AN ANALYSIS OF AIRCRAFT ACCIDENT DATA

U. S. AIR CARRIER OPERATIONS

1968

NATIONAL TRANSPORTATION SAFETY BOARD
Department of Transportation
Washington, D. C. 20591
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TABLE OF CONTENTS

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This report provides a compilation and a statistical analysis of aircraft accidents in U. S. Air Carrier operations that occurred during calendar year 1968. This compilation is in the form of several tables of statistical data which are attached as appendices. The analysis is contained in the following pages of narrative, with accompanying illustrative tables.

The analytical portion of this report presents data on accidents, fatalities, rates, and growth changes as percentage changes of the 1968 data compared with a base figure. The base figure was established by averaging the data for the 5-year period 1963-67. Such a presentation helps to eliminate annual variations inherent in accident report data and allows more meaningful comparisons than would the customary year-by year comparisons. This base figure can also be used as a standard and can be compared with other periods. For instance, the 1962-66 base period can be compared with the 1963-67 base period in measuring growth; fatalities; accident rate; aircraft miles, hours, and departures; passengers carried; passenger-miles; and other important variables. Furthermore, if this method of analysis is used for several consecutive years, the Board will have a sound basis for analyzing and projecting trends dealing with both growth and accident indices.

It is important to note, however, that this report, which is comparison of 1 year's data with the base period data, does not provide the basis for trends and/or projections, any more than would a comparison of data from 2 individual years. This report and similar reports for 3 or 4 consecutive years will provide such a basis, however.

Highlights of the Annual Review of U. S. Air Carrier Accidents

Calendar Year 1968

I. The 1968 Review offers a new format for the accident briefs of certain types of accidents. Among the items of information included in the 1968 briefs that did not previously appear are: (1) The name of the airport (if the accident site is either on or within 5 miles of an airport); (2) Special weather data (when weather is cited as a probable cause or related factor in the accident); and (3) special midair collision data (appears only when "collision with aircraft: both in flight" is the type of accident - does not appear for ground collision or when one aircraft involved in the collision is airborne).

When an accident occurs either on or within 5 miles of an airport, the name of the airport is shown just above the "TYPE OF ACCIDENT" information.

The addition of the special weather data involves several additional entries which now appear at the bottom of briefs of accidents in which weather was a probable cause or a factor. These new data are: SKY CONDITION; VISIBILITY AT ACCIDENT SITE; OBSTRUCTIONS TO VISION AT ACCIDENT SITE; TYPE OF FLIGHT PLAN; CEILING AT ACCIDENT SITE; PRECIPITATION AT ACCIDENT SITE; and TYPE OF WEATHER CONDITIONS. As an example of the possible entries, note the accident brief identified by Docket No. 1-0014.

Similarly, special data are printed for accidents involving the collision of aircraft which are both in flight. The special data appearing in the briefs of such accidents are: SEGMENTS OF AVIATION INVOLVED; CONTROLLING AGENCY; TRAFFIC ADVISORY ISSUED; CONTROL ZONE/AREAS; EVASIVE ACTION TAKEN; RADAR CONTROL/SURVEILLANCE; CONTROLLED/UNCONTROLLED AIRPORT; and CONVERGENCE ANGLE-DEGREES. The accident brief identified by Docket No. 1-0012 provides examples of the possible entries.

