

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: April 8, 1958

Released: April 11, 1958

HYCON AERIAL SURVEYS, PITTSBURGH, PENNSYLVANIA, AUGUST 23, 1957

The Accident

At 1303,^{1/} August 23, 1957, a P-38L, N 69902, crashed about 1-1/2 miles south of the Greater Pittsburgh Airport, Pittsburgh, Pennsylvania. The aircraft, owned and operated by Hycon Aerial Surveys, was totally destroyed as a result of the crash and ensuing fire. The two occupants, a pilot and photographer, died in the crash.

History of the Flight

N 69902 departed Tulsa, Oklahoma, about 1030 on August 23, 1957, for the Greater Pittsburgh Airport. The crew of the aircraft consisted of Gilbert Mendoza, pilot, and John L. McPherson, photographer.

The flight proceeded normally on a VFR flight until nearing Greater Pittsburgh Airport. About 15 miles southwest of the field, radio communication was established between N 69902 and the Pittsburgh tower; the pilot was given landing information, which he acknowledged.

TWA Flight 160, a Constellation N 91205, en route from Dayton, Ohio, to Pittsburgh, Pennsylvania, approached the Greater Pittsburgh Airport from the southwest at approximately the same time as the P-38. When the Constellation was in sight of the tower, the captain was given his landing sequence. At this time the P-38 had not been sighted by the controller.

A short interval later the controller saw both aircraft. It appeared to him that the P-38 was approaching the Constellation from behind and on the same approximate heading. He immediately issued a series of radio calls to determine if the P-38 pilot had the Constellation in sight and to inform him of his landing sequence. Pilot Mendoza acknowledged these calls but his aircraft continued to close on the Constellation.

Very shortly thereafter the TWA Constellation was observed to alter course radically in a climbing right turn. The P-38 was next seen in a vertical left bank, after which it nosed down and dived straight to the ground, exploding on contact.

The weather reported at Greater Pittsburgh Airport at 1300, three minutes before the accident, was: Ceiling 4,000, broken; visibility 10 miles; surface wind south-southwest at nine miles per hour.

^{1/} All times herein are eastern daylight and are based on the 24-hour clock; altitudes are mean sea level.

Investigation

Pilot Mendoza and his photographer departed Ontario, California, on August 21, for the purpose of conducting high altitude aerial photography in several areas in eastern United States. The flight proceeded to Tulsa, Oklahoma, where it remained for two nights. On August 23, the aircraft left Tulsa on a VFR flight bound for Pittsburgh.

As he neared Pittsburgh, Pilot Mendoza called the Greater Pittsburgh tower on a radio frequency of 126.18 mcs. The tower controller stated that he had a little difficulty in establishing communication with the P-38. He said that 126.18 mcs. is a frequency normally used by military aircraft and because it is unusual for civil aircraft to use that frequency he did not immediately identify it. However, the controller was able to establish contact with the P-38 quickly by transmitting on several frequencies simultaneously.

When communication was established, the P-38 pilot reported his position as about 15 miles southwest at 4,000 feet descending, and asked for landing instructions. The controller advised him to report entering downwind leg, landing runway two three, wind southwest at one zero. Receipt of this transmission was acknowledged. Somewhat later Pilot Mendoza asked if he was cleared for a left- or right-hand pattern. The controller told him traffic was left hand.

Shortly after this latter conversation between the tower and the P-38, TWA Flight 160 called the Pittsburgh tower and reported its position as over Imperial (a small community approximately three miles southwest of the airport). Six other flights in the vicinity were being controlled by the tower at this time. The controller called Flight 160 saying he had it in sight and that it was number two to land following a TWA Martin east of the field on a base leg for runway two three.

Immediately thereafter the controller saw the P-38. He said that the P-38 appeared to be about 1-1/2 to 2 miles behind and slightly above the Constellation, and seemed to be closing rapidly on it. To determine if the P-38 pilot had the TWA Constellation in sight, the controller initiated a call: "Nine zero two, nine zero two, do you have the Trans World Connie in sight directly in front of you and a little lower?" The P-38 pilot did not understand the call and asked Pittsburgh tower to "say again." The controller then repeated, "Do you have the Constellation in sight off your left front?" Pilot Mendoza's reply to this query was broken by another aircraft transmission. Once again the controller said, "Nine zero two pick up that Constellation, you're number three to land runway two three, follow him in." This final transmission was acknowledged by Mendoza, "Uh, roger, understand."

