coding: The database manager reports that several key fields are used to record data. The key fields include location, date, aircraft type, type of accident or incident, airline name, serial number of aircraft involved, phase of flight, and remarks. Various data coding is available in some key fields. For example, type of accident or incident is further coded into overrun, undershoot, controlled flight into terrain, runway excursion, etc.

9. Recommendations: Recommendations are not available in this database.

10. Clear Text Available: A short clear text of up to 112 characters is available with the records.

C. Utility of Data

1. Finding/Causal Format: ALPA does not determine any findings or causal factors. If the accident report has this information, it is retained in the database.

2. Focused Human Factor Information: No focused human factor information is directly available. The database manager reports that human factor information could be obtained by analyzing the information. The ALPA reports that it does have a deep interest in human factors in aviation. The ALPA has participated in many major aviation safety studies and was a member of the recent Joint Government/Industry Task Force on Flight Crew Performance. The ALPA maintains a Human Performance Committee, which interfaces with industry and Government groups.

3. Raw Text Available for Review, In-depth Study: The raw text of reports are on file.

4. Limitations/Caveats/Biases: No known biases are in the database.

5. Potential Duplication in Other Databases: All accidents or incidents on file in the ALPA database are also on file with other government agencies, either U.S. or foreign. The FAA and the NTSB do not maintain records of foreign aircraft accidents. The ALPA does have foreign aircraft accidents on file.

D. Retrieval Information

1. Reports/Summaries Available: No periodic reports are issued. Special studies are occasionally undertaken and reports issued for internal ALPA use. These special study reports may be available to non-ALPA members.

2. Accessibility: Information has been furnished to the NTSB and other parties. Information is available to ALPA members. Requests for information from non-ALPA members would be honored if the ALPA felt it could support the research project or reason for the request.

3. Turnaround Time for Requests: A turnaround time of 2 to 5 days is estimated for information or data requests.

4. Data Use Limitations: No limitations would be placed on any furnished data other than to be used to enhance aviation safety.

5. Cost Per Request: No cost would be charged for requests for data or information.

6. Contact Point for Requests: For further information and requests for data, contact ALPA's Office of Accident Investigation at (703) 689-2270, extension 4208.

3.5.3 APA Aviation Safety Database

A. Source Information

1. Database Name: Allied Pilots Association (APA) Safety Debrief Database

2. Database Sponsor/Manager: The APA is the database sponsor. The Safety Manager of the APA is the database manager. The APA is the union representing 7,500 pilots employed by American Airlines.

3. Database Purpose: The purpose of the database is to gather and analyze reports submitted by union members concerning procedures, techniques, and methods observed by the union members in daily flight operations. The submitted reports may or may not impact safety. Unsafe conditions or indications of unsafe or unsatisfactory trends are brought to the attention of the company for corrective action or for information purposes.

4. Implementation/Guiding Directive: There are no written directives regarding the implementation or operation of the APA Safety Debrief Database.

5. Type of Records: Records are voluntary reports submitted to the union by the union members.

6. Record Source: Records are constructed from an APA standardized Safety/Airport Debrief Form available at all American Airlines operations offices. These reports are constructed for ease of data automation. The forms are forwarded to the APA Safety Manager for review, analysis, and entry into the database.

7. Investigation By: The vast majority of submitted Safety/Airport Debrief Forms are not investigated. Reports of items that seem to have an immediate impact on safety are investigated and the results brought to the attention of the company for corrective action. Noncritical reports are further analyzed every 6 months by safety-trained line pilots to look for trends, repeat items involving the same locations or same aircraft, etc. Submitted reports are categorized and the overall analysis brought to the attention of the company for corrective action.

8. Criteria for Entry: All received Safety/Airport Debrief Reports are entered into the database.

B. Contents

1. General Structure: The database manager reports that the APA Safety Debrief Database is on a personal computer. The Data Perfect System is used for data manipulation. In addition to the Safety Debrief Database, the database manager has two other small databases related to aviation safety. One database is a training database that contains information from pilots as they complete recurrent training programs. This information is used to help improve flight training programs. Another database is a recording of FAA actions against APA members.

2. Type of Operations: APA members operate multiengine turbojet aircraft in commercial aviation, operating in accordance with FAR Part 121 in domestic and international operations.

3. Types of Aircraft: American Airlines operates heavy multiengine turbojet-powered aircraft.

4. Database Population Characteristics: Information regarding database population characteristics was not available.

5. Total Records: More than 3,000 records are on file. New records are added at a rate of approximately 1,000 per year.

6. Time Period(s) Covered: The database was automated in 1986 and includes data from that time to the present. Data on file before automation was discarded.

7. Rate Information Available: No rate information is available in the database. Population counts are readily available.

8. Fields/Data Coding: The fields are established to capture information directly from the Safety/Airport Debrief Form. Typical fields and some data elements include:

   - General information: Captain, first officer, domicile, aircraft
   - Publication: Operations manual, flight manual, minimum equipment list, etc.
   - Operations: Weather display, gate agents, operations agents, etc.
   - Dispatch: Flight plans, notams, fuel loading, weight and balance, etc.
   - Aircraft general: Cabin interior, exterior condition, maintenance, etc.
   - Aircraft systems: Hydraulics, auto pilot, electrical, power plants, etc.

