

**REPORT
OF
MIDAIR COLLISIONS
IN
U.S. CIVIL AIRCRAFT OPERATIONS
1938 - 1960**

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FOREWORD

The purpose of this report is to present the record of midair collisions in U. S. Civil aircraft operations for the entire period from January 1938 through 1960.

The nature of the report is broad and general in scope. It describes the general operational aspects of those collisions in which air carrier aircraft were involved and deals with the general conditions attending the collisions involving non-Air Carrier aircraft. It also presents detailed information on the altitude and distance from airport factors involved in the non-Air Carrier collisions during a selected 10-year period. It does not, however, deal with causal factors or the specific detailed circumstances of individual accidents.

Section I furnishes a summary of all midair collisions during the 23 year period 1938-1960. It includes a table showing the annual frequency of these occurrences and a breakdown of the involvement by types of operations.

Section II deals with those collisions in which Air Carrier aircraft were involved and contains a list of all these occurrences.

Section III deals with the midair collisions in general aviation operations.

NOTE: 1960 data based on preliminary information and subject to revision.

SECTION I

Summary

MIDAIR COLLISIONS IN U. S. CIVIL AVIATION FLYING 1938 - 1960

In the 23-year period 1938-1960, a total of 410 midair collisions were recorded in U. S. Civil Aircraft Operations. Slightly over half (214) of these were fatal accidents, resulting in 834 fatalities.

The year-by-year record of these occurrences is shown in Table No. 1 on the next page.

Air Carrier Involvement

Air Carrier aircraft were involved in 32 (7.8%) of the total 410 midair collisions. Twenty-two of these were fatal accidents. However, only 11 (34%) of the total 32 collisions resulted in fatalities to the occupants of the air carrier aircraft.

More detailed information is presented in Section II concerning the collisions involving Air Carrier aircraft.

General Aviation Involvement

Aircraft engaged in General Aviation operations were involved in 397 (97%) of the 410 midair collisions. Two hundred and five (205) of these were fatal accidents, resulting in 475 fatalities.

The above figures include 19 cases in which Air Carrier aircraft were involved. Excluding these 19 cases, there were 378 midair collisions in General Aviation operations. Approximately 50% (192 cases) of these were fatal accidents in which 378 persons were killed.

Refer to Section III for additional details on General Aviation involvement.

Table 1

MIDAIR COLLISIONS
IN
U. S. CIVIL AVIATION
1938 - 1960

Year	Number Accidents		Number Fatalities	Class of Operation			
	Total	Fatal		Air Carrier Air Carrier	Air Carrier Gen. Aviation	Air Carrier Military	Gen. Aviation Military
1938.....	3	1	2	0	0	0	3
1939.....	6	6	12	0	0	0	5
1940.....	14	13	26	0	0	0	13
1941.....	13	5	7	0	0	0	13
1942.....	12	10	21	0	0	2	10
1943.....	31	14	14	0	0	0	29
1944.....	11	6	6	0	1	0	10
1945.....	20	6	9	0	1	1	18
1946.....	38	15	25	1	0	0	33
1947.....	49	30	54	0	1	0	43
1948.....	30	15	47	0	0	0	27
1949.....	17	11	89	0	3	1	11
1950.....	7	3	11	0	0	0	7
1951.....	13	7	17	1	2	0	8
1952.....	14	6	14	0	3	0	6
1953.....	9	0	0	1	0	0	14
1954.....	16	10	18	0	0	1	16
1955.....	21	8	24	0	3	0	14
1956.....	17	11	161 ^{a/}	1	1	0	10
1957.....	15	6	19 ^{a/}	0	0	1	12
1958.....	16	12	86	0	0	2	10
1959.....	13	10	20 ^{b/}	0	0	0	17
1960.....	25	9	152 ^{b/}	1	4	0	3
Total....	410	214	834	5	19	8	336

a/ Includes 3 persons on ground.

b/ Includes 6 persons on ground.

