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A DESCRIPTION OF THE CIVIL AEROMEDICAL INSTSITUTE AIRLINE CABIN SAFETY DATA BANK: 1970 - 1976

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16. Abstract

This report describes the Civil Aeromedical Institute cabin safety data bank and gives summaries of injuries reflected in the over 1,400 accidents/incidents in the data bank. As an example of the uses to which these data are applicable, the numbers of aircraft involved in occurrences are compared with the numbers in operation and selected variables. The discussion provides further insight into the data bank's potential applications.

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The authors wish also to give special acknowledgment to Captain William Collier who contributed much of his own time to research accident and incident reports and to gather information for the data bank.

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LIST OF ABBREVIATIONS

ALS	Auxiliary Landing System
AFA	Association of Flight Attendants
CAMI	Civil Aeromedical Institute
FAA	Federal Aviation Administration
F/A	flight attendant
NTSB	National Transportation Safety Board
OAM	Office of Aviation Medicine
pax	passenger

Injury Categories

M	minor
S	serious
F	fatal

Aircraft

B	Boeing
BAC	British Aircraft Corporation
CV	Convair
DC	Douglas
F & FH	Fairchild
L	Lockheed
M	Martin
YS	Nihon

A DESCRIPTION OF THE CIVIL AEROMEDICAL INSTITUTE AIRLINE CABIN SAFETY DATA BANK: 1970-1976

Introduction.

This report describes the CAMI Cabin Safety Data Bank that was established in July 1974 under Research Task AM-B-75-PRS-22. This data bank contains selected data summaries of airline accidents and incidents. The over 1,400 occurrences in the data bank are presently limited to the years 1970 through 1976. The data bank was developed because of the need to systematically store and analyze specific crashworthiness data from the NTSB and FAA files.

History.

Emphasis on crashworthiness has varied over the years but received significant impetus following a series of accidents in the early 1960's. Accident investigators hypothesized that much injury and loss of life in these accidents were because of the crashworthiness characteristics of the aircraft involved. Snow et al. (1) discusses three of these accidents in depth. The aftermath of these accidents resulted in public demand for improved crashworthiness. In response, the aviation community established a crashworthiness task force, held a crashworthiness conference, conducted tests by crashing two air carrier aircraft (2), and began to place more emphasis on human factors and engineering as they interlock to form successful crashworthiness systems. As a result, changes and additions were made in emergency exit requirements, requirements for emergency evacuation tests before aircraft certification, interior and exterior emergency lighting, number of flight attendants in proportion to passenger load, passenger briefing cards, access to emergency exits, carry-on baggage, training of flight attendants, etc. (3,4). As the industry absorbed these changes, interest in crashworthiness stabilized. However, even during this relatively quiet period, the need for a data bank to document cabin safety in airline emergencies was recognized. The CAMI data bank was started during this period. Concern about crashworthiness has recently increased and the number of reports in the data bank has reached a level useful for indicating trends. Therefore, initial examination of the information is appropriate.

Procedures.

The Federal Aviation Act of 1958 (5) establishes procedures for the investigation of all accidents and incidents* and, along with

* Definitions of terms are given in Appendix A.

the Department of Transportation Act of 1966 (6), gives the NTSB authority to delegate a portion of its aircraft accident/incident investigation responsibility to the FAA. Under this authority, FAA field personnel investigate most of the incidents and the accidents in which damage or injuries are not extensive. NTSB personnel investigate selected airline incidents and all airline accidents with significant substantial damage to the aircraft, serious injuries to the occupants, or fatalities.

Investigators write reports on all accident/incident investigations. These reports vary in length and detail from a brief two-sentence statement by FAA field personnel on a minor incident to the formal accident reports of the NTSB. These formal NTSB reports are derived from documents that sometimes cover over 1,000 pages of material on committee investigations. The reports and accompanying information are stored by the FAA or NTSB in their respective accident files. These files were examined for the information essential to develop the data bank for medical, cabin safety, and crashworthiness data. Various people having airline crewmember, medical, or research backgrounds collected the information from the 1970-1976 files. Selection criteria were based on pertinence of the material to cabin safety, injury causation, cabin emergency procedures training, and frequency of occurrence. Twenty survivable accidents were then initially selected for detailed examination. Nonsurvivable accidents were not examined because they do not pertain to cabin safety discussions; however, representative evacuations and inflight accidents were reviewed. As a result of these initial reviews, by soliciting suggestions and eliminating many interesting but not-often-used facts, the list of variables to be included in the data bank was formed (Appendix B). Using the same list, a data-gathering sheet was developed (Appendix C).

The initial data-gathering process then began, to (i) find each accident/incident that could be classified as 1-29 on the list of variables or might, even though not on the list, be of interest to operational, engineering, or other personnel interested in safety; (ii) examine each accident/incident report for information pertinent to the data-gathering sheet; and (iii) complete and send to CAMI the data-gathering sheets. Later, the selected accident/incident files were copied and sent to CAMI. This approach provided more complete files as well as more consistent data because it allows one person at CAMI to examine the reports and fill out the information sheets. After the data sheets are completed, the information is compared, for completeness, to any other available data (such as reports prepared by CAMI researchers). A listing of the variables is stored in the CAMI Hewlett-Packard 21 MX-E minicomputer. The data sheets of the stored accidents/incidents are kept on file. These data are not considered statistically meaningful for estimating true incidence because all accidents/incidents are not reported. Nevertheless, useful information is provided about airline evacuations; inflight accidents/incidents and illnesses; seat, galley, pressurization, and turbulence problems, etc.; smoke and toxic fumes; injuries; and other cabin safety data.

The Data.

The 17 accident/incident categories listed in Tables 1 through 8 are primary classifications. The eight tables provide information about the number of accidents/incidents and the number of injuries in each category.

Emergency Evacuation and Ditching. The four categories of Planned Evacuation, Unplanned Evacuation, Planned Ditching, and Unplanned Ditching include accidents/incidents in which a majority of the occupants leave the aircraft under some sort of organized behavior. This behavior may be evidenced by deployment of slides or rafts or by flight attendants giving directions to remove window exits or move to a hole in the fuselage for evacuation. Accidents/incidents in which the aircraft sustains substantial structural damage and occupants use the nearest opening in the aircraft as a primary means to escape with no apparent organized behavior or instructions are not included in these categories. A ditching, for the purpose of this examination, is a situation causing passengers to deplane into water over their heads. A planned evacuation or ditching is one in which some inflight event indicates there will be a problem on landing, thus allowing the crew time to prepare the passengers for a possible evacuation or ditching. This was the case with a Pan American World Airways B-747 that sustained structural damage when it hit the ALS on takeoff from San Francisco, California: "The flight crew continued the takeoff and after determining the conditions of the injured passengers, flew the aircraft for 1 hour and 42 minutes."(7) The aircraft was then landed and passengers were evacuated by following crew directions and using the emergency slides.