- Ramps: Markings, security, personnel
- Communications: Ground, tower departure, center
- Security: Domestic, international
- Navigation aids:
- Airport facilities: Fire and rescue facilities
- Other

9. Recommendations: Recommendations are made to the company on a scheduled periodic basis based on the analysis of submitted reports to the database. Individual reports may or may not contain recommendations.

10. Clear Text Available: A clear text narrative is available.

C. Utility of Data

1. Finding/Causal Format: Findings or causes are not identified in submitted reports.

2. Focused Human Factor Information: The database manager reports that workload and manpower constraints preclude adequate documentation of human factor information in the APA database. However, the database manager believes that almost all occurring incidents result from human error. As an example, the database manager reports that his analysis shows that 50 percent of the altitude deviations by APA members are caused by partially blocked radio transmissions. The database manager believes that 100 percent of runway incursions by APA members are caused by pilots responding to similar call signs or misunderstood instructions caused by too rapid communications, etc.

3. Raw Text Available for Review, In-depth Study: The raw text reports are saved for a period of 2 years.

4. Limitations/Caveats/Biases: The submitted Safety/Airport Debrief Reports present only the opinion of the reporter, which may or may not be biased. The vast majority of the reports are not verified by further investigation.

5. Potential Duplication in Other Databases: Some incidents reported in the APA safety debrief database may be duplicated in the FAA AIDS database if the FAA inspected the incident. If the APA Safety/Airport Debrief Report involved a PD, OE, or an NMAC, the report may be duplicated in those FAA databases. Many of the APA Safety/Airport Debrief Reports may involve events also reported to American Airlines and may be in the American Airlines database.

D. Retrieval Information

1. Reports/Summaries Available: A report concerning FAA violations against APA members is issued every 6 months. A synopsis of the safety debrief reports and items of concern in those reports is issued every 6 months.

2. Accessibility: Data and information could be available for research related to aviation safety.

3. Turnaround Time for Requests: Requests for data or information would be responded to immediately.

4. Data Use Limitations: No restrictions would be placed on any furnished data if being used for research to enhance aviation safety.

5. Cost Per Request: Since no requests for data or information have been made by nonunion members, a cost summary has not been developed. Any charges would be to recover costs of duplication.

6. Contact Point for Requests: For further information and any requests for data, contact the APA Safety Manager at (800) 323-1470.

3.5.4 ATA Aviation Safety Database

The ATA has no aviation accident or incident database at this time. However, they have recently purchased the Cardbox aviation incident database and expect to have that database on line in 1989. See Sections 3.4.3 and 3.6.1 for details about the Cardbox database. Since the ATA may become a focal point for the exchange of U.S. air carrier incident data, some information about that organization and its proposed aviation safety database is provided in this section.

The ATA, located in Washington, DC, is an organization that represents the collective interests of 21 U.S. airlines. The member airlines tasked the ATA to acquire or develop an aviation incident database. The ATA decided to purchase the Cardbox database and system from the IATA. In December 1988, the IATA began marketing the Cardbox database to its airline members and other aviation safety organizations. For example, Boeing and the FSF recently purchased Cardbox.

The ATA expects its database to be operational in 1989. The database will consist of data related to air carrier incidents. Once the ATA has a functional database, it has further objectives in mind, which include:

- Recommending Cardbox to all ATA members
- Establishing an electronic bulletin board for air carrier incident information
- Serving as the focal point for an aircraft incident data exchange program
- Recommending and assisting the improvement or realignment of the FAA databases

The ATA database manager believes that confidentiality or immunity procedures have to be established to allow a free flow of aircraft incident information.

For further information, contact the ATA Aviation Safety database manager at (202) 626-4010.

3.5.5 FSF Aviation Safety Database

A. Source Information

1. Database Name: Flight Safety Foundation (FSF) Aviation Safety Database

2. Database Sponsor/Manager: The FSF is the database sponsor and manager.

3. Database Purpose: The purpose of the database is to collect aircraft incident and accident information and use that information in the aviation safety studies conducted by the FSF.

4. Implementation/Guiding Directive: No known implementing or guiding directives exist pertaining to the collection and storage of the aviation safety information.

5. Type of Records: Records are voluntary reports of aircraft incident reports. Aircraft accident reports are also on file.

6. Record Source: FSF members voluntarily forward aircraft incident reports that the members deem significant to the FSF. Aircraft accident reports are received from the NTSB and from the ICAO.

7. Investigation By: The incident reports received by the FSF have been investigated by the entity that forwarded the report. The accident reports on file have been investigated by the government in whose territory the accident occurred.

8. Criteria for Entry: All received information is filed.

B. Contents

1. General Structure: Currently, all aircraft accident reports and incident reports are paper files. The information is not classified in any particular manner, but is filed by the FSF member name.