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SECTION II
MIDAIR COLLISIONS
IN
AIR CARRIER OPERATIONS

SUMMARY

During the 23-year period 1938 through December 20, 1960, Air Carrier aircraft were involved in 32 midair collisions. Twenty-two (22) were fatal accidents; however, only eleven (11) of the collisions resulted in fatalities aboard the Air Carrier aircraft. A total of 456 persons perished in these accidents:

421 were aboard the Air Carrier aircraft,
 29 were aboard the other aircraft involved,
 6 were persons on the ground.

Two hundred and fifty six of the 421 fatalities aboard Air Carrier aircraft occurred in two accidents.

The distribution of these 32 collisions in relation to the involvement of different classes of operators was as follows:

<u>Between</u>	<u>No. Collisions</u>		<u>Total</u>
	<u>Total</u>	<u>Fatal</u>	<u>Fatalities</u>
Air Carrier and Air Carrier.....	5	3	265*
Air Carrier and Military.....	8	6	94
Air Carrier and General Aviation.	<u>19</u>	<u>13</u>	<u>97</u>
Total.....	32	22	456*

* Includes 6 persons on ground.

Scheduled Passenger Operations

In 24 of the 32 collisions, the Air Carrier aircraft were engaged in scheduled passenger operations. Seventeen (17) were fatal accidents, however, only nine (9) of these resulted in fatalities aboard the Air Carrier aircraft.

In 3 of these 24 collisions, both aircraft were Air Carrier aircraft, two of which were fatal accidents. These 3 cases are identified in the next paragraph.

Collisions Between 2 Air Carrier Aircraft

There have been 5 collisions between two Air Carrier aircraft.

In 3 cases, both aircraft were engaged in scheduled passenger service; two 1/ were fatal accidents and the other 2/ was non-fatal.

In another case 3/, a non-fatal accident, one aircraft was operating in scheduled passenger service and the other was a nonscheduled Air Carrier aircraft.

In the 5th case 4/, the collision occurred between two nonscheduled Air Carrier aircraft engaged in simulated instrument training operations. This resulted in fatalities to the occupants of one of the aircraft.

Operational Aspects

The 32 midair collisions involving Air Carrier aircraft were reviewed for the purpose of bringing out the general circumstances and conditions under which the collisions occurred. This information is presented in the following pages. As pointed out in the Foreword, the scope of this report is general. No attempt has been made, therefore to deal with the precise detailed causal factors of the individual accidents.

The general operational aspects and general conditions reviewed herein are as follows.

1. Weather Conditions
2. Occurrences in Airport Traffic Pattern Area
3. Air Traffic Control Aspects
4. Collisions in Instrument Training Operations
5. Other Operational Factors

In dealing with various operational conditions and circumstances, a reference is made to the date and location of the individual cases. Additional details as to the carrier and type of aircraft involved can be found in the list of accidents on pages 11 - 14.

- 1/ 6/30/56 Grand Canyon, Ariz. and 12/16/60 New York, N. Y.
- 2/ 8/26/53 Michigan City, Indiana.
- 3/ 12/19/46 Aberdeen, Maryland.
- 4/ 11/17/51 Oakland, California

OPERATIONAL ASPECTS OF MIDAIR COLLISIONS
INVOLVING AIR CARRIER AIRCRAFT

1. Weather Conditions

In 27 of the 32 collisions in which Air Carrier aircraft were involved the atmospheric conditions were generally good, with no restriction to visibility, although hazy sky conditions may have limited visibility to 5 or 6 miles in 2 or 3 of these cases. In another instance, there was a possibility that a cloud formation at flight level limited forward visibility in certain quadrants.

In 4 cases, weather conditions constituted a definite factor. Excluding the recent collision over New York, on December 16, 1960 there were 2 accidents 1/ in which the collision occurred in the overcast or at the base of the clouds.