Unplanned evacuations and ditching occur when something happens to the aircraft during takeoff or landing that requires the occupants to get out in a hurry and the crew has little or no time to warn the passengers or prepare the cabin. This was the case in the Trans Caribbean Airways accident at St. Thomas, Virgin Islands, December 28, 1970, when a B-727 bounced several times on landing, yawed to the right, slid part way up a hill, broke in two places, and came to rest partially on its left side (8).

Turbulence. The turbulence category contains information on reports of accidents/incidents involving turbulence. A pilot may file a report because his aircraft has encountered severe turbulence (a Turbulence Reporting Criteria Table is shown in Appendix D). Turbulence might also be reported if an injury occurred. For example, an accident that occurred on December 24, 1970, was reported: "Seat belt sign on. Baby lying in seat next to mother with seatbelt fastened around him. Fractured skull, hospitalized 5 days." (9)

Inflight Other Than Turbulence. This category pertains to those accidents/incidents for which the pilot reports an unusual inflight event; e.g., an inflight fire (10). The Inflight Other Than Turbulence category also includes reports from people that a bomb is on board an aircraft in the air and incidents in which the pilots take evasive action.

Substantial Structural Damage. This category is limited to accidents/incidents in which deformations or breaks in the fuselage occur and there is no directed evacuation. An example of an accident/incident in the Substantial Structural Damage category is provided by the United Airlines landing accident at the Midway Airport in Chicago, Illinois, on December 8, 1972. "While making a nonprecision instrument approach to Runway 31L . . . the B-737 crashed . . . The aircraft was destroyed by impact and subsequent fire . . . There were 55 passengers and 6 crewmembers . . . Forty passengers and three crewmembers were killed."(11) This accident may also be considered an evacuation because the flight attendants in the rear of the aircraft helped evacuate the passengers (12). It was classified in the Substantial Structural Damage category because a majority of the passengers were not evacuated under the direction of a crewmember. It should be noted that accidents involving substantial structural damage and crewmember-directed evacuations are classified under Planned or Unplanned Evacuations.

Nonsurvivable. The terms survivable and nonsurvivable have been widely discussed in the literature. There is no official definition for the terms; however, in this report the nonsurvivable classification is used for accidents in which there was no chance for occupant survival, such as in mid-air breakup of the fuselage or aircraft collision with the ground with sufficient force that the hull is collapsed to such an extent that life could not be sustained. An example of a nonsurvivable accident is the Trans World Airlines B-727 accident at Berryville, Virginia, on December 1, 1974. This aircraft was flown into a mountain during a winter storm while on its initial approach for landing; all the occupants were killed (13).

Pressurization Problems. This category contains the accidents/incidents that could have resulted in a decompression or in which a pressurization problem occurred and includes accidents/incidents of cracked windshields; e.g.: (i) On January 10, 1976, a Delta Airlines DC-9 flight en route from Greensboro, North Carolina, to Chicago, Illinois, "declared an emergency due to loss of pressurization. They were cleared to descent from FL310 to 10,000 feet . . ." The flight made an unscheduled landing at Cincinnati because of an injured passenger (14). (ii) On October 6, 1976, a Braniff International Airways "flight returned to Houston because of cracked windshield on climb out."(15)

Ground Occurrences. The Ground Occurrences category includes accidents/incidents occurring on the ground that may be of interest to cabin safety experts; e.g., bomb threats received before takeoff and instances in which an aircraft occupant is hurt falling down steps.

Unruly Passengers, Threatening Passengers, Alcohol, Drugs, and Mentally Ill. These four categories could all be classified as the problem-passenger category. This type of occurrence is illustrated by the following example: Three male passengers on an American Airlines flight from New York, New York, on final approach to Phoenix, Arizona (Sky Harbor International Airport), on February 9, 1975:

> "committed the following acts:
>
> 1. Were drinking from their own bottles.
> 2. Were intoxicated.
> 3. Were making advances to the cabin attendants and interfering with the cabin attendants in the performance of their duties.
> 4. Were using obscene language.
> 5. Would not buckle their seat belts when told to do so by the cabin attendants.
> 6. Would not extinguish their cigarettes when the no smoking sign was on and further would not extinguish their cigarrettes (sic) when told to do so by the cabin attendants."

The flight crew informed the tower that these passengers were responsible for the missed landing approach (15).

Passenger or Crew Illness and Passenger or Crew Injured. These two categories contain those accidents/incidents in which a crewmember or passenger became ill or was injured (in other than turbulence conditions). An example is provided by this statement from a report of the Trans World Airlines incident over Missouri on February 23, 1975: "Male PAX (sic) had heart attack. Four Drs. (sic) on board administered oxygen and closed heart massage. An ambulance met the flight and took the PAX (sic) to a hospital where he was pronounced dead on arrival."(16)

Other. The last category contains those accidents/incidents of potential cabin safety interest that did not fit in the classified categories described in the preceding paragraphs.

Certain accidents/incidents could easily be placed in two or more categories; e.g., an accident/incident in which a pressurization problem resulted in an evacuation following landing. Incidents of this nature are filed in the category in which the injury occurred. If the time of injury is not established, or if there is no injury,

the incident is filed in the category considered to have the most injury-causing potential. The cited example would be filed in the evacuation category. Incidents are not filed in two categories. A cross-referencing system is used in the data bank so that the incident may be counted in the pertinent category when the computer is interrogated. However, since Tables 1 through 8 give information about the number of injuries, accidents/incidents are only listed in their assigned category in the tables to avoid the possibility of counting an accident/incident or injury twice.

Tables 1 through 7 are yearly summations. Table 8 totals the information in the first seven tables. The largest category is Pressurization Problems, followed by Turbulence, then Inflight Other Than Turbulence. While these accidents/incidents are the most prevalent, most of the fatalities and serious injuries occurred in the Substantial Structural Damage category, and the most injuries occurred during evacuation accidents/incidents.

The data bank also contains information about the types of aircraft involved in accidents and incidents. To give this information meaning, the number of each type of aircraft involved in these occurrences must be compared with the number of that type of aircraft flying that same year. Tables 9 through 15 provide a comparison of the more commonly flown aircraft. Other less frequently used aircraft are listed in the data bank but are omitted (for brevity) from this report. Information on passenger miles flown for aircraft type for 1970 through 1976 are presented in Chapter VI of the FAA Statistical Handbook of Aviation (17).

