

July 27, 1938

DEPARTMENT OF COMMERCE
WASHINGTON

REPORT OF AIRCRAFT ACCIDENT INVESTIGATION

Statement of probable cause concerning an accident which occurred to an aircraft of Northwest Airlines Corporation in the vicinity of Billings, Montana, On July 8, 1938.

TO THE SECRETARY OF COMMERCE:

In an order dated July 8, 1938, issued by the Secretary of Commerce, pursuant to the Air Commerce Act of 1926, as amended, relating to the investigation of accidents in civil air navigation in the United States, Robert D. Hoyt, Aeronautical Inspector, Robert I. Hazen, Senior Airline Inspector, and Philip C. Salzman, Airline Maintenance Inspector, all of the Bureau of Air Commerce, Department of Commerce, were designated as a Board to investigate the facts, conditions and circumstances of an aircraft accident which occurred on the morning of July 8, 1938, in the vicinity of Billings, Montana, and to make a report thereon. Colonel Sumpter Smith and Thomas O. Hardin, recently appointed members of the Air Safety Board, provided in the Civil Aeronautics Act of 1938, and Fred E. Sheriff, Commissioner of Aeronautics for the State of Montana, were designated as advisory members of the Board. Due to unavoidable circumstances, Mr. Hardin was unable to attend the public hearing. After a field investigation had been made, public hearings were held from July 13, 1938 to July 15, 1938, inclusive, in the Federal Court Room of the Post Office Building, Billings, Montana.

The following facts, conditions and circumstances appeared to the Board to have attended the accident:

On July 8, 1938, at approximately 2:56 A. M., Mountain Standard Time, at a point 1,100 feet beyond the end of the SW-NE runway of the Billings Municipal Airport, an airplane of United States registry, while taking off for flight in scheduled inter-state operation, carrying eight passengers, mail and express, met with an accident which resulted in destruction of the aircraft and the death of one passenger. Two passengers were seriously injured, the crew and remaining passengers sustaining only minor injuries.

The pilot of the airplane, Walter R. Bullock, holds a current and appropriate Federal Pilot Certificate of Competency and the required ratings for the flight involved. The result of his last physical examination, as required by the Department of Commerce and taken March 31, 1938, showed him to be in satisfactory physical condition. The record shows that Pilot Bullock has had a total of over 11,500 hours of flying experience, of which approximately 1,800 hours has been flown at night. He has flown this type of airplane since December, 1937, and has been assigned to the Billings-Minneapolis-Chicago Division since February, 1937. The copilot, Lester H. Doan, holds a current and appropriate Federal Pilot Certificate of Competency and the required ratings. His last physical examination, taken on February 23, 1938, showed him to be in satisfactory physical condition. The passengers on board were:

Mrs. N. S. Mackie, Evanston, Illinois (fatally injured)
Mr. N. S. Mackie, Evanston, Illinois
Mrs. B. G. Tindale, Slocum, British Columbia
Mr. A. D. Neimeyer, Boeing Field, Seattle, Washington
Mr. E. V. Gary, 18 E. Elm, Chicago, Illinois
Mr. Gunther C. Tessum, 1808-4th No., Billings, Montana
Mr. Paul G. Brislawn, 118 Cedar Ave., Wallace, Idaho
Ensign W. C. Bollinger, Jr., U. S. Navy, USS Northampton

The aircraft, a Lockheed twin engine, cabin land monoplane, model 14-1, inspected and approved as airworthy by the Department of Commerce on July 1, 1938, bore Federal Aircraft Certificate (license) C-1733 and company number 83. It was owned by Northwest Airlines, Incorporated, with main offices in St. Paul, Minnesota, and at the time of the accident was being operated by that corporation as trip number 4, scheduled from Seattle, Washington, to Chicago, Illinois, with intermediate stops enroute. This operation was conducted under a currently effective letter of authority issued by the Department of Commerce.