In the other case, 2/ there was a low ceiling of 500 feet with visibility of 5 miles and icing conditions existing in and below the clouds. The collision occurred below the clouds, a short distance above the ground as both aircraft were on final approach for landing. Although the surface visibility at the time of impact was adequate, the fact that icing conditions existed, and that one of the aircraft had made an instrument approach through the low overcast, constituted conditions attributable to weather.

- 1/ 11/4/42 Kansas City, Mo.
- 1/12/55 Covington, Ky.
- 2/ 12/15/52 Richmond, Ind.

2. Collisions Occurring in Airport Traffic Pattern Areas

There have been 11 collisions^{1/} which occurred within the general airport traffic pattern area and while one or both aircraft were approaching prior to landing.

One of these occurred during the hours of darkness, 9 during daylight hours, and 1 at twilight.

Visibility conditions were good in 10 cases. In the other case, there was a low overcast at 500 feet with icing conditions existing below the clouds. In this instance, both aircraft were below the clouds and leveling off prior to touchdown.

One of the above cases occurred when one aircraft was conducting a simulated instrument approach and the other was on the downwind leg at approximately 1800 feet.

In addition to the above eleven cases, another collision^{2/} occurred in the general proximity of an airport but above the traffic pattern level.

- 1/ 4/22/47 Columbus, Ga.
- 8/7/49 Milwaukee, Wisc.
- 11/1/49 Washington, D. C.
- 11/9/51 Eugene, Oregon
- 11/27/51 Ocala, Florida
- 6/28/52 Dallas, Texas
- 12/15/52 Richmond, Ind.
- 6/27/54 Columbus, Ohio
- 7/12/55 Kansas City, Kansas
- 8/29/55 Hobbs, New Mexico
- 4/10/57 Oklahoma City, Okla.

- 2/ 11/17/51 Oakland, California

3. Air Traffic Control Aspects

In dealing with the function of air traffic control, consideration has to be given to the complex of regulations and procedures governing the respective responsibilities of traffic control in providing separation and the pilot in avoiding collisions. Circumstances differ depending on whether the aircraft are operating in accordance with instrument flight ^{RULES} ~~rules~~, and the actual weather conditions. In each of the midair collisions that occurred, these and other factors differ in one or more significant respects.

As pointed out in the Foreword, it is not the purpose of this report to delve into causal factors or the specific details of individual accidents. Accordingly, the information presented below is for the purpose of indicating the number of collisions that occurred when one or the other aircraft had received a clearance or instructions from an air traffic control facility.

Air Route Traffic Control

There were 5 midair collisions that occurred when the function of enroute traffic control existed in respect to at least one aircraft. In two cases 1/ IFR conditions existed. In the other 3 cases 2/ VFR conditions existed.

Airport Traffic Control - Approach Control

There were 10 midair collisions 3/ that occurred when one or both aircraft had received a clearance or instructions from the appropriate airport control tower or approach control facility. This figure includes a case at Oakland, California, (11/17/51) wherein a clearance had been issued to one aircraft for a simulated instrument approach on the range station at a minimum of 1500 feet altitude. Neither aircraft had received any clearance to approach for a landing. The collisions occurred at 3000 feet above the airport.

1/ 11/4/42 Kansas City, Mo.
1/12/55 Covington, Ky.

2/ 6/30/56 Grand Canyon, Ariz.
4/21/58 Las Vegas, Nevada
5/20/58 Brunswick, Md.

3/ 11/1/49 Washington, D. C. 12/16/60 New York, N. Y.
11/17/51 Oakland, Calif.
6/28/52 Dallas, Texas
6/27/54 Columbus, Ohio
7/12/55 Kansas City, Kansas
4/10/57 Oklahoma City, Okla.
10/1/60 Orlando, Florida
10/4/60 Sacramento, Calif.
11/17/60 Denver, Colo.

4. Instrument Training Operations

In 3 of the midair collisions, one or both aircraft were engaged in instrument training operations.

In one case 1/ the Air Carrier aircraft was engaged in a training flight in actual instrument weather conditions. The collision occurred in the overcast.