TABLE 1. Number of Injuries (By Category)

(1970)

M = Minor S = Serious F = Fatal

Type Occurrence	No. Occurrences	Crew Injuries			F/A Injuries			Pax Injuries			Total Injuries		
		M	S	F	M	S	F	M	S	F	M	S	F
Planned Evacuation	2	--	--	--	--	--	--	2	1	--	2	1	--
Unplanned Evacuation	13	2	2	--	1	--	--	52	13	2	55	15	2
Unplanned Ditching	0	--	--	--	--	--	--	--	--	--	--	--	--
Turbulence	16	--	--	--	9	16	--	55	12	--	64	28	--
Inflight Other Than Turbulence	4	--	--	--	--	1	--	--	--	--	--	1	--
Substantial Structural Damage	8	--	13	11	--	7	10	--	52	73	--	72	94
Nonsurvivable	2	--	--	5	--	--	3	--	--	70	--	--	78
Pressurization Problems*	--	--	--	--	--	--	--	--	--	--	--	--	--
Ground Occurrences	11	--	1	--	--	--	--	--	1	--	--	2	--
Unruly Passengers*	--	--	--	--	--	--	--	--	--	--	--	--	--
Threatening Passengers*	--	--	--	--	--	--	--	--	--	--	--	--	--
Alcohol	2**	--	--	--	--	--	--	--	--	--	--	--	--
Drugs*	--	--	--	--	--	--	--	--	--	--	--	--	--
Passenger or Crew Illness*	--	--	--	--	--	--	--	--	--	--	--	--	--
Passenger or Crew Injured	1	--	--	--	--	1	--	--	--	--	--	1	--
Mentally Ill*	--	--	--	--	--	--	--	--	--	--	--	--	--
Other*	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	59	2	16	16	10	25	13	109	79	145	121	120	174

*No data were collected in 1970 for these categories.

**These incidents have no date; therefore, they are included in 1970.

TABLE 2. Number of Injuries (By Category)

(1971)

M = Minor S = Serious F = Fatal

Type Occurrence	No. Occurrences	Crew Injuries			F/A Injuries			Pax Injuries			Total Injuries		
		M	S	F	M	S	F	M	S	F	M	S	F
Planned Evacuation	12	--	--	--	4	--	--	46	11	--	50	11	--
Unplanned Evacuation	13	--	--	--	3	--	--	23	11	--	26	11	--
Unplanned Ditching	0	--	--	--	--	--	--	--	--	--	--	--	--
Turbulence	32	--	--	--	30	8	--	60	12	--	90	20	--
Inflight Other Than Turbulence	36	--	--	4	1	1	--	1	--	1	2	1	5
Substantial Structural Damage	1	--	1	1	--	--	1	--	2	26	--	3	28
Nonsurvivable	5	--	--	15	--	--	7	--	--	148	--	--	170
Pressurization Problems	48	--	--	--	--	--	--	8	--	--	8	--	--
Ground Occurrences	20	--	3	--	--	--	--	--	--	--	--	3	--
Unruly Passengers	3	--	--	--	--	--	--	--	--	--	--	--	--
Threatening Passengers	23	--	--	--	--	--	--	--	--	1	--	--	1
Alcohol	1	--	--	--	--	--	--	--	--	--	--	--	--
Drugs	1	--	--	--	--	--	--	--	--	--	--	--	--
Passenger or Crew Illness	9	--	--	--	--	--	--	1	--	--	1	--	--
Passenger or Crew Injured	8	1	--	--	6	1	--	--	--	--	7	1	--
Mentally Ill	1	--	--	--	--	--	--	--	--	--	--	--	--
Other	1	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	214	1	4	20	44	10	8	139	36	176	184	50	204

TABLE 3. Number of Injuries (By Category)

(1972)

M = Minor S = Serious F = Fatal

Type Occurrence	No. Occurrences	Crew Injuries			F/A Injuries			Pax Injuries			Total Injuries		
		M	S	F	M	S	F	M	S	F	M	S	F
Planned Evacuation	5	--	--	--	--	--	--	9	1	--	9	1	--
Unplanned Evacuation	17	1	1	--	2	2	--	111	11	--	114	14	--
Unplanned Ditching	0	--	--	--	--	--	--	--	--	--	--	--	--
Turbulence	32	--	--	--	41	6	--	83	18	--	124	24	--
Inflight Other Than Turbulence	16	--	1	2	--	--	1	--	--	2	--	1	5
Substantial Structural Damage	5	2	--	8	3	12	2	28	101	158	33	113	168
Nonsurvivable	1	--	--	4	--	--	--	--	--	--	--	--	4
Pressurization Problems	26	2	--	--	2	--	--	21	--	--	25	--	--
Ground Occurrences	18	--	--	--	--	2	--	--	--	--	--	2	--
Unruly Passengers	5	--	--	--	--	--	--	--	--	--	--	--	--
Threatening Passengers	12	--	--	--	4	--	--	21	1	1	25	1	1
Alcohol	6	--	--	--	1	--	--	--	--	--	1	--	--
Drugs	1	--	--	--	--	--	--	--	--	--	--	--	--
Passenger or Crew Illness	19	--	--	--	--	--	--	--	1	3	--	1	3
Passenger or Crew Injured	11	1	--	--	16	2	--	11	--	--	28	2	--
Mentally Ill	2	--	--	--	--	--	--	--	--	--	--	--	--
Other	0	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	176	6	2	14	69	24	3	284	133	164	359	159	181

TABLE 4. Number of Injuries (By Category)

(1973)

Type Occurrence	No. Occurrences	Crew Injuries M = Minor			F/A Injuries S = Serious			Pax Injuries M = Minor			Total Injuries		
		M	S	F	M	S	F	M	S	F	M	S	F
Planned Evacuation	3	--	--	--	--	--	--	--	1	--	--	1	--
Unplanned Evacuation	20	1	3	--	3	3	--	74	20	--	78	26	--
Unplanned Ditching	0	--	--	--	--	--	--	--	--	--	--	--	--
Turbulence	36	--	--	--	28	8	--	30	8	--	58	16	--
Inflight Other Than Turbulence	23	--	--	3	--	3	--	--	21	1	--	24	4
Substantial Structural Damage	5	--	2	6	--	--	11	--	6	187	--	8	204
Nonsurvivable	2	--	--	5	--	--	1	--	--	11	--	--	17
Pressurization Problems	36	--	--	--	2	--	--	--	--	1	2	--	1
Ground Occurrences	14	--	1	--	--	--	--	--	--	--	--	1	--
Unruly Passengers	5	--	--	--	--	--	--	--	--	--	--	--	--
Threatening Passengers	15	--	--	--	--	--	--	--	--	--	--	--	--
Alcohol	2	--	--	--	1	--	--	--	--	--	1	--	--
Drugs	1	--	--	--	--	--	--	--	--	--	--	--	--
Passenger or Crew Illness	26	--	--	1	--	--	--	--	1	5	--	1	6
Passenger or Crew Injured	13	2	--	--	8	1	--	11	--	--	21	1	--
Mentally Ill	4	--	--	--	--	--	--	--	--	--	--	--	--
Other	0	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	205	3	6	15	42	15	12	115	57	205	160	78	232