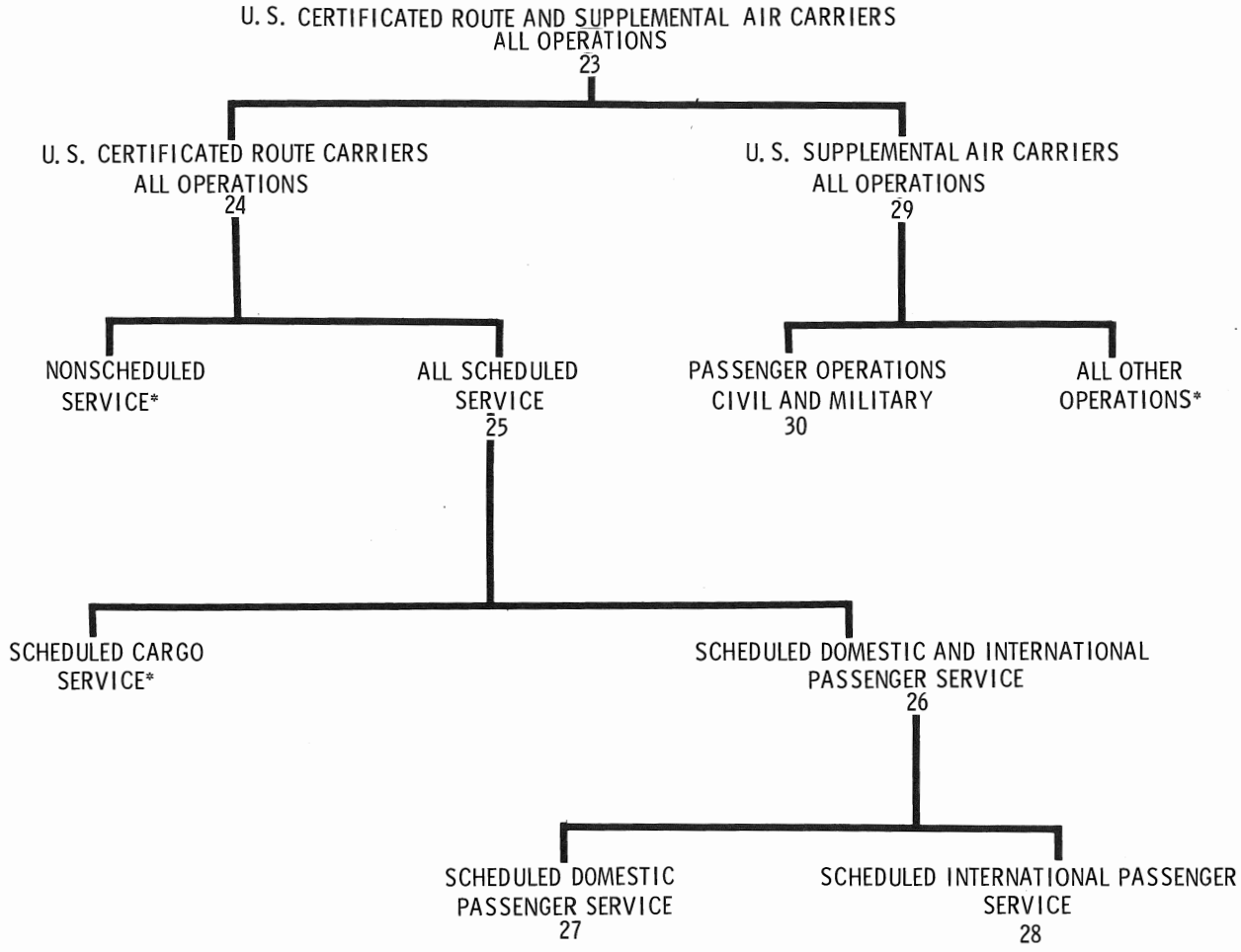
II. The total and fatal accident rates per 100,000 aircraft-hours flown, all scheduled service (page 25 in the Review), reflected the high percentage of the total number of accidents in 1968 which were fatal. The total accident rate was the lowest ever recorded, while the fatal accident rate was the highest since 1964.

The aircraft accident figures presented on page 23 of the Review indicate that U. S. Air Carriers, in all operations, experienced more fatal accidents than in any year since 1960, and more passenger fatalities and total fatalities than in any year since 1960. The fatal accident rate per

million aircraft-miles flown, however, was as low as the rate for 1966, which was the lowest ever recorded.

III. In 1968, almost one out of every three air carrier accidents was associated with turbulence. Section II of this Analysis focuses upon turbulence accidents and, in order to bring the problem into perspective, examines the recent history of turbulence associated accidents. Section II examines many aspects of these accidents, such as the location and time of the accident, aircraft damage, and type of power of the aircraft involved. One important finding resulting from the turbulence study of the 111 accidents of this type from 1960-68 concerned the number of persons injured in such accidents. In 79 of the 110 accidents involving injury, only one person was injured, while in 19 accidents, only two persons were injured. Thus, in almost 90 percent of turbulence accidents involving injury, only one or two persons were injured.

CLASSIFICATION AND TYPE OF SERVICE U.S. AIR CARRIERS



NOTE: CATEGORIES MARKED WITH AN ASTERISK (*) ARE NOT SEPARATELY EXAMINED IN THIS ANALYSIS.

NOTE: NUMBER FOLLOWING EACH CATEGORY REFERS TO PAGE IN THE ANNUAL REVIEW DEALING WITH THE PARTICULAR CATEGORY OF SERVICE.