In the second case 2/ two Air Carrier aircraft were involved and both aircraft were engaged in simulated instrument training operations. Weather was no factor.

In the third case 3/ one aircraft was making a simulated instrument approach while the air carrier aircraft was on a training flight for the purpose of making touch-and-go landing. Weather was no factor.

- 1/ 11/4/42, Kansas City, Mo.
- 2/ 11/17/51 Oakland, California
- 3/ 7/12/55 Kansas City, Mo.

5. Other Operational Factors

There were 3 collisions, 2 fatal, which involved certain particular factors not associated with normal flight:

One fatal collision 1/ occurred when the pilot of a military aircraft attempted to maneuver close to the Air Carrier aircraft. It was indicated that the military pilot had prearranged an "en route" rendezvous with the DC-3 copilot.

Another fatal collision 2/ occurred when a Navy aircraft, that had been buzzing a small private aircraft, pulled up in a climbing turn and collided with the Air Carrier.

In the third case 3/ one aircraft was taking moving pictures of the second aircraft, a DC-3. The flight had been made for this purpose. Both aircraft landed safely with no casualties.

- 1/ 10/23/42, Palm Springs, California
- 2/ 7/30/49, Chesterfield, New Jersey
- 3/ 10/17/52, Palmdale, California

Table 2

MIDAIR COLLISIONS AND FATALITIES
INVOLVING
AIR CARRIER AIRCRAFT
1938 - 1960

Number of Midair Collisions				Fatalities						
		Fatal to		Air Carrier Aircraft			Other Aircraft		Persons On	Total
Total	Fatal	Air Carrier*		Passengers	Crew	Total	Passengers	Crew	Ground	Fatalities
1938-1941 None										
1942.....	2	1	1	9	3	12	0	0	0	12
1943.....	0	0	0	0	0	0	0	0	0	0
1944.....	1	0	0	0	0	0	0	0	0	0
1945.....	2	2	1	1	0	1	1	3	0	5
1946.....	1	0	0	0	0	0	0	0	0	0
1947.....	1	1	1	7	1	8	0	1	0	9
1948.....	0	0	0	0	0	0	0	0	0	0
1949.....	4	4	2	63	7	70	1	3	0	74
1950.....	0	0	0	0	0	0	0	0	0	0
1951.....	3	2	1	0	3	3	0	1	0	4
1952.....	3	2	0	0	0	0	1	2	0	3
1953.....	1	0	0	0	0	0	0	0	0	0
1954.....	1	1	0	0	0	0	0	0	0	2
1955.....	3	2	1	10	3	13	0	4	0	17
1956.....	2	1	1	117	11	128	0	0	0	128
1957.....	1	0	0	0	0	0	0	0	0	0
1958.....	2	2	2	49	9	58	1	2	0	61
1959.....	0	0	0	0	0	0	0	0	0	0
1960.....	5	4	1	116	12	128	4	3	6	141
Total.....	32	22	11 ^{a/}	372	49	421	8	21	6	456

* Number collisions resulting in fatalities to occupants of Air Carrier.

^{a/}Nine of these occurred in scheduled passenger service; 2 in nonrevenue operations.

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January 1961

MIDAIR COLLISIONS INVOLVING U. S. AIR CARRIER AIRCRAFT

1938 - 1960

Date	Location	Operator	Aircraft	Fatalities					
				Air Carrier			Other Aircraft	Persons On Ground	Total Fatalities
				Passenger	Crew	Total			
1938	None								
1939	None								
1940	None								
1941	None								
10/23/42	Palm Spgs, Calif.	American Military	DC-3 B-34	9	3	12			12
11/4/42	Kansas City, Mo.	TWA Military	DC-3 C-53						
1943	None								
12/24/44	Saline, Mich.	American Civil	DC-3 BL-65						
7/12/45	Florence, S. C.	Eastern Military	DC-3 A-26	1		1	2		1 2
9/26/45	Chicago, Ill.	TWA Civil	DC-3 A-75				2		2
12/19/46	Aberdeen, Md.	Eastern Universal	DC-4 DC-3						
4/22/47	Columbus, Ga.	Delta Civil	DC-3 BT-13	7	1	8	1		8 1