Flight No. 4, Pilot Bertran F. Richie and Copilot Byron S. Cooper, departed from Seattle, Washington, at 9:05 P. M., Pacific Standard time, July 7, 1938. Scheduled intermediate stops were made at Spokane, Washington, and Helena, Montana. Instrument flying was authorized between Seattle and Spokane, and contact flight from Spokane to Fargo, North Dakota. The weather remained favorable throughout the flight. The flight arrived at Billings, Montana, at 2:33 A. M. MST, July 8, 1938, at which point this crew was relieved by Pilot Walter R. Bullock and Copilot Lester H. Doan.

Pilots Bullock and Doan arrived at the Billings Municipal Airport about one hour prior to the departure of the flight, at which time weather reports were studied and a flight plan prepared.

Before departure, clearance for contact flight from Billings to Fargo was received from the Divisional Dispatcher at Minneapolis, Minnesota, via radio. The aircraft carried approximately 390 gallons of fuel and 44 gallons of oil. The gross weight of the aircraft at the time of departure was 15,810 pounds, which was 1,590 pounds under the maximum weight authorized for flights east of Billings.

The United States Weather Bureau observation for the Billings Station, made at 2:41 A. M., and available to the pilot, was as follows:

Sky conditions clear, visibility 50 miles, temperature 61.3, dew point 53, wind south 4, Barometer 30.08.

The radio time check given to the crew at the end of the runway immediately before the take-off, gave the time as 2:55 A. M., wind South Southeast 7, Kollsman 30.08.

The testimony shows that the engines were run up and individually tested at the SW end of the runway used for the take-off and that the controls were checked and set in the customary take-off position.

The take-off run was started approximately 75 feet from the SW end of the SW-NE runway, heading NE. The pilot testified that he opened the throttles to 35" manifold pressure with the carburetor mixture control set at emergency rich and the propeller pitch control set to approximately the 2300 RPM position and that the airplane accelerated normally and rolled down the runway in what appears to be a normal take-off. At a point about 912 feet from the start of the take-off run, the airplane left the ground, due to a rise in the runway near the intersection with the NW-SE runway. It remained in the air about 50 feet before returning to the ground, where it continued to roll another 200 feet before finally taking off. The wheel tracks of this take-off were later measured and the total

length of the run fixed at approximately 1,162 feet. Witnesses testified that at the time of take-off, the wind sock was hanging limp, indicating practically no wind, and under these conditions, it is customary to take off in an easterly direction because the runways slope downward toward the east.

From the testimony, it is indicated that the wheels may have touched the ground lightly at points farther down the runway. The airplane passed over the boundary lights at the NE end of the airport at a very low altitude. At a point about two-thirds of the distance to the end of the runway, which is 4,250 feet long, the left wing dropped rapidly. The pilot applied full opposite aileron and advanced the throttles and propeller pitch controls to the emergency full power position. The wings responded very slowly to the aileron and the airplane was about level when it passed over the boundary lights. The right wing then started to drop rapidly and the pilot, realizing that a crash was imminent, cut the master switch.

The right wing struck the ground almost immediately and dragged for about 12 to 15 feet, when the nose dug into the earth breaking up the transparent nose piece. The airplane skidded along the ground, rotating to the right around the right wing tip and the nose, until it was probably moving tail first. At this time, the tail struck a pine tree, causing the airplane to complete a revolution to the right. It came to rest against a group of small pines growing on the extreme edge of the canyon wall, 231 feet beyond the point of first impact.

The right motor left the airplane about the time the nose struck and continued on to a point beyond where the airplane came to rest, and rolled to the bottom of the canyon. The left motor tore loose at a point somewhat farther on and also came to rest at the bottom of the canyon. Both wheels probably tore away at the point where the nose struck, the left wheel continued to a point at the bottom of the canyon beyond the right motor. The right wheel was apparently caught in the rotation of the airplane and came to rest in the vicinity of the wreckage. During the final movement of the airplane, the baggage compartment and the rear portion of the cabin floor were torn away as a result of striking large rocks on the hillside.