SECTION I
ANALYSIS BY CLASS OF CARRIER

U. S. CERTIFICATED ROUTE AND SUPPLEMENTAL AIR CARRIERS
ALL OPERATIONS
1968

In 1968, U. S. Certificated Route and Supplemental Air Carriers in all operations flew 2,498,848,000 aircraft miles, an increase of 55.72 percent over the 1963-67 base period average of 1,604,672,853 aircraft-miles per year. The total number of accidents decreased 7.55 percent, but fatal accidents increased 36.36 percent. Fatal injuries increased 32.1 percent. Since the accident and injury percentages did not increase to the same degree as aircraft-miles flown, it follows that the accident and fatality rates should decrease. The total accident rate per million aircraft-miles flown decreased 41.67 percent, while the fatal accident rate decreased over 28 percent and the fatality rate decreased almost 12 percent. In the 1967 Preliminary Analysis of Aircraft Accident Data, it was stated that this "decrease in total accidents coupled with an increase in fatal accidents is probably a reflection of the recent trend toward faster aircraft with increased passenger capacity". The data for 1968 tend to support this conclusion, for the ratio of fatal accidents to total accidents is the highest in the last 20 years.

ACCIDENTS, FATALITIES, RATES, AND GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Aircraft-Miles Flown	1,604,672,853	2,498,848,000	+55.72%
Accidents			
Total Accidents	76.8	71	-7.55%
Fatal Accidents	11.0	15a/	+36.36%
Fatal Injuries	264.2	349	+32.10%

a/ Include two midair collisions nonfatal to Air Carrier occupants, excluded in fatal accident rate.

Note: Nonrevenue miles of the Supplemental Air Carriers were not reported in 1963, 1964, 1965, 1966, and 1967, and were not used in determining the base figure.

Note: Sabotage accident occurring 5/7/64 (44 fatalities) is included in all computations except rates.

(Continued)

ACCIDENTS, FATALITIES, RATES, AND GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Accident Rate Per Million Aircraft-Miles Flown			
Total Accidents	0.048	.028	-41.67%
Fatal Accidents	0.007	.005	-28.57%
Fatality Rate Per Million Aircraft-Miles Flown	0.159	.140	-11.95%

U. S. CERTIFICATED ROUTE AIR CARRIERS
ALL OPERATIONS
1968

During the base period 1963-67, U. S. Certificated Route Air Carriers in all operations flew an average of 1,541,520,654 aircraft-miles per year. In 1968, the figure was 2,385,309,000 aircraft-miles, representing an increase of 54.74 percent. The total number of accidents decreased 9.88 percent, while fatal accidents increased 48.94 percent. The number of fatal injuries increased 42.74 percent. As in 1967, accident rates per million aircraft-miles flown showed decreases, as did the fatality rate when compared with the base period.

ACCIDENTS, FATALITIES, RATES, AND GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Aircraft-Miles Flown	1,541,520,654	2,385,309,000	+54.74%
Accidents			
Total Accidents	68.8	62	-9.88%
Fatal Accidents	9.4	14[a/]	+48.94%
Fatal Injuries	243.8	348	+42.74%
Accident Rates Per Million Aircraft-Miles Flown			
Total Accidents	0.045	.026	-42.22%
Fatal Accidents	0.006	.005	-16.67%
Fatality Rate Per Million Aircraft-Miles Flown	0.152	.146	- 4.27%

a/ Includes two midair collisions nonfatal to Air Carrier occupants, excluded in fatal accident rates.

Note: Sabotage accident occurring 5/7/64 (44 fatalities) is included in all computations except rates.

U. S. CERTIFICATED ROUTE AIR CARRIERS
ALL SCHEDULED SERVICE
1968

This segment of U. S. Air Carrier Operations showed a significant increase in aircraft activity. Aircraft-miles flown increased over 54 percent, while aircraft-hours and aircraft departures increased 33.98 percent and 24.66 percent, respectively. These percentage changes reflect the use of faster aircraft and the effects of changing route structures. The average aircraft in the base period flew a distance of 327 miles at 337 miles per hour, whereas in 1968, the average aircraft flew a distance of 405 miles at 388 miles per hour.

All rates reflecting total accidents showed marked decreases while the fatal accident rates either remained unchanged or showed moderate increases.

