AIR SAFETY BOARD
REPORT

TO THE CIVIL AERONAUTICS AUTHORITY
AS A RESULT OF AN INVESTIGATION OF AN ACCIDENT INVOLVING AIRCRAFT

Accident involving aircraft NC 17389 of
Northwest Airlines, Inc., near Miles City,
Montana, on January 13, 1939.

An accident involving aircraft of United States Registry, NC 17389, while operating as Northwest Airlines Trip 1 of January 13, 1939, having occurred in the vicinity of Miles City, Montana, on the thirteenth day of January 1939, at approximately 9:15 o'clock P.M. (M.S.T.) of said date; the Air Safety Board having investigated such accident and having considered the evidence adduced therefrom, reports the following facts, conditions, and circumstances relating to the said accident, its findings, and its conclusions as to the probable cause thereof:

FACTS, CONDITIONS, AND CIRCUMSTANCES

Northwest Airlines, Inc., a corporation organized and existing under and by virtue of the laws of the State of Minnesota, as authorized by currently effective Air Carrier Operating Certificate issued by the Civil Aeronautics Authority, operates as an air carrier via certain named intermediate points between the terminals of Chicago, Illinois, and Seattle, Washington. Application has been filed, consistent with the provisions of the Civil Aeronautics Act of 1938, with the Civil Aeronautics Authority for Certificates of Public Convenience and Necessity over certain routes, including the route above named.

Northwest Airlines Trip 1 of January 13, 1939, scheduled to operate between Chicago, Illinois, and Seattle, Washington, - with scheduled intermediate stops at Minneapolis, Minnesota; Fargo, North Dakota; Bismarck, North Dakota; Miles City, Montana; Butte, Montana, and Spokane, Washington, - was canceled from Chicago and originated at Minneapolis. Aircraft NC 17389, piloted by Captain C. B. Chamberlain, and First Officer R. B. Norby, carrying passengers, mail and property, was dispatched on this trip, cleared to Fargo, North Dakota, and departed Minneapolis at 4 o'clock p.m. (C.S.T.)

Aircraft NC 17389, operated on this trip, was a Lockheed, Model 14-H, manufactured by the Lockheed Aircraft Corporation of Burbank, California, and was placed in service by Northwest Airlines on December 13, 1937. This model aircraft is approved by the Civil Aeronautics Authority, for air-carrier operation over the routes flown by Northwest Airlines, with a standard gross weight of 15,650 pounds, and provisional gross weights of 17,400 pounds east and 16,500 pounds west of Billings, Montana. It was powered with two Pratt & Whitney Hornet, Model SIEG, engines and Hamilton Standard Constant Speed propellers, hubs Model 3E50-223 and blades Model 6111A-12.

Captain C. B. Chamberlain had accumulated a total of approximately 11,800 hours of flying time, of which more than 600 hours were acquired in Lockheed 14-H equipment. First Officer R. B. Norby had accumulated a total of approximately 4,400 hours of flying time, of which more than 600 hours were acquired in Lockheed 14-H equipment. Both pilots were possessed of required ratings and Certificate of Competency for the flight and equipment involved.

The trip proceeded normally to Fargo, North Dakota, where it was recleared, in a manner consistent with approved company procedure, to Bismarck, North Dakota, departing at 5:40 p.m. (C.S.T.). Further clearance to Miles City, Montana, was issued subsequent to arrival at Bismarck at 6:57 p.m. (C.S.T.), and the trip departed at 7:07 p.m. (C.S.T.), arriving Miles City at 7:41 p.m. (M.S.T.), after a flight of an hour and thirty-four minutes, the greater part of which was on top of the overcast. Although some ice accumulated on the aircraft during the course of the trip, the aircraft was de-iced and dried by ground personnel after arrival at Miles City.

Reports of adverse weather conditions in the vicinity of Billings, Montana, the next scheduled stop, resulted in the trip being held at Miles City. After a delay in excess of one hour, the trip was cleared to Billings on the basis of the following quoted regular weather-sequence reports and special reports received at 8:51 p.m. and 8:45 p.m. (M.S.T.), respectively:

"Miles City, high broken with lower scattered clouds, ceiling 6,000, visibility 15 miles, temperature 34, dew point 29, wind NW 22, barometer 29.95.