TABLE 5. Number of Injuries (By Category)

(1974)

M = Minor S = Serious F = Fatal

Type Occurrence	No. Occurrences	Crew Injuries			F/A Injuries			Pax Injuries			Total Injuries		
		M	S	F	M	S	F	M	S	F	M	S	F
Planned Evacuation	5	--	--	--	--	--	--	5	2	--	5	2	--
Unplanned Evacuation	22	--	--	--	7	--	--	105	10	--	112	10	--
Unplanned Ditching	0	--	--	--	--	--	--	--	--	--	--	--	--
Turbulence	37	1	--	--	14	13	--	43	9	--	58	22	--
Inflight Other Than Turbulence	36	--	--	--	--	1	--	7	1	--	7	2	--
Substantial Structural Damage	4	--	1	5	1	--	7	1	15	154	2	16	166
Nonsurvivable	5	--	--	16	--	--	17	--	--	261	--	--	294
Pressurization Problems	61	--	--	--	--	--	--	1	--	--	1	--	--
Ground Occurrences	42	1	2	1	--	--	--	2	2	--	3	4	1
Unruly Passengers	7	--	--	--	--	--	--	--	--	--	--	--	--
Threatening Passengers	46	1	--	--	1	--	--	1	--	--	3	--	--
Alcohol	4	--	--	--	--	--	--	--	--	--	--	--	--
Drugs	0	--	--	--	--	--	--	--	--	--	--	--	--
Passenger or Crew Illness	31	--	--	--	--	--	--	--	--	4	--	--	4
Passenger or Crew Injured	15	--	--	--	11	2	--	2	--	1	13	2	1
Mentally Ill	3	--	--	--	--	--	--	--	--	--	--	--	--
Other	2	--	--	1	--	--	--	--	--	4	--	--	5
TOTAL	320	3	3	23	34	16	24	167	39	424	204	58	471

TABLE 6. Number of Injuries (By Category)

(1975)

M = Minor S = Serious F = Fatal

Type Occurrence	No. Occurrences	Crew Injuries			F/A Injuries			Pax Injuries			Total Injuries		
		M	S	F	M	S	F	M	S	F	M	S	F
Planned Evacuation	4	--	--	--	--	--	--	--	--	--	--	--	--
Unplanned Evacuation	16	--	3	--	2	7	--	64	20	--	66	30	--
Unplanned Ditching	0	--	--	--	--	--	--	--	--	--	--	--	--
Turbulence	30	--	--	--	25	7	--	23	8	--	48	15	--
Inflight Other Than Turbulence	30	--	1	--	10	--	--	14	3	1	24	4	1
Substantial Structural Damage	15	--	1	9	--	3	2	2	29	113	2	33	124
Nonsurvivable	0	--	--	--	--	--	--	--	--	--	--	--	--
Pressurization Problems	48	--	--	--	--	--	--	1	1	1	1	1	1
Ground Occurrences	17	--	--	--	2	--	--	8	1	--	10	1	--
Unruly Passengers	3	--	--	--	--	--	--	--	--	--	--	--	--
Threatening Passengers	7	--	--	--	--	--	--	--	--	--	--	--	--
Alcohol	0	--	--	--	--	--	--	--	--	--	--	--	--
Passenger or Crew Illness	23	--	--	--	--	--	--	--	--	2	--	--	2
Passenger or Crew Injured	7	--	--	--	4	1	--	1	--	1	5	1	1
Mentally Ill	1	--	--	--	--	--	--	--	--	--	--	--	--
Other	0	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	201	0	5	9	43	18	2	119	62	118	162	85	129

TABLE 7. Number of Injuries (By Category)

(1976)

M = Minor S = Serious F = Fatal

Type Occurrence	No. Occurrences	Crew Injuries			F/A Injuries			Pax Injuries			Total Injuries		
		M	S	F	M	S	F	M	S	F	M	S	F
Planned Evacuation	6	--	--	--	1	--	--	4	--	--	5	--	--
Unplanned Evacuation	14	3	5	--	--	7	2	47	43	36	50	55	38
Unplanned Ditching	1	1	--	--	--	--	--	--	--	--	1	--	--
Turbulence	36	1	--	--	30	2	--	67	6	--	98	8	--
Inflight Other Than Turbulence	42	--	1	--	2	--	--	--	--	--	2	1	--
Substantial Structural Damage	1	--	--	1	--	--	--	--	--	3	--	--	4
Nonsurvivable	0	--	--	--	--	--	--	--	--	--	--	--	--
Pressurization Problems	39	--	--	--	--	--	--	3	--	--	3	--	--
Ground Occurrences	45	4	5	3	3	--	--	5	3	--	12	8	3
Unruly Passengers	1	--	--	--	--	--	--	--	--	--	--	--	--
Threatening Passengers	4	1	--	--	2	--	--	5	--	--	8	--	--
Alcohol	1	--	--	--	--	--	--	--	--	--	--	--	--
Drugs	0	--	--	--	--	--	--	--	--	--	--	--	--
Passenger or Crew Illness	31	--	--	2	--	--	--	--	--	6	--	--	8
Passenger or Crew Injured	12	1	--	--	6	1	--	4	--	--	11	1	--
Mentally Ill	4	--	--	--	3	--	--	1	--	--	4	--	--
Other	0	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	237	11	11	6	47	10	2	136	52	45	194	73	53

TABLE 8. Number of Injuries (By Category)

(Summary: 1970 - 1976)