ACCIDENTS, ACCIDENT RATES, GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Aircraft-Miles Flown	1,390,599,161	2,146,037,985	+54.33%
Aircraft-Hours Flown	4,121,610	5,521,931	+33.98%
Aircraft Departures	4,251,710	5,299,987	+24.66%
Accidents			
Total Accidents	57.6	56	- 2.78%
Fatal Accidents	7.6	13 a/	+71.05%
Accident Rates Per Million Aircraft-Miles Flown			
Total Accidents	.041	.026	-36.59%
Fatal Accidents	.005	.005	Unchanged
Accident Rates Per 100,000 Aircraft-Hours Flown			
Total Accidents	1.398	1.014	-27.47%
Fatal Accidents	.184	.199	+ 8.15%
Accident Rates Per 100,000 Aircraft Departures			
Total Accidents	1.355	1.057	-21.99%
Fatal Accidents	.179	.208	+16.20%

a/ Includes two midair collisions nonfatal to Air Carrier occupants, excluded in fatal accident rate.

Note: Sabotage accident occurring 5/7/64 is included in all computations except rates.

U. S. CERTIFICATED ROUTE AIR CARRIERS
SCHEDULED DOMESTIC AND INTERNATIONAL PASSENGER SERVICE
1968

Scheduled Domestic and International Passenger Service of the U. S. Certificated Route Air Carriers in 1968 showed a significant increase (53.43 percent) over the base period in the number of passengers carried. Passenger-miles flown also increased (60.75 percent) from the base period figure of 74.4 billion to 119.6 billion in 1968. The total number of accidents was down slightly (1.49 percent), but the number of fatal accidents almost doubled, showing an increase of about 97 percent. Passenger fatalities, up over 83 percent, nearly kept pace with the rise in fatal accidents, indicating that the concern for survivability in fatal crashes noted in the 1967 Preliminary Analysis of Aircraft Accident Data was well founded. Two of the 13 fatal accidents in 1968 were midair collisions which were nonfatal to Air Carrier occupants and which did not prevent the Air Carrier aircraft from making safe landings. Discarding these two accidents, the percentage change between the base period and 1968 is a 66.7-percent increase, which, when compared with the 83.29-percent increase in passenger fatalities, is further evidence of the continuing problem of crash survivability.

ACCIDENTS, ACCIDENT RATES, GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Passengers Carried	97,868,202	150,162,701	+ 53.43%
Passenger-Miles Flown	74,409,282,600	119,612,578,000	+ 60.75%
Accidents			
Total Accidents	53.8	53	- 1.49%
Fatal Accidents	6.6	13 a/	+ 96.97%
Fatal Injuries			
Passengers	166.4	305	+ 83.29%
Crew	22.8	34	+ 49.12%
Others	1.2	6	+400.00%
Total	190.4	345	+ 81.20%
Passenger Fatality Rate Per 100 Million Passenger-Miles Flown	0.213	.255	+ 19.72%

a/ Includes two midair collisions nonfatal to Air Carrier occupants.

Note: Passenger deaths occurring in sabotage accident on 5/7/64 (41 fatalities) are included in all computations except rates.

U. S. CERTIFICATED ROUTE AIR CARRIERS SCHEDULED DOMESTIC PASSENGER SERVICE

1968

U. S. Certificated Route Air Carriers engaged in Scheduled Domestic Passenger Service during 1968 carried 134,434,632 passengers, representing a significant increase (53.54 percent) over the base period figure of 87,557,661. Passenger-miles flown, however, showed a larger rate of increase, indicating that, for the second consecutive year, the average passenger was carried further (682 miles) per departure in 1968 than in the average base period year (646 miles). The total number of accidents decreased slightly, while the number of fatal accidents showed a marked increase of 96.43 percent. Fatal injuries to passengers increased from an average of 128.8 for the average base period year to 258 in 1968, indicating a 100.78-percent increase. Crew fatalities climbed 41.18 percent, while injuries to others climbed 500 percent from the base period figure of one. The total number of fatalities in 1968 increased 96.19 percent over the base period figure. The passenger fatality rate per 100 million passenger-miles flown increased 31.92 percent.

