

File No. 880-42

Docket No. SA-66

Adopted: October 1, 1942

Released: October 2, 1942

REPORT OF THE CIVIL AERONAUTICS BOARD

On the investigation of an accident involving aircraft of United States Registry NC 21714 which occurred near Miles City, Montana, on May 12, 1942.

## I.

## CONDUCT OF INVESTIGATION

An accident which occurred in the vicinity of Miles City Airport, Miles City, Montana, on May 12, 1942, at about 11:51 a.m. (MWT), resulted in fatal injuries to the captain, first officer, and a Northwest Airlines captain, who was deadheading, and minor injuries to one passenger, while the remaining nine passengers and the stewardess escaped injury. The airplane involved, NC 21714, was being operated at the time in scheduled air carrier service between Chicago, Illinois, and Seattle, Washington, as Trip 1 of Northwest Airlines, Inc. (hereinafter referred to as "Northwest"). The airplane was completely demolished.

The Washington office of the Civil Aeronautics Board (hereinafter referred to as the "Board") was notified of the accident about 2:05 p.m. (EWT). The Board immediately initiated an investigation in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended, (hereinafter referred to as the "Act"). Air safety investigators of the Board were sent to the scene of the accident, the first of whom arrived about 5:35 p.m. the day of the accident. In accordance with the instructions of the Board, the wreckage had been placed under guard. This guard was maintained until the wreckage was officially released to the company on May 22, 1942. A public hearing was held at St. Paul, Minnesota, on May 19, and 20, 1942. C. Z. German, an attorney for the Board, acted as presiding examiner, and the following personnel of the Safety Bureau of the Board participated in the hearing: R. D. Hoyt, Assistant Director; W. K. Andrews,

Chief, Investigation Section; Earl Smith, Air Safety Investigator; R. P. Parshall, Senior Air Safety Investigator; and B. C. Haynes, Air Safety Specialist (Meteorology). Upon the basis of all the evidence disclosed by the investigation, the Board now makes its report in accordance with the Act.

## II

### SUMMARY AND ANALYSIS OF EVIDENCE

#### Air Carrier

At the time of the accident, Northwest was an air carrier operating under currently effective certificates of public convenience and necessity and air carrier operating certificates. These certificates authorized it to engage in air transportation over various routes, including Chicago, Illinois, to Seattle, Washington; Spokane, Washington to Portland, Oregon; Fargo, North Dakota, to Winnipeg, Canada; and Twin Cities to Duluth, Minnesota.

#### Airplane and Equipment

Aircraft NC 21714 was a Douglas, model DC-3A, manufactured by the Douglas Aircraft Company, Inc., of Santa Monica, California, and purchased by Northwest in June 1939. It was powered with two Pratt & Whitney S1C3G engines, and was equipped with Hamilton Standard, constant speed, hydromatic, full-feathering propellers. This model airplane had been approved by the Civil Aeronautics Administration for air carrier operations over the routes flown by Northwest with 21 passengers and a crew of 4. It had been certificated for operation with a standard weight of 24,400 pounds and a provisional weight of

25,200<sup>1/</sup>, not including de-icer equipment. The aircraft was properly loaded and the weight distributed in such a manner that the c.g. location was within the allowable limits. The evidence indicates that the airplane and its equipment had received the overhauls, periodic inspections, and checks which are required by company practice and approved by the Civil Aeronautics Administration, and that the aircraft was in an airworthy condition at the time of its departure from Chicago, Illinois, on the day of the accident.

#### Flight Personnel

The crew of the flight in question consisted of Captain Eugene S. Shank, First Officer Donald H. Nygren, and Phyllis Hallum (Mrs. Nick Berklacich), stewardess.