M = Minor S = Serious F = Fatal

Type Occurrence	No. Occurrences	Crew Injuries			F/A Injuries			Pax Injuries			Total Injuries		
		M	S	F	M	S	F	M	S	F	M	S	F
Planned Evacuation	37	---	---	---	5	---	---	71	16	---	76	16	---
Unplanned Evacuation	115	7	14	---	18	19	2	476	128	38	501	161	40
Unplanned Ditching	1	1	---	---	---	---	---	---	---	---	1	---	---
Turbulence	219	2	---	---	177	60	---	361	73	---	540	133	---
Inflight Other Than Turbulence	187	---	3	9	13	6	1	22	25	5	35	34	15
Substantial Structural Damage	39	2	18	41	4	22	33	31	205	714	37	245	788
Nonsurvivable	15	---	---	45	---	---	28	---	---	490	---	---	563
Pressurization Problems*	258	2	---	---	4	---	---	34	1	2	40	1	2
Ground Occurrences*	167	5	12	4	5	2	---	15	7	---	25	21	4
Unruly Passengers*	24	---	---	---	---	---	---	---	---	---	---	---	---
Threatening Passengers*	107	2	---	---	7	---	---	27	1	2	36	1	2
Alcohol	21	---	---	---	2	---	---	---	---	---	2	---	---
Drugs*	3	---	---	---	---	---	---	---	---	---	---	---	---
Passenger or Crew Illness*	139	---	---	3	---	---	---	1	2	20	1	2	23
Passenger of Crew Injured	67	5	---	---	51	9	---	29	---	2	85	9	2
Mentally Ill*	15	---	---	---	3	---	---	1	---	---	4	---	---
Other*	3	---	---	1	---	---	---	---	---	4	---	---	5
TOTAL	1,417	26	47	103	289	118	64	1,068	458	1,277	1,383	623	1,444

*No data were recorded in 1970 for these categories.

TABLE 9. Comparison of Aircraft Involved in Occurrences With Number Aircraft Flying in U.S.*

(By Type Aircraft)
(1970)

Type Aircraft	Total Flying	No. Occurrences
YS-11	21	2
F-27 & FH-227	82	1
B-707	399	6
B-720	115	4
B-727	631	8
B-737	133	1
B-747	79	2
CV-240,580 & 600	284	5
CV-880	41	0
CV-990	5	1
DC-6/7	24	1
DC-8	257	10
DC-9	327	3
BAC-111	59	1
L-188	36	1
M-404	18	2

TABLE 10. Comparison of Aircraft Involved in Occurrences With Number Aircraft Flying in U.S.

(By Type Aircraft)
(1971)

Type Aircraft	Total Flying	No. Occurrences
YS-11	21	3
F-27 & FH-227	82	1
B-707	359	28
B-720	106	7
B-727	638	49
B-737	133	5
B-747	104	23
CV-240,550 & 600	Unknown	16
CV-880	41	4
CV-990	7	0
DC-6/7	Unknown	0
DC-8	236	19
DC-9	334	41
DC-10	13	1
BAC-111	58	3
L-188	24	0
L-1011	Unknown	0

*Information in Tables 9-16 for Total Flying is taken from Table 5-8 of Reference 17.

TABLE 11. Comparison of Aircraft Involved in Occurrences With Number Aircraft Flying in U.S.

(By Type Aircraft)
(1972)

Type Aircraft	Total Flying	No. Occurrences
YS-11	22	2
F-27 & FH-227	61	6
B-707	337	23
B-720	56	3
B-727	662	35
B-737	134	7
B-747	106	23
CV-240,550 & 600	Unknown	15
CV-880	41	5
CV-990	8	0
DC-6/7	Unknown	1
DC-8	227	16
DC-10	59	5
BAC-111	58	5
L-188	19	2
L-1011	17	2

TABLE 12. Comparison of Aircraft Involved in Occurrences With Number Aircraft Flying in U.S.

(By Type Aircraft)
(1973)

Type Aircraft	Total Flying	No. Occurrences
YS-11	23	3
FY-27 & FH-227	55	3
B-707	315	27
B-720	44	2
B-727	710	38
B-737	134	16
B-747	109	10
CV-240,550 & 600	Unknown	11
CV-880	37	3
CV-990	8	0
DC-6/7	Unknown	2
DC-8	207	24
DC-9	335	26
DC-10	86	19
BAC-111	31	4
L-188	19	0
L-1011	48	7

TABLE 13. Comparison of Aircraft Involved in Occurrences With Number Aircraft Flying in U.S.

(By Type Aircraft)
(1974)

Type Aircraft	Total Flying	No. Occurrences
YS-11	21	3
F-27 & FH-227	48	2
B-707	281	44
B-720	30	1
B-727	724	78
B-737	136	14
B-747	103	20
CV-340,440,580,600 & 640	124	16
CV-880	Unknown	3
CV-990	5	1
DC-6/7	29	0
DC-8	180	27
DC-9	329	45
DC-10	103	20
BAC-111	36	7
L-188	17	5
L-1011	66	14

TABLE 14. Comparison of Aircraft Involved in Occurrences With Number Aircraft Flying in U.S.

(By Type Aircraft)
(1975)

Type Aircraft	Total Flying	No. Occurrences
YS-11	23	0
F-27 & FH-227	39	7
B-707	264	23
B-720	23	3
B-727	767	59
B-737	133	8
B-747	97	8
CV-340,440,580,600 & 640	96	7
DC-6/7	35	2
DC-8	177	13
DC-9	337	25
DC-10	121	23
BAC-111	30	6
L-188	16	2
L-1011	76	9

CV-880 & 990 dropped because records indicate none were being used in air carrier service in 1975.

TABLE 15. Comparison of Aircraft Involved in Occurrences With Number Aircraft Flying in U.S.

(By Type Aircraft)
(1976)

Type Aircraft	Total Flying	No. Occurrences
YS-11	23	1
F-27 & FH-227	34	1
B-707	240	29
B-720	25	1
B-727	820	75
B-737	152	12
B-747	105	16
CV-340,440,580,600 & 640	103	12
DC-6/7	35	1
DC-8	211	12
DC-9	352	30
DC-10	125	21
BAC-111	Unknown	5
L-188	49	2
L-1011	77	15

Table 16 provides information about the number of occurrences with seat problems. These problems may be actual failures of the seats as provided by the following example of good documentation found in the NTSB Human Factors Group Chairman's report (18) on the landing accident of an Allegheny Airlines DC-9 at Philadelphia International Airport, Philadelphia, Pennsylvania, on June 23, 1976. This report gives complete information about the passenger, flight attendant, and flight crewmember seats. This particular excerpt pertains to the flight attendant seat.

"d. Forward Jumpseat

The seat pan was free at the top outboard support brace. When the seat pan was pulled down to its full travel the seat pan was tilted outboard about 26 degrees and about 10 degrees up at the outboard edge. No failures of plastic straps used to support the seat pan cushion were seen. There was no obvious evidence of body impact marks on the seat, floor, wall or other environmental surfaces near the seat.

> With regard to the damage, the following was observed: The circular pin fastener which secured the seat pan frame to the seat pan support brace was pulled out of its anchor nut on the inboard portion of the seat pan frame. The pin was bent about one-half inch in what appeared to be a downward and aftward direction. The seat pan brace was bent outboard in the area of the hold for the fastener pin. Attached to the pin was a washer, collar/spacer, and the anchor nut. The seat pan frame in the vicinity of where the pin had pulled out was bent in an outboard and upward direction."

