

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: September 21, 1951

Released: September 27, 1951

MID-CONTINENT AIRLINES, INC., SIOUX CITY, IOWA, MARCH 2, 1951

THE ACCIDENT

Mid-Continent Airlines' Flight 16, a DC-3 aircraft, N-19928, crashed at 0912,¹ March 2, 1951, during a landing approach to the Sioux City Airport, Sioux City, Iowa. Sixteen occupants, including the pilots, were killed, and the remaining nine were injured. The aircraft was completely destroyed by the crash and fire which followed.

HISTORY OF THE FLIGHT

Flight 16 departed Kansas City, Missouri, at 0724, March 2, 1951, for Omaha, Nebraska, Sioux City, Iowa, and other intermediate stops with final destination as Minneapolis, Minnesota. The crew consisted of Captain James H. Graham, First Officer Philip K. Toler, and Stewardess Marilyn Woodbury. Ernest F. Eilert, a trainee copilot, was riding in the cockpit as the fourth crew member. From Kansas City, the aircraft carried 21 passengers, cargo, and fuel, which resulted in a total gross weight of 25,100 pounds, which was within the certificated limit of 25,200 pounds. The load was properly distributed with relation to the center of gravity of the aircraft. Weather conditions over the intended route were instrument with a general overcast lowering from 4,200 feet at Kansas City to about 1,000 feet at Omaha.

No difficulty was experienced as the flight proceeded to Omaha at 4,000 feet in accordance with an instrument flight plan. A normal landing was made on Runway 14L about 1,000 feet from its approach end, but near the completion of the landing roll the aircraft ran off the right side of the runway, passing over one of the high intensity runway lights. Captain Graham reported this to one of the ground crew at Omaha, and both the aircraft and light were inspected for damage.

None was found and the aircraft was prepared for departure to Sioux City.

At 0841 the flight took off for Sioux City on an instrument flight plan with Omaha as the alternate airport. There were 21 passengers, 920 pounds of cargo, and 1,500 pounds of fuel, which resulted in a take-off weight of 24,630 pounds. The take-off was without incident and no difficulty was encountered en route to Sioux City, the flight proceeding at 3,000 feet altitude.

At 0904 Flight 16 reported over the Sloan Fan Marker, 11.9 miles south-southeast of the approach end of Runway 35 at the Sioux City Airport. It was immediately cleared by the Sioux City Airport tower for a "straight-in" approach and landing on Runway 35. Weather information was furnished to the flight as precipitation, ceiling 500 feet, sky obscured, visibility one mile in light snow showers, and wind from the east at 14 miles per hour. The medium-intensity lights for Runway 17/35 were turned on and placed at the position of full brilliance. Following receipt of this information, the flight requested permission to land to the southeast on Runway 13 and received clearance to do so. At 0909 the flight reported that it was contact over the southeast corner of the field and was cleared to land. At the same time the aircraft was seen by a ground witness one mile southeast of the airport. Shortly thereafter, it was sighted approximately over the intersection of Runways 4/22 and 17/35 on an east-southeast heading. A left climbing turned to the north was then made and the pilot was advised that he was cleared to land on either Runway 17 or Runway 13. The pilot was also advised by the tower that there would be a 90-degree cross-wind if he elected to land on Runway 17. All transmissions to the flight were acknowledged. The aircraft was not further observed, and crashed about 600 feet north and west of the approach end of Runway 17. Fire developed immediately.

¹All times referred to herein are Central Standard and based on the 24-hour clock

INVESTIGATION

The aircraft was not continually in sight from the time it was first observed at Sioux City until it crashed. It is difficult to reconstruct the flight path in the vicinity of the airport with any reasonable degree of accuracy from a combination of observations made by ground witnesses and survivors of the accident. A ground witness observed the aircraft approaching from the southeast at an estimated altitude of 120 feet with the landing gear extended. According to this observer, the aircraft made a turn to the north and shortly thereafter passed from view due to a general snowstorm in the area. It was next seen at the west side of the airport, slightly north of the approach end of Runway 13. At 0911 the aircraft was approximately over the intersection of the runways on an east-southeast heading, and at an altitude of approximately 120 feet. Additional power was applied as it began a climb out to the left. It appeared that the aircraft was in slow flight. Witnesses saw it continue the climbing turn to the north until it was lost from sight in the snowfall. Survivors stated that it seemed to have been leveled off after the climb, flew straight for a short distance, and then seemed to descend again in a gliding turn to the left. Approximately one minute after passing over the field, the crash occurred off the north end of Runway 17. Survivors and ground witnesses reported hearing a substantial surge of power immediately before the crash. Survivors stated that just before the aircraft struck the ground it was in a left turn, that the left wing suddenly went down, accompanied by a shuddering and an application of full power. The aircraft was at very low altitude and did not recover from the wing-low attitude, slipping into the ground on the left wing.