Captain Shank, aged 37, had been employed by Northwest as a captain since March 23, 1937. He had had approximately 21 years flying experience, and was and check pilot chief pilot/for Northwest at the time the accident occurred. He held an airline pilot certificate with a multi-engine 400-3150 h.p. rating, and had a total of 13,899 hours flying time, of which approximately 2,273 hours had been on

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1/ The "standard weight" of an airplane is the maximum allowable weight for landing while the "provisional weight" of an airplane is the maximum allowable weight for take-off. When an airplane takes off with a weight in excess of the designated standard weight, the weight of the airplane must be reduced by gasoline consumption, prior to arrival at its next scheduled stop, to the extent necessary to bring it within the standard weight for landing. If sufficient gasoline has not been consumed between the time of take-off and any emergency landing, gasoline can be dumped by the use of tested and approved dump valves in order to reduce the total weight to the approved weight for landing. At the time of the accident, the weight of the airplane had been reduced slightly below its authorized standard weight.

Douglas DC-3 equipment. In his capacity as chief pilot, he had conducted a series of flight tests on DC-3's, and was regarded as an authority on the flying characteristics of this type of aircraft. Shank had a total instrument time of approximately 1063 hours. His last physical examination required by the Civil Air Regulations was taken on March 2, 1942. His rest period prior to departure from Minneapolis on May 12, 1942, was approximately 7 days.

First Officer Donald H. Nygren, aged 21, held a commercial pilot certificate with a single-engine landplane, 0-80 h.p. rating. He had been employed by Northwest since April 8, 1942, and had a total of approximately 437 hours flying time, about 77 hours of which were with Northwest on DC-3 equipment. His last physical examination required by the Civil Air Regulations was taken on May 5, 1942. His rest period prior to departure from Minneapolis was approximately  $4\frac{1}{2}$  days.

It appears from the evidence that both Captain Shank and First Officer Nygren were physically qualified and held proper certificates of competency for the flight involved.

Phyllis Hallum, stewardess, and the third member of the crew, had been employed by Northwest for about eight and one-half months.

#### History of the Flight

Northwest's Trip 1 of May 12, 1942, originated at Chicago, Illinois, with Seattle, Washington, as its destination. Several intermediate stops were scheduled, the first of which was Minneapolis, Minnesota. The trip was delayed one hour and eight minutes at Chicago due to connections, mail and cargo handling. It departed from Chicago at 5:08 a.m. (CWT)

and arrived at Minneapolis at 7:30 a.m. The flight crew was changed at this stop and Captain Shank, First Officer Nygren, and Stewardess Hallum became the crew of Trip 1. According to the Northwest flight superintendent, Captain Shank arrived at the field at Minneapolis about two hours before the flight departed, and made a study of the weather map, the current forecast, and winds aloft chart. Trip 1 was delayed about 25 minutes at Minneapolis on account of mail, and departure was made at 8:15 a.m. Arrival at Fargo, North Dakota, was at 9:35 a.m.