   The FSF has recently purchased the IATA-sponsored Cardbox system to gain an automated database of air carrier incidents. The Cardbox database is expected to be operational some time in 1989. The FSF is also looking for an automated database to allow it to keep track of recent air carrier and corporate jet aircraft accidents. The many years of collected aircraft accident or incident data presently maintained in paper files may or may not be entered into an automated database.

2. Type of Operations: FSF members operate multi engine turbojet and turboprop aircraft in domestic or international operations.

3. Types of Aircraft: The FSF is primarily concerned with air carrier and corporate jet occurrences. Consequently, its data are primarily concerned with large multiengine turbojet or turboprop aircraft.

4. Database Population Characteristics: The records are mostly air carrier or corporate jet aircraft incidents and accidents. Since the database is composed of paper files, no population characteristics were readily available.

5. Total Records: The total number of records is unknown.

6. Time Period(s) Covered: The FSF started collected aviation safety data in 1947 and has information on file from 1947 to the present.

7. Rate Information Available: Rate information is not available.

8. Fields/Data Coding: No automated database is in operation.

9. Recommendations: Submitted aircraft accident and incident reports usually have recommendations.

10. Clear Text Available: Submitted aircraft accident and incident reports usually have clear text available.

C. Utility of Data

1. Finding/Causal Format: The findings or causal format is the format used by the party who submitted the report.

2. Focused Human Factor Information: Any human factor information would have to be obtained by reading the individual reports.

3. Raw Text Available for Review, In-depth Study: The records are currently all raw text.

4. Limitations/Caveats/Biases: No known biases are in the paper record database.

5. Potential Duplication in Other Databases: FSF members who submitted an aircraft incident report retain a record of the incident. Aircraft accident reports on file with the FSF are obtained from other agencies who retain a copy of the accident report.

D. Retrieval Information

1. Reports/Summaries Available: The FSF publishes monthly digests of a particular item of interest to aviation safety. The digest is approximately 8 to 12 pages long and is an in-depth study of an aviation safety topic. The digests are forwarded to FSF members.

   The FSF also publishes monthly and bimonthly bulletins on topics of current interest in the aviation safety field. Current topics in monthly or bimonthly bulletins include:

   - Accident prevention
   - Human factors and aviation medicine
   - Cabin and crew safety
   - Airport operations
   - Helicopter safety
   - Maintenance bulletins

   The FSF also initiates studies and reports on aviation topics that the FSF recognizes as needing to be addressed.

2. Accessibility: Reports and bulletins are available to FSF members.

3. Turnaround Time for Requests: Minor requests could be answered immediately. Requests involving extensive research would take considerably longer.

4. Data Use Limitations: No limitations are placed on furnished information.

5. Cost Per Request: A fee may be charged for requests for data from non-FSF members, depending on the request.

6. Contact Point for Requests: For further information or any requests for data, contact the FSF at (703) 820-2777.

3.5.6 Robert Breiling Associates Aviation Safety Database

A. Source Information

1. Database Name: Robert Breiling Associates Aviation Safety Database

2. Database Sponsor/Manager: Robert Breiling is the database sponsor and the database manager.

3. Database Purpose: The purpose of the database is to support the statistical analysis and detailed aviation accident report analysis that Mr. Breiling markets.

4. Implementation/Guiding Directive: There are no written implementing or guiding directives for this database.

5. Type of Records: The records are all reports of aviation accidents and NTSB-investigated aircraft incidents concerning multiengine jets, twin-engine turboprop aircraft, and twin-engine rotary-wing aircraft used in corporate aviation.

6. Record Source: Aircraft accident reports and information about aircraft accidents are received from the NTSB, from aviation insurance companies, and from the ICAO.

7. Investigation By: All U.S. civil aircraft accidents are investigated by trained NTSB investigators. Foreign aircraft accidents are investigated by the foreign governments concerned.

8. Criteria for Entry: All aircraft accidents and NTSB-investigated aircraft incidents are entered into the database. The NTSB definition of an aircraft accident is the criterion for inclusion in the database. See Section 3.1.2.A.5 for the NTSB definition of an aircraft accident.

B. Contents

1. General Structure: The database is maintained on a personal computer. Lotus is used as a database management system. The database was constructed in late 1984.

2. Type of Operations: The database contains information about multiengine turbojet-, twin-engine turboprop- and twin-engine turbojet-powered helicopters operated under FAR Parts 91 or 135, or under foreign rules.

3. Types of Aircraft: The database is concerned with aircraft accident information for corporate multiengine jet and turboprop aircraft, and twin-engine helicopters.

4. Database Population Characteristics: Mr. Breiling reported that his database is able to generate statistics that are tuned to the needs of aviation insurance companies. He was in the aviation insurance business for many years. Mr. Breiling maintains that analyzing aviation accidents by hours flown is not accurate for corporate jet and general aviation aircraft because reliable data do not exist regarding hours flown by those types of aircraft, as it does for air carrier aviation. He finds a more revealing type of analysis to be the number of aircraft accidents of a particular aircraft type and model vs. the number of that type of aircraft that were built. For example, his analysis indicates that 47 percent of all Lear 23s (a twin-engine corporate jet) have been involved in aircraft accidents. His database was established to readily access such information about each aircraft type and model of corporate aircraft.