The data bank may also reflect problems with the restraint system or other design or maintenance problems that kept the restraint system from performing properly when needed.

TABLE 16. Number of Occurrences of Airline Seat Problems*

(1970-1976)

Type Occurrence	No. Occurrences Pax Only	F/A Only	Pax & F/A
Planned Evacuation	-	1	1
Unplanned Evacuation	6	4	4
Turbulence	7	9	2
Inflight Other Than Turbulence	1	-	-
Substantial Structural Damage	3	1	7
Pressurization Problems	-	2	-
Passenger or Crew Injured	1	4	-
TOTAL	18	21	14

*Information about seat problems in nonsurvivable accidents is not included.

Table 17 gives information about special passengers. For purposes of the data bank, any mention of an elderly or obese person, a child, or a person stereotyped as handicapped (such as blind or paraplegic) was listed under the handicapped variable. An example of good documentation of this variable is provided by the NTSB Human Factors Group Chairman's report of the Continental Airlines B-727 takeoff accident at Stapleton International Airport, Denver, Colorado, on August 7, 1975. This report records the number of unticketed infants and gives an account of what happened to them during impact.

> "The 131 occupants of the passenger cabin included four flight attendants, 124 ticketed passengers, and three unticketed infants."
>
> "Two infants, held on their mothers' laps for takeoff, were thrown forward down the aisle several rows."(19)

TABLE 17. Number of Occurrences in Which Special Passengers Are Mentioned

(1970-1976)

Type Occurrence	No. Occurrences
Planned Evacuation	3
Unplanned Evacuation	21
Turbulence	11
Substantial Structural Damage	1
Pressurization Problems	1
Ground Occurrence	5
Unruly Passengers	1
Passenger or Crew Ill	1
Passenger or Crew Injured	3
TOTAL	47

Table 18 gives information about occurrences in which help by someone other than a crewmember (including fire and rescue personnel on the ground) is mentioned. An example of this occurred in the Allegheny Airlines incident at Logan International Airport, Boston, Massachusetts, on November 22, 1974:

> "5. Firefighting.
>
> The Boston Airport fire station received an emergency notification at 1318 that Allegheny flight 844 was landing on Runway 04R, with a fire in the cockpit. Five fire vehicles responded to the alarm. After landing, the aircraft taxied clear of the runway and stopped on Runway 33L. Upon arriving at the aircraft, fire personnel observed that no one was exiting the aircraft, although people were trying to get the doors open. Fire personnel attempted to open the exits from the outside, but were unsuccessful. After repeated unsuccessful attempts to open the exits, the firemen broke windows with axes, thus permitting the aircraft to depressurize.
>
> Following depressurization, the exits were opened and the aircraft was evacuated. At 1328 passengers began evacuating the aircraft. The fire in the bulkhead was extinguished using 2½ gallons of water and 10 lbs. of Ansul dry chemical."(20)

Another example of assistance by other than a crewmember might be help given by a doctor or nurse during an inflight injury or illness. For an example of what might be considered outside help, refer to the accident history cited in the discussion of the inflight illness category on page 5 of this report.

TABLE 18. Number of Occurrences of Help by a Person Other Than a Crewmember

(1970-1976)

Type Occurrence	No. Occurrences
Planned Evacuation	10
Unplanned Evacuation	37
Turbulence	24
Inflight Other Than Turbulence	7
Substantial Structural Damage	8
Pressurization Problems	1
Ground Occurrences	7
Unruly Passengers	6
Unruly Passenger Threatening Flight or Crew	79
Alcohol-Related Passenger Disturbance	4
Drug-Related Passenger Disturbance	1
Passenger or Crew Illness	26
Passenger or Crew Injured	12
Mental Illness-Related Passenger Disturbance	3
TOTAL	225

Information about smaller cabin debris (such as galley debris, carry-on baggage, blankets, and pillows) is given in Table 19. Table 20 gives information about larger debris (such as overhead racks, panels, and wind screens).

TABLE 19. Number of Occurrences in Which Cabin Debris Problems Are Mentioned

(1970-1976)

	Category of Debris			
Type Occurrence	Galley	Carry-On	Both	Other
Planned Evacuation	2	2	--	--
Unplanned Evacuation	2	13	6	1
Turbulence	20	2	9	--
Inflight Other Than Turbulence	19	--	--	--
Substantial Structural Damage	2	--	5	--
Pressurization Problems	2	--	--	--
Occurrences on Ground	6	--	--	1
Passenger or Crew Injured	29	1	--	--
TOTAL	82	18	20	2

TABLE 20. Number of Occurrences in Which Large Cabin Debris Problems Are Mentioned

(1970-1976)

Type Occurrence	Category of Debris			
	Overhead Rack	Panels	Both	Other
Planned Evacuation	--	--	1	--
Unplanned Evacuation	4	1	2	1
Turbulence	6	--	--	--
Inflight Other Than Turbulence	--	--	--	1
Substantial Structural Damage	1	1	3	1
Pressurization Problems	1	1	--	--
Passenger or Crew Injured	4	--	--	--
TOTAL	16	3	6	3

Discussion.

Table 8 indicates that the largest number of civil air transport occupant fatalities occurred during the accidents classified as Nonsurvivable or Substantial Structural Damage. In fact, these two categories account for 93 percent of the fatalities recorded in Table 8. The Substantial Structural Damage category contains 39 percent of the serious injuries, followed by the Unplanned Evacuation category with 26 percent, the Turbulence category with 21 percent, etc. These two categories also contain the largest percentage of minor injuries with 36 and 39 percent respectively.

Table 9-15 provide information about the number of accidents/incidents by aircraft and year. They also provide information (from Reference 17) on the number of types of aircraft flown during those years. It should be noted, however, that the data bank does not provide information about all the accidents/incidents, number of aircraft flown or utilization figures. Therefore, these tables may only be used for general comparisons and do not provide information relative to accident/incidents per type of aircraft.

Tables 16-19 are also intended to describe selected variables rather than to provide in-depth analysis.

Conclusions.

The most valuable applications of the data bank (since these data are not statistically meaningful) are to: (i) provide interested aviation personnel with computer listings of specific variables or accident/incident categories, thus reducing the number of reports

to be examined to fill a need for specific information; (ii) use the files on which the data bank is based to write reports that contain narrative descriptions of individual accidents/incidents in the described categories; (iii) use the files to develop reports that contain narratives of accidents/incidents involving the variables; and (iv) use these reports as the data base for in-depth studies of cabin safety problems.