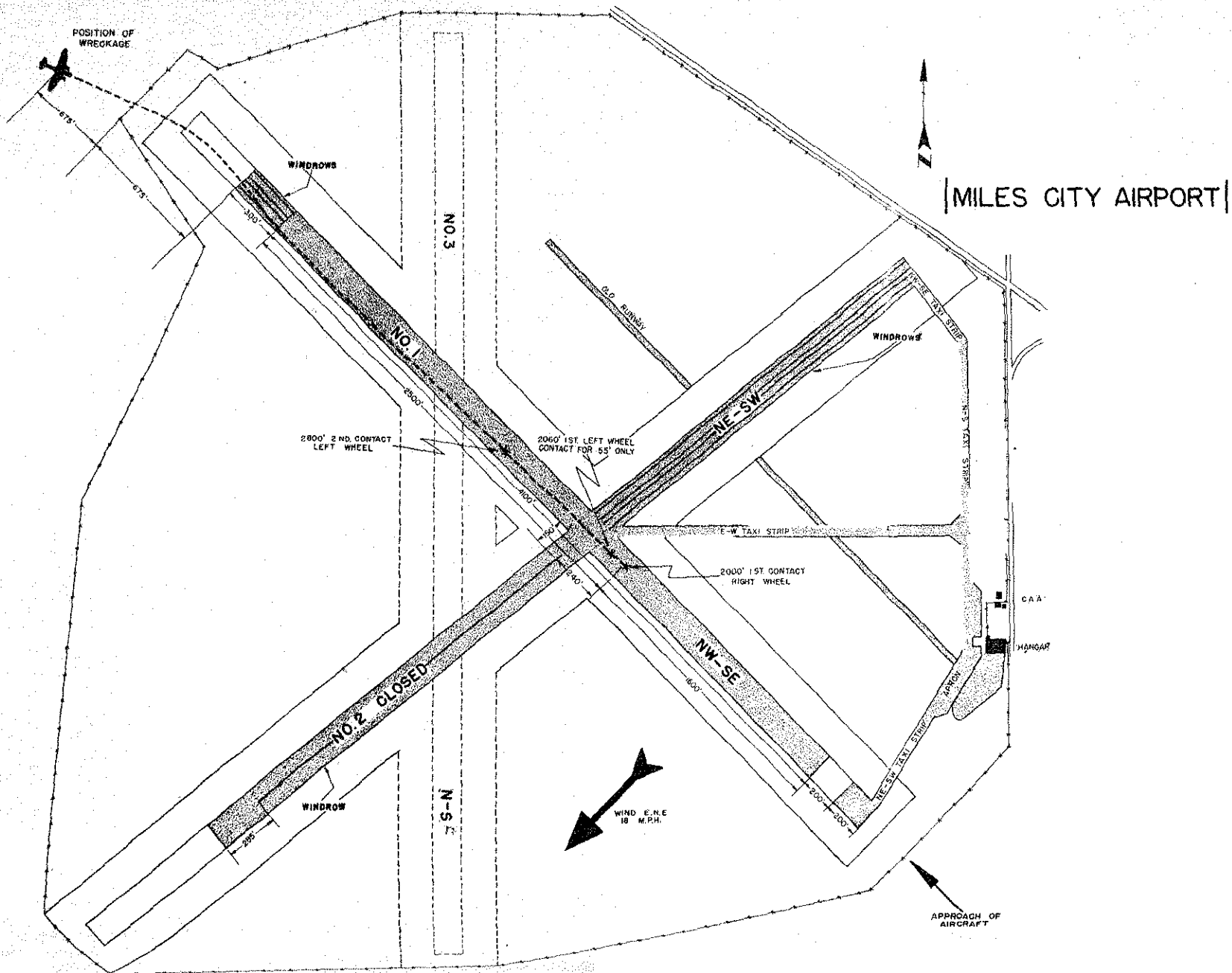
Trip 1 departed from Fargo at 9:45 a.m. (CWT) and arrived at Bismarck, North Dakota, at 10:55 a.m. It departed from Bismarck at 11:09 a.m. with 520 gallons of gasoline on board and was loaded to a gross weight of 25,165 pounds. The next point of intended landing was Miles City, Montana. The flight was cleared from the Minneapolis boundary to the Miles City Airport to cruise at 6000 feet, with permission to cross the Miles City range station at 5000 feet. The elevation of Miles City Airport is 2,626 feet above sea level.

Captain Shank made his first approach to the northwest-southeast runway at the Miles City Airport at 11:27 a.m. (MWT) and it was the consensus of opinion of witnesses that the wheels touched the ground slightly beyond the point of intersection of the two runways. At this point, power was applied and the pilot circled the field to the left and made a second approach. However, on this approach, the captain apparently elected not to land but dragged the field at an altitude estimated as approximately 100 feet. It would appear that during this maneuver, Captain Shank was familiarizing himself with the conditions on

the field and was planning his landing. The following messages were radioed to the flight at 11:32 a.m. and 11:35 a.m., respectively, while Trip 1 circled the airport: "The NW-SE only runway and it 300 feet short on both ends, will have to stay on the runway account soft field and taxi strips." "Windrows of gravel on the ends of the runway about 3 or 4 feet high." Both of these messages were acknowledged as "OK" by Trip 1. The last acknowledged radio contact with the flight was at 11:46 a.m. (MPT) at the conclusion of the second approach. This contact, as given, was: "The wind is right across the runway. If you can't make out runway or hold to runway suggest you pass Miles City as must hold to runway. Billings is closed and Bismarck is open. The wind velocity varies from 12 to 20 NE." Trip 1 made the following acknowledgment: "Will try to land again then advise."