5. Total Records: The database consists of approximately 900 multi-engine (mostly twin) turbojet-powered aircraft accident records, approximately 850 twin-engine turboprop-powered aircraft accident records, and approximately 200 twin-engine turbojet-powered rotary-wing aircraft accident records.

6. Time Period(s) Covered: The database covers all accidents of the corporate jet and turboprop fleets since the introduction of those aircraft in the 1950s.

7. Rate Information Available: Various rate information is available. Rates offer comparisons between numbers of accidents vs. numbers of that type of aircraft, number of accidents vs phase of flight, pilot experience, pilot currency, type of aircraft, etc.

8. Fields/Data Coding: Since the information in the database is for commercial purposes, no information about the database fields or data coding was available.

9. Recommendations: Recommendations are not contained in the records.

10. Clear Text Available: A clear text narrative is available. Mr. Breiling re-interprets and rewords the NTSB remarks into what he considers a more presentable format.

C. Utility of Data

1. Finding/Causal Format: The findings and causal factor information is the same information as presented in the NTSB aircraft accident reports - see Section 3.1.2.C.1.

2. Focused Human Factor Information: The database can yield statistical human factor information about each aircraft type and model in the business jet field. For example, Mr. Breiling reported that 74 percent of all CE-500 aircraft accidents were attributed to pilot error. The statistics for all business jet accidents from 1964 to 1988 show that 62 percent were caused by pilot error, 11 percent by airframe, and 20 percent by mechanical problems. Other human factor information regarding pilot licenses, total flight time, pilot currency and experience level is also available. Mr. Breiling is able to produce aircraft accident rates vs. pilot experience levels as an aid to aviation insurance companies in setting insurance rates for each aircraft type and model. Mr. Breiling believes he has analyzed NTSB accident reports and briefs to a finer level of detail than the NTSB had time to do, and he believes his analysis yields more human factor information than the NTSB aviation accident reports.

3. Raw Text Available for Review, In-depth Study: The raw text of the NTSB reports is available for review.

4. Limitations/Caveats/Biases: The only known bias in the database is Mr. Breiling's re-interpretation of the NTSB narratives or briefs.

5. Potential Duplication in Other Databases: All records in the Breiling database are duplicated in the NTSB aircraft accident database or in the ICAO aircraft accident database.

D. Retrieval Information

1. Reports/Summaries Available: Mr. Breiling publishes a large volume of business jet accident reports, with one page devoted to each accident. The initial volume includes every business jet accident on record since the inception of the business jet. The volume is compatible for looseleaf binder storage. An annual update of reports of business jet accidents is also published in looseleaf format. The same type of information is available for turboprop aircraft and twin-engine rotary-wing aircraft. Special reports and studies are available upon demand.

2. Accessibility: All published reports are available at a set cost.

3. Turnaround Time for Requests: Published reports are available immediately. Specific information or data requests could be responded to immediately.

4. Data Use Limitations: No limitations are placed on any furnished data.

5. Cost Per Request: Since this is a commercial database, all reports and requests have a fee schedule. The fee for annual subscription service is approximately $240.

6. Contact Point for Requests: For further information or any requests for data, contact Robert Breiling Associates at (407) 338-6900.

3.6 INTERNATIONAL AVIATION ORGANIZATIONS' AVIATION SAFETY DATABASES

Two international aviation organizations were surveyed for the content and accessibility of their aviation safety databases. Section 3.6.1 contains information about the aviation safety database of the IATA. Section 3.6.2 contains information about the ICAO aviation safety database.

3.6.1 IATA Aviation Safety Database

A. Source Information

1. Database Name: International Air Transport Association (IATA) Safety Information Exchange (SIE) Incident Database

2. Database Sponsor/Manager: The IATA is the database sponsor. Within IATA, the Technical Services Office is the database manager. The IATA is an international association of airlines. Currently, there are approximately 180 airlines in the IATA. The IATA functions as a focal point for airlines to exchange information on technical, economic, and other subjects as they see fit. The IATA is headquartered in Montreal, Canada.

3. Database Purpose: The purpose of the database is to collect information from IATA members regarding aviation incidents experienced by IATA members and to disseminate that information to the other IATA members to help minimize the recurrence of similar incidents and to minimize the occurrence of aviation accidents.

4. Implementation/Guiding Directive: No written guidelines apply to the establishment of the IATA SIE database.

5. Type of Records: Records are voluntary reports of aviation incidents experienced by IATA member airlines.

6. Record Source: The individual member airlines submit incident reports directly to the IATA. A standardized report form has been developed by the IATA and is available to member airlines.

7. Investigation By: The reported aviation incidents have been investigated by personnel of the airline submitting the incident. The airline personnel investigating or submitting the incident report may or may not be trained in aviation safety.