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16. Pollard, D. W.: Survey of Air Carrier Inflight Illnesses: 1971-1975. Memorandum Report No. AAC-119-78-10(E), July 1978, unpublished.

17. Moles, Charles and Violet Wimbash: FAA Statistical Handbook of Aviation, Calendar Year 1976, December 1976.

18. Human Factors Group Chairman's Factual Report, Allegheny Airlines Douglas DC-9-30, N994VJ, Philadelphia International Airport, Philadelphia, PA, June 23, 1976, National Transportation Safety Board, pp. 8-9.

19. Human Factors Group Chairman's Factual Report, Continental Airlines Boeing 727 - 224, N88777, Stapleton International Airport, Denver, Colorado, August 7, 1975. National Transportation Safety Board Report No. DCA 76-AZ002, pp. 1, 6.

20. Human Factors Group Chairman's Factual Report, Allegheny Airlines Douglas DC-9-31, N960VJ, Boston Logan International Airport, Boston, Mass., November 6, 1974. National Transportation Safety Board, p. 3.

APPENDIX A

DEFINITIONS*

a. Aircraft accident - means an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight 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 anything attached thereto, or the aircraft receives substantial damage.

(1) Demolished - means damage to an aircraft to the extent that it would be impracticable to return the aircraft to an airworthy condition.

(2) Fatal injury - means any injury which results in death within seven days.

(3) Serious injury - means any injury which:

(a) Requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received.

(b) Results in a fracture of any bone except simple fractures of fingers, toes, or nose.

(c) Involves lacerations which cause severe hemorrhages, nerve, muscle, or tendon damage.

(d) Involves injury to any internal organ.

(e) Involves second or third degree burns, or any burns affecting more than five percent of the body surface.

(4) Substantial damage: (Field inspectors are urged to fully consider all aspects of the exceptions in paragraph (b) before making a final "substantial damage" determination that would classify the occurrence as an accident.)

(a) Except as provided in subparagraph (b) of this paragraph, substantial damage means damage or structural failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component.

---

*Adapted from Order 8020.11, dated July 16, 1976, "Aircraft Accident and Incident Notification, Investigation, and Reporting," Department of Transportation, Federal Aviation Administration, pp. 7-10.

(b) Exceptions: engine failure, damage limited to an engine, bent fairings, or cowling, dented skin, small punctured holes in the skin or fabric, ground damage to rotor or propeller blades, damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wing tips are not considered "substantial damage."

b. Incident - means an aircraft occurrence, not classified as an accident, in which a hazard or potential hazard to safety is involved. For the purpose of notification, investigation, and reporting, the following will apply:

(1) Inflight fire.

(2) Rapid decompression requiring emergency action.

(3) Unwanted or asymmetrical thrust reversal.

(4) Flight control system malfunction or failure.

(5) Inability of any required flight crewmember to perform his normal flight duties as a result of injury or illness.

(6) Loss of life or serious injury which occurs as a result of personnel presence in or on an aircraft or in direct contact with the aircraft, or with anything attached thereto, during ground operations, while the engines are functioning without the intention of flight.

(7) Substantial damage to the aircraft sustained during ground operations with the engines functioning with no intention of flight.

(8) Turbine-engine rotor failures excluding compressor blades and turbine buckets.

(9) Aircraft collide in flight with less than substantial damage with minor or no injuries.

(10) Hazardous materials incidents.

(11) Any significant occurrence related to aviation safety. This includes, but is not necessarily limited to, threats or acts of sabotage and aircraft hijacking.

(12) Inflight total electrical failures for multiengine aircraft; inflight total electrical failure for single-engine aircraft while under IFR weather conditions.

(13) Near midair collisions.

c. Industry coordinator - means the coordinator approved by the NTSB to represent the operator, manufacturer, or another party to the investigation, who has technical knowledge or expertise which the Board feels should be included as a representative in the accident investigation.

d. Investigator-in-charge - means the NTSB person assigned to conduct an accident/incident investigation in accordance with appropriate NTSB regulations and the FAA investigator of PN-1 accidents.

e. Large aircraft - means aircraft of more than 12,500 pounds, maximum certificated takeoff weight.

f. Near midair collision - refers to 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 definite report is received from an air crew member stating that a collision hazard existed between two or more aircraft.

g. Operation of aircraft or operate aircraft - means the use of aircraft for the purpose of air navigation and includes the navigation of aircraft. Any person who causes or authorizes the operation of aircraft, whether with or without the right or legal control (in the capacity of owner, lessee, or otherwise) of the aircraft, shall be deemed to be engaged in the operation of aircraft within the meaning of the Federal Aviation Act of 1958.

h. Operator - means any person who causes or authorizes the operation of an aircraft, such as the owner, lessee, or bailee of an aircraft.

i. Public use aircraft - means any aircraft used exclusively in the service of any government or of any political subdivisions thereof including the government of any state, territory, or possession of the United States, or the District of Columbia, but not including any government-owned aircraft engaged in carrying persons or property for commercial purposes.

j. Small aircraft - means aircraft of 12,500 pounds or less, maximum certificated takeoff weight.

k. Survivable accident - any accident in which the cabin is relatively intact, and if occupied by adequately restrained occupants, would not result in fatal injuries.

APPENDIX B

VARIABLES LIST - DATA BANK

1 FILE NUMBER

2 MONTH
DAY
YEAR

3 ACCIDENT/INCIDENT

01	Planned evacuation - land
02	Planned evacuation - water
03	Unplanned evacuation - land
04	Unplanned evacuation - water
05	Turbulence
06	Inflight other than turbulence
07	Substantial structural damage
08	Nonsurvivable
09	Depressurization
10	Occurrence on ground
20	Unruly passengers
21	Unruly passengers threatening welfare of flight or crew
22	(Not presently assigned)
23	Alcohol
24	Drugs
25	Passenger or crew ill
26	Passenger or crew injured
28	Mentally ill
29	Other
30	Hazardous materials (not used)

4 AIR CARRIER

5 LOCATION
UNITED STATES

01	Alabama
02	Alaska
--	
50	Wyoming
51	District of Columbia
52	Unknown/not reported
61-64	U.S. territories and possessions
71-81	Foreign countries
91-95	International waters

6 AIRCRAFT MAKE
AIRCRAFT MODEL

1409	F-27 and FH-227
2712	B-707, 100-200 series
2713	B-707, 300 series
2716	B-720
2717	B-727
2731	B-737
2733	B-747
4513	CV-240
4514	CV-340,580,600 and 640
4515	CV-880
5513	DC-6
5519	DC-8
5520	DC-9
5521	DC-10
8815	L-188
8819	L-1011
20801	BAC-111
21701	YS-11