Witnesses estimated that the third and final approach was also slightly high and fast. While several witnesses saw the landing, and one, who was standing near the intersection of the two runways, saw the plane disappear beyond the boundary of the field, there were no eye-witnesses to the actual crash. The airplane's window curtains were drawn in compliance with wartime regulations; consequently, the ten passengers and the stewardess were unable to observe the landing or the subsequent events.

Marks on the runway showed that the right wheel contacted the ground at a point about 240 feet short of the intersection of the two runways. Approximately 60 feet beyond, the left wheel made contact for a distance of about 55 feet, after which there were no left wheel marks for approximately 660 feet, indicating that the aircraft rolled this distance on the right wheel only. The aircraft then rolled on both wheels for





about 2500 feet, with no indication of tail wheel marks. At a point about 300 feet from the end of the usable runway, tire burns indicated that Captain Shank had applied brakes violently in an effort to avoid several windrows of surfacing material, approximately 30 inches high, located at the end of the runway. The left wheel came in contact with the extreme left windrow and scars on the blades indicate that the left propeller also struck this windrow. After passing over the windrow, the aircraft headed straight down the runway between the windrows for about 155 feet, at which time power was evidently applied. The plane became momentarily airborne, as indicated by a break in the track marks, and then settled into a barbed wire fence which enclosed the airport. This fence is 675 feet from the end of the runway. The airplane continued on, still on the ground, and 125 feet beyond the fence the left wing and propeller began contacting the ground. The airplane rolled down a slope and plunged into a gully, where the left wing and engine struck an embankment that projected into a path of the plane. The ship rotated to the left, crushing the nose and pilot's compartment against the embankment, slewed around, and came to rest approximately 1350 feet northwest of the end of the runway, headed in the opposite direction from which the landing was attempted.

Fires which apparently originated in the vicinity of the flares and the right side of the cockpit spread slowly and destroyed most of the wreckage shortly after the passengers had left the ship.

#### The Airport

Miles City Municipal Airport is located on a plateau 2626 feet above sea level. It is a square sod field of 160 usable acres with two 200 by 4600-foot asphalt runways. (See map, opposite page.) At the time of the accident, extensive construction work was in progress necessitating the closing of the field except for its northwest-southeast runway. This runway was in good condition

except for 300 feet of the northwest end and 200 feet of the southeast end, the paving material was placed in parallel windrows about 30 inches high. The remaining 4100 feet of the runway had been completed except for the final seal coat. The ends of this usable part were properly marked by red lights and flags. On the uncompleted northeast-southwest runway there were four windrows of paving material, extending from the northeast end to the edge of the northwest-southeast runway, and one windrow extending from a point 285 feet from the southwest end of the runway to a point 150 feet from the intersection.

On April 27, 1942, the following warning was posted on the bulletin board in the flight office at both Minneapolis and Miles City: "Miles City, Montana, Miles City Airport. Use northwest-southeast strip only, caution, 250 both ends (repairs); men installing lights along edge; balance of field closed. Men and equipment on southeast edge of field, lighted, floodlights for northwest-southeast strip only." The Civil Aeronautics Administration "Weekly Notice to Air<sup>1</sup>men", dated May 7, 1942, carried the same warning. This warning was included in the airports condition report attached to Captain Shank's flight plan.