8. Criteria for Entry: Received reports are entered into the database. IATA personnel do not investigate the report and do not analyze the reporter's findings or report.

B. Contents

1. General Structure: The SIE files are maintained on a computer using the Cardbox system developed by Business Simulation Limited, Scriventon House, Speldhurst, Kent, England The IATA is making the Cardbox software package, plus the available incidents in the database, available to members for $700, in an effort to facilitate the exchange of safety information.

2. Type of Operations: The incidents involve airlines operating aircraft in domestic or international operations.

3. Types of Aircraft: The database is composed of reports of large multiengine turbojet aircraft.

4. Database Population Characteristics: The database manager estimates that approximately one-third of the submitted incidents are from U.S. carriers. All incidents are de-identified as to the name of the submitting carrier before entry into the database.

5. Total Records: The SIE database consists of approximately 3,000 records.

6. Time Period(s) Covered: The database was originated in the early 1970s. The database has been automated for approximately the last 2 years. New records are added to the database at a rate of approximately 135 per year.

7. Rate Information Available: Rate information is not available directly from the SIE database.

8. Fields/Data Coding: Fields have been set up to allow a direct capture of information from a standardized report form. The fields include aircraft type, route from-to, date, flight number, registration number, location, meteorological conditions, altitude, phase of flight, cause, action, engine type, type of operation, system involved, status, reference number, severity, people on board, fatalities, summary, and key words.

9. Recommendations: The recommendations or actions taken by the reporting airline are recorded in the database and is reproduced on SIE reports sent to members.

10. Clear Text Available: A clear text narrative of 8,000 characters is available.

C. Utility of Data

1. Finding/Causal Format: The IATA aircraft incident format classifies causes into three broad areas, with several modifiers in each area. The three areas of causes and some modifiers are:

   - Technical: logistical, maintenance, etc.
   - Environmental: airport, weather, nav aid, air traffic control etc.
   - Human: deliberate disregard of procedures, unawareness, lack of skill or proficiency, incapacitation

   In the printed SIE report, these causes are alphanumerically coded.

2. Focused Human Factor Information: To assist in standardization the IATA database uses the ICAO Accident Reporting Manual's key words list for the recording of the IATA SIE incidents. The SIE report narratives can be searched by the use of key words. Human factor information would be contained in the narrative of the SIE reports.

3. Raw Text Available for Review, In-depth Study: The IATA maintains the raw text of submitted incident reports.

4. Limitations/Caveats/Biases: The database manager believes that the reported aviation safety incidents in the SIE database represent only a small percentage of the incidents actually occurring. Many IATA member airlines do not have a safety office, and the database manager believes this inhibits the reporting of aviation incidents. The database manager also reports that each reported incident also has a bias since each incident necessitates a value judgment on the part of the reporter as to whether or not to report the incident.

5. Potential Duplication in Other Databases: Airlines submitting incident reports probably maintain a record of the submitted report. In the United States, if the FAA investigated the incident, the incident would be contained in the FAA's AIDS.

D. Retrieval Information

1. Reports/Summaries Available: The IATA periodically disseminates computer-generated incidents reports to member airlines for the airlines' information and possible use in their safety programs. A sample of incidents from the first computer-generated batch of incident reports disseminated to member airlines is contained in Appendix M.

   An IATA Safety Advisory Committee meets annually to review the previous year's incident reports and worldwide accident reports. Recommendations to improve aviation safety are made in a report to IATA member airlines, based on the Safety Advisory Committee's review of the accidents and incidents on file.

2. Accessibility: Aircraft incident information is only available to IATA member airlines.

3. Turnaround Time for Requests: Requests for incident information are not honored by organizations that are not members of the IATA.

4. Data Use Limitations: Aircraft incident information is strictly confidential and not available to non-IATA members.

5. Cost Per Request: Since requests for information or data are not honored by organizations that are not IATA members, no cost estimates have been developed.

6. Contact Point for Requests: For further information regarding the IATA SIE database, contact IATA at (514) 844-6311.

3.6.2 ICAO Aviation Safety Database

A. Source Information

1. Database Name: ICAO Accident/Incident Database

2. Database Sponsor/Manager: The ICAO is the database sponsor. The Accident Investigation and Prevention section of the ICAO is the database manager. The ICAO is an arm of the United Nations. ICAO maintains several offices throughout the world to maintain and assist in international aviation safety standardization. The uniform application by member states of the specifications contained in ICAO standards is recognized as necessary for the safety or regularity of international air navigation. The ICAO also publishes recommended practices that are regarded as desirable in the interest of safety, regularity, or efficiency of international air navigation. The ICAO currently has 159 members.

3. Database Purpose: The purpose of the database is to record results of aviation accident investigations conducted by ICAO member states and to make this information available to other member states for use in aviation accident reduction programs.

4. Implementation/Guiding Directive: The ICAO Annex 13, Aircraft Accident Investigation, requires member states to report to the ICAO information on all aircraft accidents that involve aircraft of a maximum certificated take-off gross weight of more than 2250 kilograms (approximately 5,000 pounds). The ICAO Accident/Incident Reporting Manual, ICAO document 9156, offers guidelines and procedures for reporting aviation accidents or incidents to ICAO.

