

## CIVIL AERONAUTICS BOARD

## AIRCRAFT ACCIDENT REPORT

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NORTHWEST AIRLINES, INC., DOUGLAS C-54A-DC, N 48762,  
MISSOULA, MONTANA, OCTOBER 28, 1960SYNOPSIS

On October 28, 1960, at 1139 m. s. t., a Douglas C-54A-DC, N 48762, operated by Northwest Airlines, Inc., as Flight 104, crashed and burned approximately 13 nautical miles northwest of the Missoula, Montana Airport. The captain, first officer, two hostesses and all eight passengers died in the crash.

The flight took off from Spokane, Washington, on an instrument flight plan. En route radio reports were routine and indicated the flight was on schedule, and in no difficulty.

The aircraft was observed from the ground flying on course toward Missoula in and along the Clark Fork Valley within six nautical miles west of the scene of the crash. The engines were running and the aircraft was descending as if on an approach to a landing.

As the aircraft descended deeper into the valley, flight visibility became restricted by light snow showers, and the tops of the mountains surrounding the valley were obscured by the overcast.

The aircraft entered a steep left banking turn and the nose was raised in an apparent attempt to turn and climb out through an intersecting valley; however, the aircraft continued to sink toward the ground, rolled to the left and crashed inverted.

The Board believes the accident was caused by the failure of the pilot to continue in accordance with his IFR flight plan by attempting a VFR approach during instrument weather conditions.

Investigation

Northwest Airlines Flight 104 of October 28, 1960, was a scheduled passenger flight originating in Portland, Oregon, and was scheduled to arrive at Missoula, Montana, at 1155.1/ En route stops were Yakima and Spokane, Washington.

The aircraft was a Douglas C-54A-DC, N 48762. No aircraft maintenance was requested at Spokane and there were no aircraft discrepancies carried on the maintenance log. The flight had been dispatched from Portland according to the

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1/ All times herein are mountain standard based on the 24-hour clock.

company procedures. The crew that flew the aircraft from Portland to Spokane advised that the flight had been routine except they had experienced stronger tail winds than had been expected between Ellensburg and Ephrata, Washington.

Captain James R. Perkins and First Officer Harry C. LaBart took over the flight at Spokane and were to take the flight on to Minneapolis, Minnesota, via Missoula and other intermediate stops.

The flight departed the Spokane terminal at 1050, and the crew received the following instrument flight clearance from the Spokane Tower: "ATC clears Northwest 104 to the Missoula Airport via Victor 2, maintain 9,000." The clearance was correctly read back to the tower by the flight, and the Spokane Tower logged the flight's takeoff time as 1056.

The reported existing weather at Missoula at 0957 was: Measured 5,000 feet, overcast; 20 miles visibility; temperature 42 degrees; dewpoint 35 degrees, wind east-southeast 8 knots; altimeter 29.90; breaks in overcast. This weather report was available to the flight crew at Spokane prior to departure.

The route weather forecast, Minneapolis/Midway west, issued by Northwest Airlines, and attached to the flight papers, was as follows: "1000 to 2000 hours, October 28, 1960; weak cold front at 0800 aligned northwest to west-southwest through Spokane to Portland moving eastward at 15 knots. Freezing level 6,000 feet from Seattle to Bismarck and 9,000 to 10,000 feet from Bismarck to Minneapolis-St. Paul. From Spokane to Billings and through southern Montana, broken to overcast deck of strato-cumulus clouds with bases 10,000 feet and tops at 14,000 feet with a higher broken deck. Probable clear air turbulence from Seattle to Mullan Pass from 18,000 feet to 25,000 feet."

No verbal briefing is known to have been given to the crew by the Weather Bureau.

After Flight 104 departed Spokane, the following 1057 Missoula weather observation was released to the teletype circuits by the Weather Bureau: "Measured ceiling 3,900 feet, overcast; 40 miles visibility; temperature 44 degrees; dewpoint 31 degrees; wind east-southeast 7 knots; altimeter 29.87; breaks in overcast; snow showers of unknown intensity in mountains northeast."

Recorded radio communications between the flight and Northwest Airlines Spokane Radio revealed that the flight had received this 1057 Missoula weather sequence

According to the flight plan, Flight 104's true airspeed was to be 183 knots and the estimated time en route was 50 minutes. Helena, Montana, was their alternate destination should Missoula have weather conditions less than a 3,000-foot ceiling and two miles visibility upon their arrival.