#### Weather Conditions

The weather conditions were satisfactory for flying in the vicinity of Miles City. The sky was overcast with intermittent light rain and variable visibility. The United States Weather Bureau<sup>2/</sup> report issued at the Miles City Airway Station indicated the following:

At 10:30 a.m. (MWT) ceiling 800 feet, overcast, lower scattered clouds at 400 feet, visibility 9 miles, light rain; wind east-northeast 17 m.p.h. At 11:30, the airway weather report was ceiling 800 feet, overcast, lower scattered

<sup>2/</sup> See appendix for the United States Weather Bureau observations made at 11:30 a.m. at stations in North Dakota and Montana, and for analysis of weather conditions at Miles City, prepared by the Air Safety Specialist (Meteorology).

clouds at 500 feet, visibility 7 miles, light rain; wind east-northeast 19 m.p.h. A special weather observation issued at Miles City at 11:52 indicated that the ceiling was 700 feet, overcast, ragged, light rain, visibility  $1\frac{1}{2}$  miles, wind east-northeast 18 m.p.h., temperature  $50^{\circ}$ , dew point 50, altimeter setting 29.51. At 12:30 p.m., the airway weather report was ceiling 700 feet, overcast, visibility  $1\frac{1}{2}$  miles, light rain, wind east-northeast 17 m.p.h.<sup>3/</sup>

After the accident, the two wind vanes at the Miles City Airport were calibrated. The wind indicator on Northwest's office was found to have a  $7^{\circ}$  minus error; the one on the office of the Civil Aeronautics Administration was found to be correct. Since the Weather Bureau was reporting the wind direction as east-northeast at the time the landing was attempted, it would appear that the wind, instead of being across, may have been slightly aft of the beam of the landing aircraft. This would have the effect of slightly increasing the ground speed of the aircraft during the landing approach and the length of the landing roll.

#### Examination of the Wreckage

The cockpit was crushed and many of the instruments were damaged by the impact or destroyed by fire. The left engine ignition switches and the master ignition switch were in the "on" position; however, the right engine ignition switches were "off". Flaps were "up". Control cables at the cockpit end were destroyed by the intense fire in that vicinity. The right undercarriage and tire were extensively damaged by fire. The tire on the left undercarriage was fully inflated and showed no major damage. One place in the center of the tread was badly abraded in the direction of the normal travel of the wheel. Beyond the abraded mark, the tire had received a blow sufficient to lift the bead from the rim and allow the entry of weeds.

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<sup>2/</sup> The minimums authorized for landing DC-3 equipment, during daylight hours, at the Miles City Airport were: Ceiling 400 feet, visibility 1 mile.

After the preliminary examination of the wreckage at the scene of the accident, the engines were shipped to Northwest's shop at St. Paul, Minnesota where a tear-down inspection was made. This inspection was supervised by an air safety investigator of the Board. No indication was found of any malfunctioning of either engine prior to impact.

Examination of the propellers revealed a pitch setting of approximately 18° and that the variable pitch mechanisms were functioning properly.

The National Bureau of Standards made an examination of the left brake mechanism and found that it was probably in operative condition until the left undercarriage was damaged by impact. The right brake mechanism was so severely damaged by fire that nothing could be detected by examination.

There was no indication that the aircraft or its accessories were not functioning properly at the time of landing.

#### CONDUCT OF FLIGHT

The evidence indicates that the trip was properly dispatched and that its operation was normal until it arrived in the vicinity of Miles City. It is also clear from the evidence that the radio range facilities involved, maintained by the Civil Aeronautics Administration, were functioning properly at the time. The weather conditions at Miles City, while adverse, were above the prescribed minimums and not beyond the capabilities of a pilot of Captain Shank's experience. The evidence shows that Captain Shank and other pilots of Northwest were accustomed to landing at Miles City under similar or even worse conditions. In fact, prior to the completion of the runway used, the Miles City Airport had only a single runway much narrower and shorter than the one in use at

the time of the accident.

We must, therefore, examine the events following Captain Shank's first approach in an effort to determine the causes leading up to the disaster. It would appear that Captain Shank probably intended to complete a landing on the first approach, but being dissatisfied with the situation at the time he contacted the ground, quite properly elected to go around again. The second trip across the airport was obviously for the purpose of observing conditions and planning his landing.