5. Type of Records: The records are submitted reports of aviation accidents of aircraft in excess of 2250 kilograms (5,000 pounds) maximal take-off weight. ICAO also gathers information on aircraft incidents considered important for safety and accident prevention.

6. Record Source: Records are written reports of aviation accidents or incidents submitted to the ICAO by the member state that investigated the accident. Usually the accident is reported in a preliminary report, which contains some immediately available factual and circumstantial information. The preliminary report is followed by an Accident Data Report when the investigation is complete. ICAO guidelines state that there is no obligation for member states to conduct an investigation into an incident, but, if a state has found an incident significant enough to warrant an investigation, then an incident report should be forwarded to the ICAO. Some member states, including the United States, submit data in tape format. The ICAO then converts the data, through much manipulation, into a format compatible for acceptance by the ICAO database.

7. Investigation By: Aircraft accidents and investigated incidents are investigated by the state submitting the report. The personnel conducting the investigations may or may not be trained in aircraft accident investigation procedures.

8. Criteria for Entry: The database consists of aircraft accident reports for aircraft that exceed a certificated take-off gross weight of 2250 kilograms (approximately 5,000 pounds). Incident reports for aircraft that exceed 5700 kilograms (12,500 pounds) are incorporated into the database. An aircraft accident is defined in ICAO Annex 13 as: an occurrence wherein a person is fatally or seriously injured; or the aircraft sustains major damage or structural failure; or the aircraft is missing. An incident is defined as an occurrence, other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operation.

B. Contents

1. General Structure: Data are stored on a mainframe computer. An internally developed ICAO software system is used for database management.

2. Type of Operations: The ICAO database is concerned with any aircraft operating in accordance with the rules of the state reporting the accident or incident.

3. Types of Aircraft: Only aircraft accident reports involving aircraft of more than 2250 kilograms (5,000 pounds) are incorporated into the database. Except in rare cases only aircraft incident reports involving aircraft of more than 5700 kilograms (12,500 pounds) are incorporated into the database.

4. Database Population Characteristics: The database manager reported that approximately 92 percent of the occurrences on file are aircraft accident reports. The ICAO states that it is mainly interested in severe incidents for inclusion in the ICAO database. Types of incidents of main interest include:

   - Failures of more than one engine on the same aircraft, engine failures that are not contained to the engine, such as compressor blade and turbine bucket failures
   - Fires that occur in flight
   - Incidents that result in danger of collision or actual collision with terrain or obstacles
   - Flight control and stability problems
   - Take-off and landing incidents that involve undershooting, overrunning, running off the side of runways, or wheels-up landings
   - Flight crew incapacitations
   - Decompression resulting in emergency descents
   - NMACs or other hazardous air traffic incidents

5. Total Records: There are more than 14,500 aircraft accidents and incidents on file in the database. Approximately 800 records are added each year.

6. Time Period(s) Covered: The database was started in 1970 and contains records from 1970 to the present time. In 1976 the reporting format was structured into an accident/incident data reporting format called ADREP.

7. Rate Information Available: Rate information can be generated using statistical data available from other ICAO sources.

8. Fields/Data Coding: The fields are structured to allow ease of entry of the information contained on the accident report into the database. See Appendix N for a sample of several pages of a sample ICAO aircraft accident report.

9. Recommendations: Safety recommendations and preventive measures taken by the reporting state are considered an important part of a record. Recommendations are available in each record.

10. Clear Text Available: A clear text narrative of up to 200 words is available.

C. Utility of Data

1. Finding/Causal Format: Causal factors are recorded in the ADREP report in such a way as to allow their components to be coded and recorded by computer. The ICAO experience has shown that these factors are often the reference used when extracting information about accidents.

   To illustrate the coding of causal factors, a diagram is presented below:

   Event 1 + Phase of Operation

Descriptive Factor + modifiers	Descriptive Factor + modifiers	Descriptive Factor + modifiers	Etc.
Explanatory Factor + modifiers	Explanatory Factor + modifiers		

   Each aviation accident or incident is recorded in a series of events. Each event has a companion phase of operation, e.g., climb, cruise, landing. Each event can be described by up to five descriptive factors. Descriptive factors describe what happened during an event and are coded chronologically. Descriptive factors do not blame any person. For example, a descriptive factor would specify "altitude misjudged" not "pilot misjudged altitude." Each descriptive factor must have from one to three modifiers. Approximately 450 modifiers are available. A list of descriptive factors and the associated modifiers, as contained in the ICAO ADREP Manual, are contained in Appendix N.

   Explanatory factors are used to explain why an event happened. Up to three explanatory factors can be entered for each descriptive factor. Explanatory factors have approximately 100 modifiers available to depict the nature of the involvement of the person or organization mentioned in the explanatory factor. A list of the explanatory words and modifiers that may have human factor interest, taken from the ICAO ADREP Manual, is contained in Appendix N.