7 TOTAL CREW ON BOARD

8 TOTAL FLIGHT ATTENDANTS ON BOARD

9 TOTAL PASSENGERS ON BOARD

10 CREW WITH MINOR INJURIES

11 FLIGHT ATTENDANTS WITH MINOR INJURIES

12 PASSENGERS WITH MINOR INJURIES

13 CREW WITH SERIOUS INJURIES

14 FLIGHT ATTENDANTS WITH SERIOUS INJURIES

15 PASSENGERS WITH SERIOUS INJURIES

16 CREW - FATALITIES

17 FLIGHT ATTENDANT - FATALITIES

18 PASSENGERS - FATALITIES

19 HANDICAPPED PROBLEMS

20 SEAT PROBLEMS

01	Passenger only
02	Flight attendant only
03	Both

21 EXIT DIFFICULTIES

01	Operation
02	Chute
03	Both

22 COMMUNICATION DIFFICULTIES

01	Public address
02	Language
03	Visual
04	Megaphone
05	More than one
06	Other

23 LIGHTING DIFFICULTIES - CABIN

01	Yes

24 LIGHTING DIFFICULTIES - EMERGENCY

01	Yes

25 LIGHTING DIFFICULTIES - EXIT SIGN VISIBILITY

01	Yes

26 LIGHTING DIFFICULTIES - SMOKE

01	Yes

27 EVACUATION TIME (SECONDS)

28 PROBLEMS CREW-COORDINATED
ACCESSIBILITY OF EMERGENCY EQUIPMENT AND ADEQUACY

29 OXYGEN

30 FIRE EXTINGUISHER

31 FIRST AID

32 LIFEJACKET

01	Yes
02	No
03	Did not work

33

01	Fire
02	Smoke
03	Both
04	Toxic fumes
05	All of above

34 CABIN DEBRIS I

01	Overhead rack
02	Panel
03	Overhead rack and panel
04	Other
05	All of the above

35 CABIN DEBRIS II

01	Galley
02	Carry-on baggage
03	Galley and carry-on baggage
04	Other
05	All of the above

36 PASSENGER REACTION PROBLEMS

01	Yes

37 PASSENGER OR CREW ALIVE AT IMPACT AND LATER DIED

01	Yes

38 PASSENGER OR CREW HURT AFTER IMPACT

01	Yes

39 ASSISTANCE AFTER ACCIDENT

40-44 (NOT PRESENTLY ASSIGNED)

APPENDIX C

CAMI ACCIDENT/INCIDENT BIOMEDICAL DATA

File No. _____ Date _____ Air Carrier _____
(month/day/year)

Location _____ _____ Type Aircraft _____
(city and state)

Type Incident (check one)

Planned evacuation land _____ water _____

Unplanned evacuation land _____ water _____

Turbulence _____ Inflight (other than turbulence, specify)

_____

Other incidents (specify) _____

_____

		Total Crew	Flight Attendants	Pax	Total Number
-28	Total	_____	_____	_____	_____
-35	Minor Injuries	_____	_____	_____	_____
-42	Serious Injuries	_____	_____	_____	_____
-49	Fatalities	_____	_____	_____	_____

SPECIFIC PROBLEMS

(1) Handicapped Child _____ Aged _____ Obese _____

Other (specify) _____

(2) Seat or restraint problems PAX _____ F/A _____

(3) Exit difficulties Operation _____ Slide _____

(3) Communication difficulties Public address _____

Language _____ Visual _____ Megaphone _____

(5) Lighting difficulties (yes or no)

Cabin _____ Emergency _____ Exit sign visibility _____

Smoke _____

(6) Evacuation time (seconds) _____

(7) Problems crew coordination Yes _____ No _____

Specify _____

(8) Emergency equipment (accessibility--yes; not accessible--no, write the numeral three if it did not work)

Oxygen _____ Fire extinguisher _____ First aid kit _____

Lifejacket _____ Other (specify) _____

(9) Environment

Fire _____ Smoke _____ Toxic fumes _____

(10) Cabin debris I (this is large debris)

Overhead rack _____ Panel(s) _____ Other (specify) _____

_____

(11) Cabin debris II

Galley _____ Carry-on baggage _____

(12) Passenger reaction problems Yes _____ No _____

(13) Passenger and crew alive at impact later died _____

(14) Passenger and/or crew hurt after impact _____

(15) Assistance after the accident _____

APPENDIX D

TURBULENCE REPORTING CRITERIA TABLE*

Intensity	*Aircraft Reaction*	*Reaction Inside Aircraft*	*Reporting Term* *Definition*
LIGHT	Turbulence that momentarily causes slight, erratic changes in altitude and/or attitude (pitch, roll, yaw). Report as *Light Turbulence*:* or Turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude. Report as *Light Chop*.	Occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly. Food service may be conducted and little or no difficulty is encountered in walking.	Occasional—Less than 1/3 of the time. Intermittent—1/3 to 2/3. Continuous—More than 2/3.
MODERATE	Turbulence that is similar to Light Turbulence but of greater intensity. Changes in altitude and/or attitude occur but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed. Report as *Moderate Turbulence*:* or Turbulence that is similar to Light Chop but of greater intensity. It causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude. Report as *Moderate Chop*.	Occupants feel definite strains against seat belts or shoulder straps. Unsecured objects are dislodged. Food service and walking are difficult.	NOTE—Pilots should report location(s), time (GMT), intensity, whether in or near clouds, altitude, type of aircraft and, when applicable, duration of turbulence. Duration may be based on time between two locations or over a single location. All locations should be readily identifiable. Example: a. Over Omaha, 1232Z, Moderate Turbulence, in cloud, Flight Level 310, B707. b. From 50 miles south of Albuquerque to 30 miles north of Phoennx, 1210Z to 1250Z, occasional Moderate Chop, Flight Level 330, DC8.
SEVERE	Turbulence that causes large, abrupt changes in altitude and/or attitude. It usualy causes large variations in indicated airspeed. Aircraft may be momentarily out of control. Report as *Severe Turbulence.**	Occupants are forced violently against seat belts or shoulder straps. Unsecured objects are tossed about. Food service and walking are impossible.	
EXTREME	Turbulence in which the aircraft is violently tossed about and is practically impossible to control. It may cause structural damage. Report as *Extreme Turbulence.**		

*** High level turbulence (normally above 15,000 feet ASL) not associated with cumuliform cloudiness, including thunderstorms, should be reported as CAT (clear air turbulence) preceded by the appropriate intensity, or light or moderate chop.**

* U.S. Department of Transportation, Federal Aviation, Airman's Information Manual, January 1979, Basic Flight Information and ATC Procedures, Figure 4-1, page 102.

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