The third approach was most likely made in accordance with a definite plan. It appears that this landing, while shorter than the first, was made much farther down the runway than would be expected normally. Under the variable conditions that existed, it may be that during this approach cockpit vision was momentarily restricted to a considerable degree by a lowering of the visibility and moisture on the windshield. The fact that the wind was probably slightly aft of the beam would tend to carry the plane farther down the runway than Captain Shank anticipated. Furthermore, under the cross-wind conditions that existed, some power was probably being used over a considerable portion of the landing roll. However, with 2500 feet of usable runway in front of him it would still appear that the landing should have been brought to a successful conclusion within that distance. It may well be that restricted cockpit vision again had a bearing on what happened. The Miles City Airport is situated on a treeless plateau so that there is little in the vicinity of the ends of the runways to form a background that would assist in judging

distance. It would appear that Captain Shank was unaware of his real position until he reached a point not over 300 feet from the windrows at the end of the runway. This is evidenced by the severe use he made of his brakes at that point.

It is reasonable to assume that up to the time the airplane skidded into the windrow, nothing more than a minor landing accident impended. The reason for the application of power in an apparent effort to take off is unexplained. Captain Shank, as a result of long experience with Northwest, was undoubtedly thoroughly familiar with every detail of the terrain in the vicinity of the airport. The nature of the terrain immediately adjoining the end of the runway and the presence of the gully 1350 feet away were such as to practically preclude any possibility of a successful take-off from that point.

#### CONCLUSIONS

##### Findings

We find, upon all the evidence available to the Board at this time, that the facts relating to the accident involving aircraft NC 21714, which occurred near Miles City Airport, Miles City, Montana, on May 12, 1942, are as follows:

1. The accident, which occurred at approximately 11:51 a.m. (MPT) to Trip 1, resulted in fatal injuries to the captain, first officer, and a Northwest pilot, who was deadheading, and minor injuries to one passenger. Nine other passengers and the stewardess escaped injury. The airplane was demolished.

2. At the time of the accident Northwest Airlines, Inc. held a currently effective certificate of public convenience and necessity and an air carrier operating certificate authorizing it to conduct the flight.

3. Captain Shank and First Officer Nygren were physically qualified and had proper certificates of competency to perform their duties on the flight in question.

4. Aircraft NC 21714 was currently certificated as airworthy at the time of the accident.

5. At the time of departure from Bismarck, the aircraft was properly loaded and the weight distributed in such a manner that the c.g. was within the allowable limits.

6. The Civil Aeronautics Administration Weekly Notice to Airmen, dated May 7, 1942, carried proper warning of the obstructions on the Miles City Airport. This warning was posted on the bulletin board in the flight office at both Minneapolis and Miles City on April 27, 1942, and was included in the airport condition report which was attached to Captain Shank's flight plan.

7. The weather conditions in the Miles City area at the time Trip 1 landed were within the allowable limits.

8. The radio range facilities were operating normally at the time of the accident.

9. There were no icing conditions which would affect the flight during its approach.

10. The time of the last radio contact was 11:46 (MST), at which time the plane was circling the field to the left after its second approach.

11. The right wheel first contacted the runway southeast of the intersection of the two runways, and slightly beyond the left wheel also contacted the ground. After rolling the entire remaining usable portion of the runway, the left wheel struck a windrow of material located at the end of the runway. After application of power, the aircraft continued through the boundary fence, off the plateau, into a gully, and burned.

PROBABLE CAUSE

Upon the basis of all of the evidence available to the Board at this time, we find that the probable cause of the accident to aircraft NC 21714, on May 12, 1942, was the failure of the captain to complete the landing run in time to avoid the obstruction at the end of the runway, for reasons undetermined, and his action in attempting to take off after striking the obstruction.