   To illustrate the event - descriptive factor + modifier - explanatory factor + modifier concept, a copy of an event worksheet, as taken from the ICAO ADREP Manual, is contained in Appendix N.

2. Focused Human Factor Information: Focused human factor information is contained in the explanatory factor section of the causal factor section of an accident or incident report. See Appendix N for a list of the explanatory factors and modifiers that pertain to human factors. The narrative may also contain human factor information.

The ICAO has established a human factors committee to study the human factor problem in aviation accidents. Dr. William Shepherd of the FAA Office of Aviation Medicine is a member. Dr. Shepherd may be contacted at (202) 267-3403.

3. Raw Text Available for Review, In-depth Study: The raw text reports are retained by the ICAO.

4. Limitations/Caveats/Biases: The database manager reported that the quality of information reported in the accident reports varies by state. Many levels of detail may be missing from a report depending on the skill, experience, procedures, etc., of the investigator and the constraints imposed by the state reporting the accident. Some states do not allow an investigation to fix blame. Also, some things may be lost in translating the reports language to one of the three ICAO languages: English, French, and Spanish.

5. Potential Duplication in Other Databases: States submitting the accident or incident report probably retain the original report.

D. Retrieval Information

1. Reports/Summaries Available: The ICAO can provide computerized printouts of aircraft accident or incident information in English, French, or Spanish. There are three standard output formats:

   - A full print that contains all the information in a report and usually consists of four pages per report.
   - A brief print that contains the information essential to understanding the occurrence, including factors and narrative, and usually consists of two pages.
   - Standard statistics that present events, phases of flight, and statistical factors, and are usually produced when more then 10 reports are involved.

   There are two types of nonstandard outputs:

   - Occurrence summaries that can contain any data coding specified by the requester.
   - Statistical printouts including frequencies, and two- or three-way cross-tabulations involving any data coding.

   The ICAO will also respond to requests for data in any other form, as needed.

   The ICAO publishes bimonthly summaries of aircraft accident reports received and also selective safety recommendations sent to the ICAO from member states.

   The ICAO also publishes annual aviation accident statistics.

2. Accessibility: ICAO member states have provided the ICAO with a list that specifies what official agencies of that state are authorized to request data from the ICAO database. In the United States the designated agencies are the FAA and the NTSB. Requests for ICAO data must be routed to the FAA Office of International Affairs, Washington, DC at (202) 267-3213.

   Published bimonthly and annual reports are available from the ICAO.

3. Turnaround Time for Requests: Approved requests for data can be responded to in approximately 5 working days.

4. Data Use Limitations: The ICAO will respond to requests for aviation accident or incident information only if the information is to be used for the enhancement of aviation safety.

5. Cost Per Request: There is no charge for furnished data.

6. Contact Point for Requests: For further information, contact the ICAO at (514) 285-6727.

Requests for aviation safety data from the ICAO should be routed through the FAA Office of International Affairs at (202) 267-3213.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

During the information collection process for the aviation safety database compendium contained in Section 3 of this report, numerous persons with aviation safety expertise were interviewed, many aviation safety offices were visited, and multitudes of aviation safety reports, forms and data were reviewed. Based upon that process, and the information contained in Section 3 of this report, the following conclusions were drawn:

a. Each of the aviation safety databases in existence was established for a specific purpose, usually operational, using technology available at the time. The existing databases do not provide information in formats or terminology that allow easy correlation of data between databases.

b. Many of the forms used to collect data for various FAA databases are obsolete and provide very little human factor information to the databases.

c. The NTSB Aviation Accident Database is the largest available database of U.S. civil aircraft accidents. All other databases that include U.S. civil aircraft accident data derive information from the NTSB Aviation Accident Database.

d. The collection of human factor information in aircraft accidents and incidents is labor intensive and difficult to document, if it is even documentable. The human factor terms in aircraft accident and incident reports generally address what happened but not why it happened. The quality and amount of human factor information in aircraft accident and incident reports is constrained by available manpower and influenced by the difficulty in proving human factor conclusions.

e. The narratives of aircraft accident and incident reports must be read to obtain the best human factor information from the reports.

f. The FAA AIDS Database is not utilized often by aviation safety personnel for incident analysis because the incident data is perceived to be incomplete and unreliable.

g. There is great reluctance to provide the FAA any aircraft incident information for fear of punitive action and because government information becomes public information. A perceived feeling exists among companies and personnel regulated by the FAA that the desire of the FAA to be viewed as a tough regulatory agency is stifling the free flow of aviation safety information.

h. Airline safety officials see a need for a common aviation incident database and the sharing of information to enhance aviation safety. There is movement within the airline industry towards the establishment of a confidential, common aviation incident database using an IATA sponsored system called Cardbox.

i. Even though the FAA/NASA ASRS Database has known biases and limitations the ASRS Database is the best available large database containing human factor information about why aviation incidents occurred.

j. A perceived need exists among aviation safety personnel to direct more flight safety information, including human factor information, to pilots. Information about pilot deviations, near mid-air collisions, safety trend analyses, and aircraft accidents and incidents could reduce future occurrences of accidents and incidents if pilots are made more aware in a timely fashion of the information available in various databases.

k. A widespread appreciation exists within all segments of the aviation industry for the significance of human factors in the occurrence of aviation accidents or incidents.