The aircraft structure was largely consumed by fire before the arrival of rescuers, and it was not possible to determine the extent of impact damage to the fuselage and seat structure. Survivors stated, however, that none of the seats appeared to have been displaced and so far as they knew, all passengers were held securely by safety belts. All survivors left the wreckage through either the main cabin door or the left side of the fuselage, which had been broken open by the crash.

The remains of the left wing panel showed that the resultant forces of the impact had traversed along a line approximately parallel to the lateral axis of the aircraft, as impact had buckled and compressed the left wing panel from tip to root. The right wing panel remained almost entirely undamaged. Both engines and propellers were thrown free of the aircraft upon contact with the ground but were found within a radius of approximately 50 feet. The landing gear and wing flaps were in the down position.

A detailed inspection was made of all components of the aircraft, including flight controls, electrical equipment, and radio, but no item was found which indicated that any part was operating improperly prior to the accident. Power plants were removed from the scene and taken to a nearby hangar where they were disassembled and examined. No evidence was found which indicated any malfunction or mechanical failure prior to the accident. An inspection of the company maintenance records indicated that the aircraft had been properly maintained.

An analysis of the U. S. Weather Bureau data revealed that there was precipitation from an overrunning air mass along the route from Kansas City to Sioux City. A warm front extended east-southeast through Oklahoma, Arkansas, and thence eastward. Warm moist air was flowing northward over the wedge of cold air. The precipitation was in the form of rain from Kansas City to Omaha, except that rain became mixed with snow and sleet at Omaha after 0700. Snow was falling north of Omaha, including Sioux City. The flight between Omaha and Sioux City was made in a temperature range of from 30 to 33 degrees. Weather reports reflected that Omaha, the alternate, remained well above minimums throughout the time between departure and the accident. Analysis of weather data indicates a condition of little or no icing, particularly in the northern half of the route, Omaha to Sioux City. It was possible, however, that a light deposit of ice accumulated during the first half of the flight. Surviving witnesses stated that they observed a thin ice formation on the wing panels and that this formation was also present at Omaha when they boarded the aircraft. Company personnel at Omaha stated that the formation was wet snow and slush, which was present on the

wings and tail surfaces. One ground witness who arrived at the scene a short time after the accident said that he observed what appeared to be "hard" ice on the vertical fin.

The analysis of weather data further reflected that the flight remained in relatively stable air from Omaha to Sioux City and should have experienced very little turbulence en route. The latest forecast available to the flight before departure from Omaha indicated that Sioux City would have a ceiling of 1,500 feet and visibility of two miles upon arrival. Weather conditions at Sioux City, however, deteriorated faster than expected, the ceiling was 500 feet and visibility was reported as one mile immediately before the landing approach was made. Mid-Continent Airlines' minimums for a daylight approach at Sioux City are 500 feet and one mile. Several witnesses who were in the vicinity of the airport at the time of the accident stated that a snowstorm reduced the visibility to about one-half mile at ground level. It is probable that visibility at or near ground level during the snowstorm was considerably less than that observed by the tower operator and reported to the flight just before the accident. Snow showers were increasing at Sioux City at the time the aircraft was maneuvering in that area. Although the intensity of snowfall reported at the airport until the time of the accident was light, there are indications that visibility was becoming variable due to heavier snow showers. Further, heavier snowfall and lower visibility in the northwest area of the airport were indicated. An observation taken immediately after the crash gave the 0915 weather as precipitation, ceiling 500, visibility one mile, light snow showers, temperature 29, dew point 28, wind east-northeast 12, altimeter setting 29.91, surface visibility one-half mile.

Testimony of the surviving passengers, tower operators, and witnesses in the vicinity of the airport at the time of the accident was to the effect that the snow had not completely covered the runways and that they were still distinguishable.

An examination of airman records maintained by both the company and the Civil Aeronautics Administration reflected that Captain Graham was a validly certificated airline pilot with 6,971 hours in DC-3

aircraft. His last route check (including Sioux City) was performed on February 9, 1950, and his last pilot instrument flight examination on February 14, 1950, reflected a "good" rating. This test included such items as steep turns, maneuvering at minimum speed, approach procedures and final approach to field.

Captain Graham had been flying the route involved in the accident for a number of years and he was thoroughly familiar with the terrain, land-marks and field conditions at the Sioux City Airport. Investigation further disclosed that all radio communications between the tower and the flight were normal and at no time did the captain express any concern as to the safety of the flight.