Immediately following this transmission the controller saw the Constellation take evasive action by climbing to the right out of the path of the P-38. Almost instantaneously thereafter he observed the P-38 in a vertical dive below the Constellation. He stated that he was not conscious of the action by the P-38, which resulted in the vertical dive, as his attention had been concentrated on the Constellation. The testimony of other CAA personnel in the tower was substantially the same as that of the controller.

The captain of the Constellation described his approach to the Greater Pittsburgh Airport. He said they canceled their IFR flight plan three minutes east of Wheeling, West Virginia. Flight 160 then descended to pattern altitude (2,600 feet) and when about 10 miles south of the airport informed Pittsburgh tower of its position. The tower controller advised them of the active runway and to report passing Imperial. The first officer, who was flying the aircraft from the right seat, had reduced airspeed to about 150 knots with flaps in the takeoff position. When the aircraft passed Imperial the captain, who was performing the duties of copilot, reported to the tower. The controller cleared Flight 160 to follow a TWA Martin which was east of the field on a base leg for runway 23. The crew had the Martin in sight and planned their approach to follow it in at a normal interval.

In scanning the area for other aircraft the captain looked to the left and saw a black twin-engine airplane at an eight o'clock position to them. The airplane was at the same altitude on a collision course converging at a 45-degree angle. The captain immediately took over the controls of the airplane and executed a climbing right turn. He stated that he was unable to see the P-38 after starting the evasive maneuver and that he did not see any evasive action on its part.

One passenger, seated in the rearmost seat on the left of the Constellation, also saw the P-38. He said it appeared to be coming directly at them from an eight o'clock position. The witness said the aircraft appeared to be in a slight left bank and that he lost sight of it as the Constellation turned. He estimated the P-38 was about a city block away when it disappeared behind the tail of the Constellation. He also did not see it take any evasive action. He further added that he felt a collision was avoided only because of the alertness and immediate action taken by the crew of the Constellation.

Several ground witnesses saw the near collision. Most stated their attention was primarily concentrated on the maneuver by the Constellation and consequently they could not describe the maneuvers of the P-38 with any degree of accuracy. One witness, who was located in a hangar on the south side of the airport, stated he did not see the Constellation but did see the P-38 in its final dive. He said when the P-38 first came into his view it was nosed down slightly, then the dive steepened rapidly until it was vertical. He was not able to determine if the airplane was banked in any way; however, he said when the airplane was vertical it made a half turn but did not spin. He added that he saw no separation of parts and no fire prior to impact with the ground.

Examination of the Constellation immediately after landing proved that no contact between the two aircraft had occurred.

Examination of the P-38 wreckage revealed that the aircraft struck the ground on a northwesterly heading of 350 degrees. In its descent the P-38 passed nearly vertically through trees approximately 60 feet high. The resulting fire consumed a major portion of the aircraft; however, it was possible to determine that the aircraft was intact when it hit the ground. Continuity of the controls was traced and nothing was found which would have prevented their normal operation prior to impact. The wing flaps and landing gear were in the retracted position.

Both engines were broken open and burned. No indication was found which would have prevented normal operation of either prior to impact. In addition, inspection of the propellers showed both were rotating and in the cruise range at the time of striking the ground.

It was determined that no inflight fire had occurred and there was no indication of any malfunction or failure of any components or systems of the aircraft prior to impact.

The P-38 was a military aircraft which had been extensively modified for use in aerial photography. In 1954 the nose section had been extended approximately 42 inches to accommodate an additional crew member-photographer and his equipment. It was test flown and an airworthiness certificate was issued by the CAA which restricted it from being used to carry passengers or cargo for hire. Pilot Mendoza had flown N 69902 prior to departure from Ontario, California. The purpose of the flight was to check the performance of the airplane following a 100-hour inspection, during which considerable routine maintenance was accomplished. The flight was satisfactory.