4.2 RECOMMENDATIONS

As a result of this study the following recommendations are offered:

a. The feasibility of establishing a master database or data clearinghouse to incorporate the functions and data of existing civil and military aircraft accident, incident, and other aviation safety related databases should be studied. A master aviation safety database would generate a broader source of data, standardize terminology, enhance ease of access and utility of data, provide confidentiality of data as necessary, and could be cost effective when compared to the multitude of existing aviation safety databases. The current state-of-the-art in data processing technology, as shown in the Federal Highway Administration Commercial Driver's License Program, does support the creation of a central data clearinghouse.

b. To enhance the quality of human factor information being provided to existing or future aviation accident or incident databases, the FAA should establish a task force to analyze needs, standardize terminology and develop guidelines and forms for collecting human factor information from aircraft accidents or incidents. The task force should consist of operational personnel who gather, analyze and use the data as well as personnel with human factor expertise from government, universities, and the aviation industry. A standard form(s) with standardized definitions will greatly facilitate quality data collection, easier analysis, and rapid distribution of information.

c. A limited immunity program should be established to facilitate the flow of human factor aviation incident information between airline management and pilots, between airlines, and between airlines and the FAA. The current ASRS Program is a good point of departure to develop such a program.

d. A more vigorous effort should be initiated to get available human factor and other aviation safety information to pilots. The information could be distributed directly from the FAA or could be distributed through contracted parties such as AOPA, ALPA, APA, FSF, HAI, NBAA, RAA, and widely circulated professional publications. Similar information avenues should be opened to air traffic controllers, maintenance personnel and aircraft design teams.

e. The present momentum of interest in human factors in aviation should be perpetuated through FAA sponsored recurring seminars and conferences involving government, industry, and academic personnel. Highlights of the conferences and other significant information should be widely disseminated throughout the aviation industry.

REFERENCES

1. Boeing Commercial Airplane Company. Statistical Summary of Commercial Jet Aircraft Accidents, Worldwide Operations, 1959 - 1987. Seattle, WA. April 1988.

2. Sears, R.L. "A New Look at Accident Contributors and the Implications of Operational and Training Procedures". Boeing Commercial Airplane Company. 38th International Flight Safety Foundation Symposium, November 1985.

3. Foushee, H., and Helmreich, R. "Group Interaction and Flight Crew Performance" 189-227. Human Factors in Aviation. Edited by Wiener, Earl and Nagel, David. San Diego, CA. Academic Press, Inc. 1988.

4. Nagel, David "Human Error in Aviation Operations" 263 - 303. Human Factors in Aviation. Edited by Weiner, Earl and Nagel, David. San Diego, Ca. Academic Press, Inc., 1988.

5. Billings, C. and Cheaney, E. Information Transfer Problems In the Aviation System, NASA Technical Paper 1875, 1981.

6. Hawkins, F. Human Factors In Flight. Hants, England. Gower Technical Press, Ltd., 1987.

7. Lederer, Jerome. Forward to Human Factors in Aviation. Edited by Weiner, Earl and Nagel, David. San Diego, CA. Academic Press, Inc., 1988.

8. Federal Aviation Administration. An Overview of the Aviation Safety Analysis System. Washington, DC October 1987.

9. Federal Aviation Administration, Office of Aviation Safety. Aviation Safety Statistics, Annual Summary Calendar Year, 1987. Washington, DC April 1988.

10. Federal Aviation Administration, Office of Aviation Safety. Profile of Operational Errors in the National Airspace System, Calendar Year 1986. Washington, DC November 1987.

11. Federal Aviation Administration, Office of Aviation Safety. Selected Statistics Concerning Pilot Reported Near Midair Collisions (1983-1986). Washington, DC October 1987.

12. International Civil Aviation Organization, Accident/Incident Reporting Manual (ADREP Manual), Document 9156-AN/900. Montreal, Canada, 1987.

13. Joint Government/Industry Task Force On Flight Crew Performance, Recommendations. Washington, DC June 1988.

REFERENCES (CONTINUED)

14. Reynard, W. et al. The Development of the NASA Aviation Safety Reporting System, NASA References Publication 1114, Washington, DC November 1986.

15. Society of Automotive Engineers, Inc. Human Error Avoidance Techniques Conference Proceedings, December 1-3, 1987, Washington, DC. Society of Automotive Engineers, Inc., Warrendale, PA. February 1988.

16. U.S. Air Force, U.S. Air Force Guide to Mishap Investigations. U.S. Air Force Publication 127-1, Volume 1, Washington, DC, May 1987.

17. Wiegers, F. and Rosman, E. "Safety Information System - A Safety Profile of Wide-Body Commercial Aircraft". Douglas Aircraft Company, Douglas Paper 7780. Flight Safety Foundation, International Air Safety Seminar, Vancouver, BC, October 1986.