APPROVED:

/s/ Harllo Branch  
Harllo Branch

/s/ Oswald Ryan  
Oswald Ryan

/s/ Edward Warner  
Edward Warner



APPENDIX

Report of the weather conditions near Miles City on the morning of May 12, 1942 as taken from the weather map at the Minneapolis, Minnesota, Airport Station and prepared by the Board's Air Safety Specialist in Meteorology.

SYNOPTIC SITUATION

A polar continental air mass covered Nebraska, North Dakota, South Dakota, Montana, and Wyoming. Unstable, tropical maritime air moving northeastward, from the Gulf of Mexico, covered Kansas and Missouri. Dry superior air covered Colorado. The main frontal system between the polar and tropical air was centered in a low pressure system in southeastern Wyoming with a warm front extending eastward through southern Nebraska and a cold front extending from the center through western Colorado.

There was strong evidence of an upper cold front extending northward from the center and along this upper front thunderstorms were occurring. Overrunning was producing precipitation to the north of the center one to two hundred miles in advance of the upper cold front and behind the upper front over west of Montana.

The pressure gradient was weak over the Dakotas but was producing winds of eight to twelve miles per hour from the east and southeast over eastern Montana. A pressure trough extended along the upper cold front and winds were from the north or west over the area two hundred miles west of the trough line. The trough line and attendant precipitation area were moving eastward at fifteen to twenty miles per hour.

Ceilings were unlimited from Minneapolis to Jamestown, N. D. and Dickinson, N. D. and Gelva, N. D. reported twelve to thirteen hundred with visibility above ten. Custer, Montana reported a thunderstorm with moderate rain with visibility three miles. Light rain had started at Miles City, Montana where the ceiling was reported as fifty-five hundred feet and visibility above ten.

By 8:30 a.m. EDT the pressure trough associated with the upper cold front had moved into extreme eastern Montana with precipitation continuing to the west of the trough and for about one hundred miles in advance of the upper front.

Ceilings were lowering to six to nine hundred feet between Dickinson, N. D. and Custer, Mont. with light rain and light fog reducing the visibility to three to four miles. The pressure center moved eastward and at 8:30 a.m. was located on the Wyoming-Nebraska border. The warm front of the system moved northward into southern Nebraska.

By 2:30 p.m. EDT (12:30 p.m. MDT) the trough associated with the upper cold front had broadened somewhat and become oriented in a north-west-southeast direction extending from southeastern Montana through western Nebraska.

Precipitation had spread eastward to Bismarck, N. D. and continued west of Bismarck with ceilings seven to twelve hundred feet Dickinson to Billings and visibilities two to four miles in light rain and light fog. Miles City reported overcast with ceilings estimated seven hundred feet and visibility one and one-half miles with light rain. Lower scattered clouds were reported at four to five hundred feet in the rain area west of Golva, N. D.

Reports made at 11:30 a.m. EDT at stations in North Dakota and Montana were as follows:

11:30 a.m. EDT Golva, N. D.	Ceiling 900 feet, overcast, lower scattered clouds at 500 feet, visibility 5 miles, light rain, light fog, temperature 47, dewpoint 46, wind east 25, altimeter 29.58.
Miles City, Montana	Ceiling 800 feet, overcast, lower scattered clouds at 500 feet, visibility 7 miles, light rain, temperature 51, dewpoint 50, wind east-northeast 19, altimeter 29.51, overcast ragged, visibility 2½ miles southwest
Custer, Montana	Ceiling estimated 1200 feet, overcast, visibility 5 miles, light rain, temperature 50, dewpoint 50, wind northeast 11, altimeter 29.50, overcast ragged, visibility 9 miles southeast.
Billings, Montana	Closed ceiling estimated 200 feet, overcast, visibility ¾ mile, variable, light rain, light fog, temperature 44, dewpoint 44, wind south-southwest 8, altimeter 29.51
Miles City SPECIAL 11:52 a.m. EDT	Ceiling 700 feet, overcast, visibility 1½ miles, light rain, temperature 51, dewpoint 50, wind east-northeast 18, altimeter 29.51, overcast ragged.