Date	Location	Operator	Aircraft	Fatalities				
				Air Carrier		Other Aircraft	Persons On Ground	Total Fatalities
				Passenger	Crew			
1948	None							
1/30/49	Port Washington, New York	Pan American Civil	L-749 Cessna 1140				2	2
7/30/49	Chesterfield, New Jersey	Eastern Military	DC-3 F6F	12	3	15	1	15 1
8/7/49	Milwaukee, Wisconsin	Capital Civil	DC-3 Cessna				1	1
11/1/49	Washington, D. C.	Eastern Civil	DC-4 P-38	51	4	55		55
1950	None							
11/9/51	Eugene, Oregon	West Coast Civil	DC-3 PT-23					
11/17/51	Oakland, Calif.	Overseas National	DC-4		3	3		3
		Calif. Eastern	DC-4					
11/27/51	Ocala, Fla.	Eastern Civil	DC-3 Piper L-4				1	1
6/28/52	Dallas, Tex.	American Civil	DC-6 Swift				2	2

Date	Location	Operator	Aircraft	Fatalities					Total
				Air Carrier			Other Aircraft	Persons On Ground	
				Passenger	Crew	Total			
10/17/52	Palmdale, Calif.	Calif. Air Charter Civil	DC-3 L-12A						
12/15/52	Richmond, Ind.	Lake Central Civil	DC-3 Cessna 170				1		1
8/26/53	Mich. City, Indiana	United American	CV-340 CV-240						
6/27/54	Columbus, Ohio	American Military	CV-240 SNB				2		2
1/12/55	Covington, Ky.	TWA Civil	M-202 DC-3	10	3	13			13
7/12/55	Kansas City, Kansas	TWA Civil	DC-3 Cessna 140				2		2
8/29/55	Hobbs, N. M.	Continental Civil	DC-3 PA-22						
6/30/56	Grand Canyon, Arizona	TWA United	L-1049 DC-7	64 53	6 5	70 58			70 58
9/9/56	Bartlesville, Oklahoma	Continental Civil	DC-3 Cessna						
1/10/57	Oklahoma City, Oklahoma	AAXICO Military	C-46 B-25						
4/21/58	Las Vegas, Nevada	United Military	DC-7 F-100	42	5	47	2		47 2

Date	Location	Operator	Aircraft	Fatalities				
				Air Carrier		Other Aircraft	Persons	
				Passenger	Crew		On Ground	Total
5/20/58	Brunswick, Md.	Capital Military	Viscount T-33	7	4	11	1	11
1959	None							
4/20/60	Hickory, N. C.	Piedmont Civil	F-27 Cessna 310				4	4
10/1/60	Orlando, Fla.	Eastern Civil	M-404 Beechcraft				1	1
10/4/60	McClellan, AFB	Capitol Civil	C-46 Cessna 172				2	2
11/17/60	Denver, Colo.	UAL Civil	DC-6 Beechcraft					
12/16/60	New York, N. Y.	TWA UAL	L-1049 DC-8	39 77	5 7	44 84	6	44 90
				372	49	421	29	456

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SECTION III

MIDAIR COLLISIONS IN GENERAL AVIATION OPERATIONS

SUMMARY

In the 23-year period 1938 through December 31, 1960, General Aviation aircraft were involved in a total of 397 midair collisions, 205 of which were fatal to one or both aircraft. These collisions resulted in a total of 475 fatalities including 3 persons on the ground.

The involvement of different classes of operators, was as follows:

<u>Between</u>	<u>Collisions</u>	
	<u>Total</u>	<u>Fatal</u>
General Aviation and General Aviation	336	170
General Aviation and Military.....	42	22
General Aviation and Air Carrier....	<u>19</u>	<u>13</u>
Total.....	397	205

In the 19 collisions between General Aviation aircraft and Air Carrier aircraft, 13 were fatal resulting in 97 fatalities. Of the 97 fatalities, 76 were aboard the Air Carrier aircraft and 21 aboard the General Aviation aircraft.