ACCIDENTS, ACCIDENT RATES, GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Passengers Carried	87,557,661	134,434,632	+53.54%
Passenger-Miles Flown	56,487,899,200	91,668,180,000	+62.28%
Accidents			
Total Accidents	46.4	42	- 9.48%
Fatal Accidents	5.6	11 a/	+96.43%
Fatal Injuries			
Passengers	128.8	258	+100.78%
Crew	17.0	24	+ 41.18%
Others	1.0	6	+500.00%
Total	146.8	288	+96.19%
Passenger Fatality Rate Per 100 Million Passenger-Miles Flown	0.213	0.281	+31.92%

a/ Includes two midair collisions nonfatal to Air Carrier occupants.

Note: The 41 passenger fatalities which occurred in a 1964 sabotage accident are included in passenger fatalities but are excluded in the computation of passenger fatality rates.

U. S. CERTIFICATED ROUTE AIR CARRIERS
SCHEDULED INTERNATIONAL PASSENGER SERVICE

1968

In 1968, U. S. Certificated Route Air Carriers engaged in Scheduled International Passenger Service showed large increases in activity indicators. The number of passengers carried increased 52.54 percent, while passenger-miles flown increased 55.91 percent. The total number of accidents increased 48.65 percent while the number of fatal accidents increased 100 percent from one in the base period year to two in 1968. Passenger fatalities increased 25 percent in 1968, while the total number of fatalities increased 30.73 percent. The passenger fatality rate per 100 million passenger-miles decreased 20 percent.

ACCIDENTS, FATALITIES, RATES, AND GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Passengers Carried	10,310,540	15,728,069	+52.54%
Passenger-Miles Flown	17,922,869,600	27,944,398,000	+55.91%
Accidents			
Total Accidents	7.4	11	+48.65%
Fatal Accidents	1.0	2	+100.00%
Fatal Injuries			
Passengers	37.6	47	+25.00%
Crew	5.8	10	+72.41%
Others	0.2	0	-100.00%
Total	43.6	57	+30.73%
Passenger Fatality Rate Per 100 Million Passenger-Miles Flown	0.210	.168	-20.00%

U. S. SUPPLEMENTAL AIR CARRIERS
ALL OPERATIONS
1968

The total number of accidents incurred by U. S. Supplemental Air Carriers in 1968 increased 50.00 percent, or about the increase in aircraft-miles flown (64.47 percent). All of the other indicators showed decreases. The number of fatal injuries decreased 95.15 percent, while the fatality rate per million aircraft-miles decreased almost 97 percent. The total accident rate and fatal accident rate showed decreases of 9.20 percent and 60.87 percent, respectively.

ACCIDENTS, FATALITIES, RATES, AND GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Aircraft-Miles Flown	69,032,600 a/	113,540,000 a/	+64.47%
Accidents			
Total Accidents	6.0	9	+50.00%
Fatal Accidents	1.6	1	-37.50%
Fatal Injuries	20.6	1	-95.15%
Accident Rates Per Million Aircraft-Miles Flown			
Total Accidents	.087	.079	- 9.20%
Fatal Accidents	.023	.009	-60.87%
Fatality Rate Per Million Aircraft-Miles Flown	.298	.009	-96.98%

a/ Nonrevenue miles not reported.

U. S. SUPPLEMENTAL AIR CARRIERS
PASSENGER OPERATIONS-CIVIL AND MILITARY
1968

In 1968, U. S. Supplemental Air Carriers engaged in Civil and Military Passenger Operations flew nearly 9 billion passenger-miles, representing a 183.96-percent increase over the 3,129,269,400 passenger-miles averaged during the base period of 1963-67 and approximately a 50-percent increase over the 6 billion passenger-miles flown in 1967. An increase of 108.63 percent in passengers carried in further evidence of the large increase in activity for 1968. The three accidents in 1968 brought a 400-percent increase in the total number of accidents in 1968, and the number of fatal accidents increased a like amount.

The extremely safe year in terms of rates, recorded by "Passenger Operations" helped to keep the fatal accident rate and fatality rate for "All Operations" down as well.