Analysis

That a midair collision was narrowly averted by the TWA crew is considered indisputable by the Board. Further, the Board believes that the TWA crew should be highly commended for their alertness and prompt action which prevented the occurrence of an even more tragic accident.

Although the tower had some difficulty in initially establishing contact with the P-38, and several transmissions were interrupted by other calls, it is apparent that Pilot Mendoza did receive the controller's final transmission. The last instructions issued by the controller, which included the message concerning traffic and landing sequence for the P-38, were acknowledged by Mendoza. After receiving this acknowledgment from the P-38, the controller diverted his attention to the other traffic in the area and did not observe the P-38 until the evasive action was taken by the Constellation.

It is apparent that the P-38 pilot did not see the Constellation ahead of him as he entered the traffic pattern, or, if he did see the Constellation it was only when the Constellation was already being maneuvered out of his path. This is reasoned because although the alert tower controller attempted to advise the P-38 pilot, he, without alteration of course, continued to close on the Constellation from the rear at an approximate angle of 45 degrees. As the Constellation maneuvered to avoid, the paths of the two airplanes converged until the P-38 was directly behind the Constellation at a distance estimated to be about one city block. This placed the P-38 directly into the area of severe turbulence left by the Constellation.

Several comprehensive studies have been made on the problem of turbulence. Beech Aircraft Corporation and the Flight Safety Foundation have been particularly interested in the hazard to flight which can be caused by airplane turbulence. They have published and given wide dissemination to several safety bulletins outlining their findings. The Civil Aeronautics Board has also gathered considerable information on the subject which has been published as a Safety Bulletin and given wide distribution.

All of these bulletins caution pilots that extreme turbulence is caused by wingtip vortices. This turbulence has been reported to have seriously affected aircraft such as the Lockheed Lodestar; Douglas A-20, B-26, and DC-3; and Convair 340, etc. While these reports are primarily concerned with dangerous turbulence encountered during landing and takeoff, they serve to point up the fact that wake or wash following an aircraft can be a serious problem even to the large, more stable aircraft.

The National Advisory Committee for Aeronautics has conducted a series of flight tests to investigate this matter. It reports^{2/} that the strength of the trailing vortices of an airplane are mainly dependent on two quantities; Span loading (i. e., the ratio of aircraft weight to wing span); and the forward velocity of the airplane. The intensity of these vortices is directly proportional to the span loading and inversely proportional to the aircraft velocity. When the ratio of the aircraft weight to wing span increases, the strength of the trailing vortices increases; when the forward velocity of the aircraft decreases, the strength of the trailing vortices increases. This report concludes that the trailing vortices contain velocities of a dangerous magnitude and represent a region of air similar to severe turbulence. These disturbances can remain in the atmosphere for periods of 30 to 60 seconds and under favorable conditions may not dissipate for somewhat greater lengths of time.

The intensity of this area of turbulence was probably increased substantially when the Constellation "pulled up." The "pull-up" would increase the instantaneous span loading which would result in a corresponding increase in the strength of the trailing vortices.

Many instances have been recorded in which aircraft have experienced uncontrollable rolling when encountering aircraft wake. It has also been shown that this rolling effect is more severe on the penetrating aircraft when its angle of attack is increased. Evidence has shown that the P-38 was in a slight left turn. Because the P-38 was entering traffic, it can also be reasoned that its speed was somewhat less than cruising. Both of these factors would result in a slightly higher angle of attack and consequently a more severe effect from the wingtip vortices.

It is probable that this turbulence caused the P-38 to roll violently. It is also possible that the pilot aggravated the rolling effect by a last-minute reaction to avoid a collision. In either case, it is evident the P-38 rolled in the turbulence to an approximate 90-degree bank. While in this 90-degree bank the P-38 pivoted to a vertical nose-down attitude. While the Board cannot determine the reason for this flight deviation, several possibilities are suggested. One, that the violence of the upset from the turbulence was sufficient to temporarily incapacitate the pilot; two, that the flight path resulted from the pilot's evasive action; three, that the aircraft was rendered uncontrollable either by the turbulence alone or because of some inflight structural failure. The latter was not substantiated by any evidence at the scene. In any event, the aircraft reached a vertical attitude at an altitude too low to permit recovery.