"Custer, scattered clouds, ceiling 7,000, visibility 30, temperature 34, dew point 29, wind NW 18.

"Billings, ceiling estimated 1,500, broken clouds 2,500, visibility ½ mile, snow, temperature 32, dew point 32, wind NNW 13, barometer 30.02, conditions changeable.

"Billings, special 8:54 p.m. (M.S.T.), scattered clouds, ceiling 1,500, visibility 15 miles, temperature 32, dew point 32, wind NW 16, barometer 30.02, rise in barometer last three hours, three points, sky 8, scattered clouds moving from NW, conditions changeable."

At the time of departure from Miles City, the gross weight of the aircraft was 14,800 pounds, including mail, cargo, 450 gallons of fuel (of which 70 gallons had been added at Miles City), 32 gallons of oil, and the following passengers:

Mrs. Clara Morris, address given as Mandan, North Dakota; and
Mr. R. S. Zahniser, address given as Billings, Montana.

The aircraft started the take-off to the northwest at 9:14 p.m., leaving the ground at a point approximating the intersection of the two field runways, and crossed the field boundary in a normal climb. After reaching an estimated altitude of 500 feet, the aircraft began a slow turn to the left, which is the usual procedure in contacting the west leg of the Miles City radio range for the purpose of continuing flight to Billings, Montana. Shortly after starting the turn, the aircraft was seen to lose altitude rapidly and descend almost to the ground before the descent was checked, and the aircraft pulled up in a sharp climb to an altitude approximating that previously attained. Immediately thereafter, the aircraft turned sharply to the left and descended rapidly, striking the ground in a ravine and headed in a southeasterly direction with its left wing and nose slightly down. The aircraft traveled for a distance of approximately 280 feet from the point of first contact with the ground, scattering fragments along its path, and came to rest on rising terrain, where it was entirely destroyed by fire at a point 2650 feet distant from the west

boundary of the Miles City airport, and 1200 feet south of a projection of the north boundary of the airport. The crash resulted in the death of all persons aboard the aircraft.

Although a thorough examination was made of the wreckage of the aircraft, no definite evidence of the origin of the fire was found; nor was any indication discovered of structural failure of the aircraft or its control system prior to impact with the ground. An exhaustive inspection and study of both aircraft engines and propeller assemblies, after complete disassembly of such units, clearly indicated that both engines and propellers were functioning and delivering a high rate of power output at the instant of impact.

An 8" x 10" wooden box cover was found some fifteen feet distant from the path of the aircraft after the first impact, completely surrounded for some distance by dry grass and brush, and located completely outside of the area of the fire. Bound on all edges with aluminum and covered on the upper surface with a rubber mat, this cover originally formed a part of the flooring between the pilot and co-pilot's seat in the control cabin of the aircraft, and covered the emergency control box which contained a gasoline cross feed control valve, dump-valve controls, flare controls, emergency hydraulic controls, a wrench for operating the cross-feed valve and an electric light used for the purpose of illuminating the box. The cover, which is also used as a stop, was hinged on the rear side when in position, and, through contact by means of a metal strip attached to the cover, operated, when raised or lowered, the switch to the light referred to above.

Although no trace of fire was evident on the upper side of this box cover, nor on the edge which had been located farthest from the cross-feed valve, a concentrated burn to the depth of $\frac{1}{2}$" was found, in an area approximating $1\frac{1}{2}$" x 2", on that part of the under side of this box cover which had been located directly over the cross-feed valve when the cover was in position on the control box. Further traces of fire were present on the three edges of this cover that had been located nearest to the cross-feed valve, while the balance of the lower surface of the cover was lightly charred. Indentations, obviously caused by contact during the crash with some object or objects after the charring referred to had taken place, were apparent on the lower side of this cover.