Excluding the 19 cases involving Air Carriers, there were 378 collisions in General Aviation operations. One hundred and ninety-two (192) were fatal accidents resulting in 378 fatalities. In 42 of these 378 cases a military aircraft was involved, twenty-two of which were fatal accidents.

In 336 cases, both aircraft were being operated in General Aviation flying. One hundred and seventy (170) of these were fatal accidents. One of these, a fatal accident, involved two aircraft both of which were being flown in factory test operations, one was a DC-7B and the other was a military type aircraft F-89-J. Another case, non-fatal also involved factory test flight operations of military type aircraft.

General Conditions and Circumstances

The great majority of the General Aviation collision accidents occurred during daylight in conditions of good flight visibility, and in the landing approach phase or while in the traffic pattern.

A small number occurred in other than normal flying operations. In these cases the aircraft were engaged in acrobatics, racing, formation flying or in buzzing. A few occurred in special kinds of flying such as in aerial application and fish spotting activities. Two cases involved 2 gliders.

The element of traffic control was non-existent in practically all cases with the exception of the collisions involving Air Carrier aircraft and one or two others.

Altitude and Distances From Airport

For the purpose of establishing the altitude and distance from airport factors in the General Aviation collisions, a study was made of all cases occurring in a 10-year period (1948-1957). During this period there were 120 collisions that occurred between two General Aviation aircraft, 58 of which were fatal.

Table No. 3 on the following page presents the frequency distribution of these 120 accidents in respect to altitude and relationship to distance from airport.

Table 3

MIDAIR COLLISIONS IN RELATION TO AIRPORT
PROXIMITY AND ALTITUDE
GENERAL AVIATION VS GENERAL AVIATION AIRCRAFT
(1948-1957)

Altitudes	On Airport	Within (Miles) from Airport								Beyond Five	Unknown	Total
		<u>1/4</u>	<u>1/2</u>	<u>3/4</u>	<u>One</u>	<u>Two</u>	<u>Three</u>	<u>Four</u>	<u>Five</u>			
6-10 (feet).....	10	0	0	0	0	0	0	0	0	0	0	10
11-25.....	5	0	0	0	0	0	0	0	0	0	0	5
26-35.....	6	1	0	0	0	0	0	0	0	0	0	7
51-60.....	3	1	0	1	0	0	0	0	0	0	1	6
76-100.....	4	3	0	0	0	0	0	0	0	0	0	7
101-125.....	0	1	0	0	0	0	0	0	0	0	0	1
126-150.....	4	0	1	0	0	0	0	0	0	0	0	5
176-200.....	1	7	2	0	0	0	0	0	0	0	0	10
351-400.....	1	0	1	1	1	1	1	0	0	0	0	6
451-500.....	0	0	1	0	0	1	0	0	0	0	0	2
501-550.....	0	0	0	0	2	1	0	1	1	1	0	6
601-650.....	0	3	1	0	0	0	0	0	0	0	0	4
701-750.....	0	2	0	0	0	1	0	0	0	0	0	3
751-800.....	0	1	0	0	0	0	0	0	0	1	0	2
801-850.....	0	0	0	1	0	0	0	0	0	0	0	1
851-1000.....	0	0	2	0	0	3	0	0	0	0	1	6
1001-1500.....	0	1	0	0	1	1	0	2	3	5	0	13
1501-1800.....	0	0	0	0	0	1	0	0	1	0	0	2
2001-2500.....	0	0	0	0	1	2	1	0	0	4	2	10
2601-3000.....	0	0	0	0	1	1	2	0	0	0	0	4
Over 3000.....	0	0	0	0	0	1	0	0	1	2	0	4
Unknown.....	1	1	0	0	0	1	0	0	3	0	0	6
Total.....	35	21	8	3	6	14	4	3	9	13	4	120