ANALYSIS

The left wing panel was crushed and compressed from tip to root from absorption of impact, the force of which was applied almost parallel to the lateral axis of the aircraft. These facts alone show that the aircraft must have been in a sharp left slip and a stalled condition immediately before the crash. In addition, several of the survivors were able to describe the stall and slip, advising that the aircraft shuddered and seemed to slide downward in the direction of the left wing tip. Full power was applied at the time, further indicating that the pilot was attempting to recover from a stall. The aircraft struck the ground immediately thereafter. It must be concluded that the pilot permitted air speed to decrease below that which was necessary to maintain flight during the attempt to land.

It appears that the first approach to Runway 13 was abandoned and a second approach, this time to Runway 17, was being attempted by the pilot through visual reference to the ground. The landing gear and flaps were found in the down position, it is therefore evident that the pilot intended to make a landing rather than execute a missed approach procedure.

It has been mentioned that visibility in the area was variable due to snow showers, with lower visibility and heavier snow showers to the northwest of the airport at the time of the accident. Weather conditions were, therefore, marginal but there is no proof that the pilot encountered weather below the allowed minimums during either

approach. As the reduced visibility due to blowing snow was apparently confined to within 10 feet of the ground, it does not seem to be a factor contributing to the accident.

The flight from Omaha to Sioux City was conducted in weather which was marginal enough to suggest that light ice formation may have been a factor in this accident. Some ice was observed on the wings by survivors at the time of the crash and on the vertical fin by a ground witness who arrived at the scene shortly thereafter. However, other witnesses stated that they observed none. Visibility from the cockpit could possibly have been reduced by windshield ice and an accumulation of wet snow. Ice accumulation would not have been critical for normal flight operations, but, under a condition of low air speed in a turn, might have been a factor in causing the aircraft to stall at a slightly higher than normal air speed.

FINDINGS

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

1. The carrier, the aircraft, and the crew were properly certificated.

2. The aircraft, including all components, operated properly until the crash.

3. At 0904, Flight 16 was advised that the Sioux City Airport weather was precipitation, ceiling 500 feet, visibility one mile in light snow showers, wind east 14 mph.

4. The approved company weather minimums for Sioux City are ceiling 500 feet and visibility one mile.

5. The aircraft was being flown in a left turn at low altitude just before the accident.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was a stall during a left turn too close to the ground to effect recovery.

BY THE CIVIL AERONAUTICS BOARD

/s/ DONALD W. NYROP

/s/ OSWALD RYAN

/s/ JOSH LEE

/s/ JOSEPH P. ADAMS

/s/ CHAN GURNEY

Supplemental Data

INVESTIGATION AND HEARING

The Civil Aeronautics Board was notified of this accident promptly through CAA Communications, and an investigation was immediately initiated in accordance with the provisions of Section 702 (a)(2) of the Civil Aeronautics Act of 1938, as amended. A public hearing was ordered by the Board and held at Sioux City, Iowa, on March 15 and 16, 1951.

AIR CARRIER

Mid-Continent Airlines, Inc., is incorporated under the laws of the State of Delaware and has its principal office at Kansas City, Missouri. The company is engaged in the transportation by air of persons, property, and mail, and holds a certificate of public convenience and necessity issued by the Civil Aeronautics Board. Mid-Continent Airlines also possesses an air carrier operating certificate issued by the Administrator of the Civil Aeronautics Administration.

FLIGHT PERSONNEL

The pilot in command, James H. Graham, age 33, was employed by Mid-Continent Airlines on February 5, 1944. He had received previous training through the civilian pilot training program, and had been employed as a flight instructor for the Spartan School of Aeronautics, Tulsa, Oklahoma. He was promoted to

reserve captain on July 8, 1946, and to captain on April 15, 1947. His total flight time was 8,585 hours, of which 6,971 were in DC-3 aircraft. His total instrument time was 764 hours. Captain Graham held a valid airline transport pilot certificate, had passed a physical examination on September 6, 1950, and had successfully completed his latest instrument check.

The copilot of this flight, Philip Knight Toler, age 30, was employed by Mid-Continent Airlines on May 12, 1947. He had received his previous experience and training in the Army Air Force. Mr. Toler had a total of 3,695 flying hours, of which 1,445 hours were in DC-3 aircraft. His total instrument time was 313 hours. Mr. Toler held a valid commercial certificate, and had successfully passed his last physical examination in December 1950.

THE AIRCRAFT

N-19928 was a DC-3A and had a total of 28,202 flight hours. Flight time since its last overhaul was 7,744 hours. The aircraft was equipped with Pratt & Whitney R-1830-S1C3G engines. Time since last overhaul for both the left and right engines was 629 hours. Propellers were Hamilton Standard Model 23E50-473. All historical and maintenance records pertaining to the aircraft were found in order.