The reason for Pilot Mendoza's failure to see the Constellation in time to avoid its wake is unknown. It is possible that Mendoza was establishing an

^{2/} Velocity and Persistence of the Trailing Vortices of an Airplane, Christopher C. Kraft, Jr., Langley Aeronautical Laboratory, NACA conference on some problems of aircraft operation, November 17-18, 1954.

approach interval with respect to the TWA Martin on the base leg. Since the P-38 was in a slight left bank, the relative position of the Constellation was ahead and slightly below which would have made it difficult to see. It is also considered possible that the pilot's field of vision was further restricted because of the modified nose section on the P-38.

Findings

On the basis of all available evidence the Board finds that:

1. The P-38 aircraft and its pilot were properly and currently certificated.
2. The P-38 approached Pittsburgh at the same approximate time as TWA Flight 160.
3. Both aircraft were at nearly the same altitude on converging flight paths with the P-38 slightly to the rear and above the Constellation.
4. The Constellation pilot saw the P-38 in time to execute a climbing right turn and avoid a collision.
5. The P-38 entered a vertical left bank, either as a result of the pilot's reaction to avoid a collision, or by the severe turbulence of the wing vortices of the Constellation, or a combination of these.
6. The P-38 then nosed down and dived vertically to the ground.
7. No malfunction of the airplane or its components prior to impact with the ground was found.
8. No inflight contact occurred between the Constellation and P-38 and the Constellation landed without further incident.

Probable Cause

The Board determines that the probable cause of this accident was due either to aircraft-induced turbulence or excessive control action by the pilot in an effort to avert collision, or both, causing loss of control of the P-38 at an altitude too low to effect recovery.

A contributing factor was the lack of vigilance by the P-38 pilot as he entered the airport traffic pattern.

BY THE CIVIL AERONAUTICS BOARD:

/s/ JAMES R. DURFEE

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

/s/ G. JOSEPH MINETTI

/s/ LOUIS J. HECTOR

S U P P L E M E N T A L D A T A

Investigation and Taking of Depositions

The Civil Aeronautics Board was notified of this accident shortly after it occurred. An investigation was immediately initiated in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. Depositions, ordered by the Board, were taken in Santa Monica, California, September 25; Boston, Massachusetts, September 26; Pittsburgh, Pennsylvania, September 27; and Washington, D. C., September 30, 1957.

Operator

The operator, Hycon Aerial Surveys, is a subsidiary of the Hycon Manufacturing Company, Pasadena, California. Hycon Aerial Surveys operates a fleet of aircraft for the purpose of conducting aerial photography and magnetometry. The company maintains its base of operations at Ontario, California. It employs six to eight pilots, several photographers, and, in addition, CAA certificated mechanics to maintain the aircraft.

Pilot

Albert Mendoza, 30, was employed by Hycon Aerial Surveys September 20, 1954. He possessed a currently effective airman certificate with commercial, single- and multi-engine land, single-engine sea, P-38, and instrument ratings. His flight time was recorded with the Civil Aeronautics Administration as totaling 2,600 hours, with approximately 310 in P-38 aircraft. His second-class CAA physical examination was passed August 19, 1957, with no waivers or limitations.

Photographer

John L. McPherson, age 34, was employed by Hycon Aerial Surveys August 16, 1957, as an aerial photographer. He previously had been employed as a photographer by Fairchild Aerial Surveys.

The Aircraft

N 69902 was a P-38L manufactured by Lockheed Aircraft Corporation for the U. S. Air Force. The manufacturer's serial number was 8470 and the military serial number was 44-53180. Extensive modification had been made to the aircraft to enlarge and lengthen the nose section to accommodate multiple aerial cameras and a photographer. These modifications were made in compliance with CAA engineering data. The aircraft was subsequently inspected and test flown, and issued a limited category airworthiness certificate. This limitation restricted the aircraft from being used for the purpose of carrying passengers or cargo for hire.

The aircraft had a total of 980 hours and 52 minutes of flying time. It was equipped with two Allison V-1710-91 engines and Curtiss electric propellers, hub models C532D-F-61 and C532D-F-62, blade models 88996-18 and 89303-18.