ACCIDENTS, FATALITIES, RATES, AND GROWTH CHANGES FROM BASE (1963-67)

	Base	1968	Percentage Change
Passenger-Miles Flown	3,129,269,400	8,885,783,000	+183.96%
Passengers Carried	1,279,518	2,669,466	+108.63%
Accidents			
Total Accidents	0.6	3	+400.00%
Fatal Accidents	0.2	1	+400.00%
Fatal Injuries			
Passengers	15.6	1	-93.59%
Crew	1.0	0	-100.00%
Others	0	0	Unchanged
Total	16.6	1	-93.98%
Passenger Fatality Rate Per 100 Million Passenger-Miles Flown	0.499	0.011	-97.80%

SECTION II

AN ANALYSIS OF ACCIDENTS INVOLVING TURBULENCE 1960-68

In 1968, turbulence accidents[1/] were more prevalent than in any previous year. Of the 71 accidents occurring in U. S. Air Carrier Operations in 1968, 21, or 29.58 percent, were turbulence accidents. Turbulence accidents accounted for a large percentage of the total number of accidents occurring during the period 1960-68. Of the 691 accidents in U. S. Air Carrier Operations during this period, 111, or 16.1 percent, were turbulence accidents. Thus while one out of every six total accidents during the period was a turbulence accident, it will be noted that only one out of 15 fatal accidents was a turbulence accident.

In most accidents involving turbulence, there is little or no damage to the aircraft. Of the 111 aircraft involved in turbulence accidents, 85 were undamaged. Six aircraft, however, were destroyed: two L-188's, an L-1049, a B-720, a DC-8, and a BAC-1-11. The four aircraft substantially damaged were a C-46, a DC-6, and two DC-8's. Twelve aircraft incurred minor damage, including four DC-8's, two B-720's, a DC-6, a DC-3, a CV-880, a CV-440, a Caravelle, and one L-749. In four accident reports, the damage to the aircraft was either unknown or not reported.

AIRCRAFT DAMAGE

YEAR	DESTROYED	SUBSTANTIAL	MINOR	NONE	UNKNOWN/ NOT REPORTED	TOTAL
1960	1	0	1	8	0	10
1961	0	0	1	3	2	6
1962	0	0	1	3	1	5
1963	1	1	2	10	1	15
1964	2	1	3	8	0	14
1965	0	1	0	13	0	14
1966	0	0	0	11	0	11
1967	1	0	3	11	0	15
1968	1	1	1	18	0	21
Total	6	4	12	85	4	111

1/ Turbulence accidents are defined as those accidents in which turbulence is cited as a probable cause or related factor, as well as those accidents in which turbulence is cited as a type of accident.

Turbulence accidents normally result in serious injury to only one or two persons. Six times in the 9-year period, however, such accidents have been catastrophic. On March 17, 1960, a Northwest Airlines Lockheed 188 crashed at Cannelton, Indiana, fatally injuring the 57 passengers and six crewmembers aboard. On February 12, 1963, a Boeing 720, also operated by Northwest Airlines, crashed near Miami, Florida, fatally injuring 35 passengers and the crew of eight. An Eastern Airlines DC-8 crashed on February 25, 1964, in Lake Ponchatrain, near New Orleans, Louisiana. All 58 persons aboard, including 51 passengers and seven crewmembers, died in the crash. On December 24, 1964, three crewmembers were fatally injured when a Lockheed 1049, operated by Flying Tiger Lines, crashed after taking off from San Francisco, California. On August 6, 1966, a Braniff BAC 1-11 crashed at Falls City, Nebraska, fatally injuring the 38 passengers and four crewmembers aboard. At Dawson, Texas, on May 3, 1968, however, the worst of the turbulence-associated accidents took place, when an L-188, operated by Braniff, crashed and fatally injured 80 passengers and five crewmembers. It is important to note that, in the foregoing accidents, turbulence was listed as a probable cause or as a contributing factor, and not as the probable cause. Thus, during the 9-year period, 262 passengers and 33 crewmembers died in six catastrophic crashes at least partially attributable to turbulence.

One additional fatality occurred on July 8, 1964, near Knoxville, Tennessee, when a United Air Lines Caravelle, with 54 persons aboard, encountered severe turbulence. One passenger was fatally injured when, as a result of the turbulence, she was hurled upward against the overhead rack and then to the floor. No other persons were injured, and the aircraft was undamaged.

In the 110 accidents in which persons received injury,[2] passengers only were injured[3] in 52 accidents, crewmembers only were injured in 41 accidents, and in 17 accidents, both passengers and crewmembers were injured. This is to say that passengers were injured in 69 of those 110 accidents, while crewmembers were injured in 58 accidents.

In 79 of the 110 accidents in which persons received serious or fatal injuries, only one person was injured. In each of 19 accidents, two persons were injured, while in each of seven accidents, three persons were injured. Six of the accidents involved injury to more than three persons, and all of these accidents were, as mentioned before, fatal to all aboard.