The cross-feed valve, above referred to, is kept at all times in a closed position, except in the event of fuel-line or fuel-pump failure to one engine. In such an event, the opening of the valve permits the fuel pump of the operative engine to supply fuel, through the cross-feed-fuel system, to the one inoperative. Constant pressure, of at least $4\frac{1}{2}$ pounds, is maintained in the cross-feed-fuel system of the Lockheed Model 14-H. Leakage in this cross-feed valve has been experienced upon numerous occasions prior to the time of the accident herein involved, in aircraft of the same make and model operated by Northwest Airlines.

Although the exact origin and source of the fire is undetermined, the condition and location of the emergency-control-box cover, when found, indicates the possibility of fire at a point of leakage in the cross-feed-fuel system in the immediate vicinity of the cross-feed valve, and that such fire could have entered the cockpit prior to crash, through or around the box containing the emergency controls.

The cross-feed-fuel system, as located in the fuselage of Lockheed 14-H aircraft operated by Northwest Airlines, extends through the fuselage directly under the cockpit floor at a point about one-half inch below the bottom of the emergency control box. The control valve is located directly below and near the left side of the emergency control box, with the stem of such valve protruding upward through the bottom of such box. A leakage trough is provided directly below this valve, but no provision had been made for draining such leakage from the trough to a point outside the aircraft. The cross-feed valve, as located, is difficult of inspection or servicing.

FINDINGS

1. Aircraft NC 17389 was certificated as airworthy by the Civil Aeronautics Authority, and had been inspected and maintained in accordance with the currently effective Air Carrier Operating Certificate of Northwest Airlines, Inc.

2. Both airmen held required ratings and Certificates of Competency for the flight and equipment involved, and were authorized in the company's currently effective Air Carrier Operating Certificate for service over the route of Northwest Airlines Trip 1 of January 13, 1939.

3. Northwest Airlines Trip 1 of January 13, 1939, was properly dispatched from Minneapolis, Minnesota, and was subsequently cleared to Fargo, North Dakota, and Miles City, Montana, in accordance with approved company procedure and currently effective Air Carrier Operating Certificate issued by the Civil Aeronautics Authority.

4. The trip was properly cleared to Billings, Montana, subsequent to the receipt of regular sequence and special weather reports indicating weather conditions improved to the extent of permitting safe operation of the trip to that point.

5. The weather at Miles City, Montana, at the time of departure was ceiling 6,000 feet with visibility of 15 miles and a NW wind of 22 M.P.H.

6. The aircraft began its take-off from the SE end of the NW-SE run-way of the Miles City, Montana, airport at 9:14 p.m. (M.S.T.).

7. The take-off and climb were normal until after the aircraft had passed the northwest boundary of the airport and had reached an estimated altitude of 500 feet.

8. Subsequent to executing a normal turn to the left and reaching an estimated altitude of 500 feet, the maneuvers of the aircraft were abnormal.

9. The aircraft crashed at 9:15 p.m. (M.S.T.) in a ravine located 2650 feet west of the western boundary of the Miles City airport and 1200 feet south of a projection of the north boundary of the airport, resulting in the complete destruction of the aircraft and the death of all persons aboard.

10. Parts of the aircraft found near the wreckage, and the unusual maneuvers executed by the aircraft while in flight, indicate that a fire of considerable intensity developed, prior to the crash, in the control cabin of the aircraft, in the immediate vicinity of the gasoline cross-feed valve. It has not been possible to determine the exact origin and source of the fire.

11. The aircraft engines were operating at a high rate of power output at the time of the crash.

12. There were no indications of either structural failure of the aircraft, or its control system, or of aircraft-engine failure prior to impact.

PROBABLE CAUSE

Fire in the pilot's control cabin, resulting in loss of control of the aircraft.

CONTRIBUTING FACTOR

Improper location and installation of that portion of the aircraft's cross-feed fuel system which passed through the fuselage.

RECOMMENDATIONS

It is recommended that, that part of the cross-feed fuel system of the Lockheed 14-H aircraft which passes through the fuselage be relocated, and the installation improved so as to provide for the drainage outside the fuselage of any gasoline leakage which might occur, and to provide for the elimination from the fuselage of any gasoline fumes which might accumulate as a result of such leakage.

- 0 -