Mrs. Mackie, the passenger who was fatally injured and who was in the rear seat on the left side, was dragged out of the airplane with the seat and thrown to a ledge below the point where the airplane came to rest. The damage done to the floor, together with the force of impact, tore most of the balance of the seats loose and the rotating movement piled passengers, seats and loose articles into the rear of the cabin. The final rotation of the airplane brought it against the trees, crushing the right side of the fuselage and opening the left side aft of the door.

Within an hour all passengers and the crew were removed to the St. Vincent's Hospital at Billings for observation and treatment.

During the hearing, Northwest Airlines, Incorporated, offered the use of Lockheed NC-17385, an airplane of the same model and type as that involved in the accident, for the purpose of conducting flight tests with a view of aiding in the determination of the probable cause of the accident.

These tests were conducted between six a. m. and eight a. m. on July 15 at the Billings Municipal Airport, and the results were interpolated to reflect the approximate conditions existing at the time of the accident.

The first test consisted of take-offs, using the power and propeller pitch control lever settings as were used on the flight which resulted in the accident; which were standard for take-off procedure at the altitude and under the conditions that existed at the Billings Municipal Airport on the morning of July 8. The result of these tests showed that, in the take-off on July 8, the airplane left the ground before it had traveled the normal distance required for the existing altitude, temperature and load conditions.

The second series of tests consisted of take-offs, using the same power and propeller pitch control settings used on the first test, with the addition of the use of emergency power after leaving the ground. At this time, it was discovered that airplane NC-17385, the one being used for the tests, had a stop installed on the quadrant which restricted the forward movement of the propeller pitch control lever, preventing the use of additional power; and that moving the throttle and propeller pitch control levers to full power and emergency low pitch settings respectively, produced no perceptible additional power.

Although the engines of this aircraft have been rated by the Bureau of Air Commerce for take-off for one minute at 40.5" Hg at 2500 RPM, I. E., 850 HP, this power is referred to in the testimony and hence in this report as "full emergency power" and likewise, any power over 800 HP at 2300 RPM as "emergency power". This usage is also in conformity with Northwest Airlines' instructions to pilots.

After a readjustment of the stop, permitting full forward movement of the propeller pitch control lever, tests were conducted and full maximum rated horsepower was obtained.

After discovering that a limiting stop had been installed on the quadrant of the propeller pitch control lever on Airplane NC-17385, investigation disclosed that a similar control stop had been installed on Airplane NC-17383.

The records of the company failed to disclose that this limiting stop had been installed on NC-17383, or that a flight test had been conducted to determine whether or not full maximum rated horsepower could be obtained after the stop had been installed.

The similarity of the performance of Airplane NC-17385 during the test to that of Airplane NC-17383 on the morning of July 8, indicates that the same limiting factor restricted the obtainable horsepower in each case.

SUMMATION

In reviewing the evidence, it appears to the Investigating Board that:

1. Trip 4 arrived at Billings after a normal flight from Seattle.

2. The trip was dispatched from Billings in accordance with normal company procedure with a load well under the maximum allowable gross weight of the airplane.

3. The weather at the Billings Airport at the time of take-off was good with light variable winds.

4. The airplane was taken off the ground before it had traveled a normal distance for take-off, at the altitude of the Billings Airport, with the load carried.

5. The airplane left the ground in a stalled condition from which the pilot attempted to recover by use of full emergency power while within the boundaries of the airport.

6. Emergency power was not available to the pilot because of improper adjustment of a stop which had been placed on the quadrant of the propeller pitch control levers, preventing the levers from going to the full low pitch position.

7. As a result of the stalled condition, the airplane fell off on the right wing and crashed at a point 1,100 feet beyond the NE end of the SW-NE runway, the pilot having cut the switch just prior to the impact.

It is the opinion of the Investigating Board that the probable cause of this accident was a stall at low altitude, following take-off, from which the pilot was unable to recover, due to lack of emergency power.

Respectfully submitted,

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