2/ One accident involved no injury to passengers or crew, but was reported as an accident because the aircraft sustained substantial damage.

3/ Includes fatal injuries.

LOCATION OF TURBULENCE ACCIDENTS

U. S. AIR CARRIERS

ALL OPERATIONS

1960-68

LOCATION	ACCIDENTS TOTAL	ACCIDENTS FATAL
Alabama	2	0
Alaska	1	0
Arizona	1	0
Arkansas	1	0
California	8	1
Colorado	4	0
Delaware	1	0
Florida	13	1
Georgia	1	0
Hawaii	3	0
Illinois	5	0
Iowa	4	0
Indiana	3	1
Kansas	3	0
Louisiana	1	1
Maine	1	0
Michigan	2	0
Minnesota	2	0
Montana	3	0
Nebraska	5	1
Nevada	2	0
New Jersey	1	0
New York	4	1
North Carolina	4	0
Oregon	1	0
Panama	1	0
Pennsylvania	7	0
South Dakota	1	0
Tennessee	1	1
Texas	3	0
Virginia	2	0
Vermont	1	0
Washington	1	0
Wyoming	1	0
Outside the U. S.	17	0
TOTAL	111	7

SELECTED ACCIDENT DATA

TURBULENCE ACCIDENTS

U. S. AIR CARRIER OPERATIONS

1960-68

BY YEAR OF OCCURENCE

TOTAL ACCIDENTS	YEAR	TURBULENCE ACCIDENTS
90	1960	10
84	1961	6
70	1962	5
77	1963	15
79	1964	14
83	1965	14
75	1966	13
70	1967	13
71	1968	21

BY MONTH OF OCCURRENCE AND LOCATION

TOTAL TURBULENCE ACCIDENTS	MONTH OF OCCURRENCE	TURBULENCE ACCIDENTS-CONTIGUOUS UNITED STATES
14	January	7
4	February	3
8	March	7
7	April	6
11	May	11
9	June	9
14	July	14
16	August	13
11	September	7
5	October	3
7	November	4
5	December	5
111	Total	89

BY TYPE OF POWER

YEAR	PISTON	TURBOJET	TURBOPROP	TOTAL
1960	5	4	1	10
1961	3	2	1	6
1962	2	3	0	5

BY TYPE OF POWER (Cont'd)

YEAR	PISTON	TURBOJET	TURBOPROP	TOTAL
1963	0	12	3	15
1964	6	7	1	14
1965	2	8	4	14
1966	1	10	2	13
1967	1	12	0	13
1968	1	17	3	21
Total	21	75	15	111

RATE BY AIRCRAFT HOURS AND MILES FLOWN

YEAR	TURBULENCE ACCIDENTS	AIRCRAFT-HOURS FLOWN	AIRCRAFT-MILES FLOWN (000)	TURBULENCE ACCIDENT RATE PER 100,000 AIRCRAFT-HRS. FLOWN	TURBULENCE ACCIDENT RATE PER MILLION AIRCRAFT-MILES FLOWN
1960	10	4,661,418	1,130,069	.215	.009
1961	6	4,192,374	1,104,042	.143	.005
1962	5	4,111,724	1,170,374	.122	.004
1963	15	4,126,399	1,231,312	.364	.012
1964	14	4,312,764	1,336,867	.325	.010
1965	14	4,690,882	1,536,395	.298	.009
1966	13	5,104,984	1,768,458	.255	.007
1967	13	5,868,842	2,179,739	.222	.006
1968	21	6,404,260	2,498,848	.328	.008
TOTAL	111	43,473,647	13,956,104	.255	.008

The foregoing tables need little interpretation, but certain interesting items deserve comment. The rate of turbulence accidents has decreased steadily, with the exception of the year 1968, since 1963. Prior to 1963, about one out of every 11 accidents was a turbulence accident. From 1963-68, turbulence accidents accounted for about one out of every five total accidents. The effects of the climate in the continental United States is reflected by the table relating location to month of occurrence. Over 52 percent of the turbulence accidents occurring during the 9-year period in the contiguous United States occurred during the four month period of May through August. The changing nature of the air carrier fleet, as well as the special turbulence problems encounted by the faster and higher flying turbojet aircraft, are reflected in the table depicting turbulence accidents by type of power. Turbojet aircraft accounted for nearly 68 percent of the turbulence accidents during the period; turboprop aircraft were involved in 13.5 percent; piston aircraft in almost 19 percent.