Flight 104 advised the Northwest Airlines Spokane Radio its estimated arrival time over Mullan Pass, Idaho, was to be 1124; however, the flight reported to Spokane Center as being over Mullan Pass at 1122, at 9,000 feet, and estimated its arrival at the Missoula Omni Range at 1144. Spokane Center then relayed the flight's Mullan Pass position report to Great Falls Center. Great Falls Center, by a separate computation, estimated an identical arrival time for the flight over the Missoula Omni Range.

At 1136, Great Falls Center contacted Flight 104 and issued the following clearance: "Northwest one zero four is cleared for an approach to the Missoula Airport, over." Flight 104 answered, "Northwest one zero four is cleared for an approach to the Missoula Airport, thank you." This was the last communication heard from the flight. Three minutes later, at 1139, Flight 104 crashed at the foot of Cayuse Mountain at an elevation of 3,140 feet m.s.l.

The aircraft had been observed in normal flight approximately 21 nautical miles west of the crash site. Witnesses observed it in normal flight 6 to 6-1/2 nautical miles west of the crash site at an altitude of 6,700 feet to 6,800 feet m.s.l. Others traced its flight down to where it was seen 2-1/2 nautical miles west of the crash site in what appeared to be a normal but rapid descent.

The aircraft had entered the area of the crash on a heading of 060 degrees at approximately 500 feet above the valley floor. Within approximately 1/2 mile southwest of the point of impact, the aircraft began to bank into a left turn, and the bank increased to a left wing-down attitude of near 45 degrees. A mushing and nose-high attitude accompanied the bank and the engines were heard to be running at high speed. The aircraft nosed downward, rolled to the left to an inverted position, and struck the ground. The direction of impact was 037 degrees, magnetic, and the wreckage distribution followed that heading. An intense fire followed.

At 1144, a DC-4 landed at Missoula. The pilot stated that while his flight was in the landing traffic pattern at Missoula, he observed the weather conditions to the northwest toward the accident site. He stated there was a line or wall of dark clouds and showers west of the field obscuring the mountains and Nine-Mile Valley. He also stated there was smoke blowing from the pulp mill west of the airport toward the Nine-Mile Valley.

At 1159, the surface observation at Missoula read as follows: "4,300 feet scattered; estimated 6,500-foot overcast; 40 miles visibility, pressure 1011.3 millibars; temperature 47 degrees, dewpoint 32 degrees; wind east-southeast 6 knots; altimeter 29.81; breaks in overcast; pressure falling rapidly; snow showers of unknown intensity obscuring mountain tops northwest."

Thirty-six minutes after the crash, pilots from Missoula arrived over the site. They said the base of the overcast was from 1,200 to 1,500 feet above the valley floor which is approximately 3,000 feet m.s.l. They also stated there was a light rain falling and the tops of the higher surrounding mountains were obscured by clouds.

The weather observer at the Missoula Airport, who was on duty at the time of the accident, stated that the 40-mile visibility recorded in the 1057 and 1159 observations was based upon his ability to see Palisade Mountain on a true bearing of 173 degrees from his point of observation on the airport. He stated further that the clarity of the outline of closer mountains in other quadrants was a factor in the determination of visibility. Weather Bureau instructions in effect at the time of the accident did not require the recording of varying visibilities in different quadrants unless the visibility in a particular quadrant was less than three miles or the variation was considered to be operationally significant.

From the Missoula Airport Weather Station, the observer's view of the accident site was obscured by mountains to the west. His unobstructed view up the valley to the west was about nine statute miles. This was in the direction from which Flight 104 would have been approaching.

The area within a one-nautical-mile radius around the crash site is where the Clark Fork Valley, through which U. S. Highway 10 and two railroads run, intersects the southeast end of Nine-Mile Valley. The Nine-Mile Valley extends northwestward from the crash site about 14 nautical miles and its floor rises only 321 feet in that distance. The valley is open also at the northwest end. The intersection of the two valleys forms a bowl, and Flight 104 entered the bowl from the west on a heading of approximately 060 degrees magnetic. This heading forms an approximate 90-degree angle with a heading up the Nine-Mile Valley. Between the bowl and Missoula, the Clark Fork Valley makes an "S" turn, and between the bowl and Missoula lay the snow showers or wall of dark clouds which would have necessitated instrument flight.

Examination of the powerplants did not reveal any failure of parts or exhibit any unsatisfactory condition that could have led to any malfunction. Examination of propellers 1, 2, 3, and 4 revealed the following data respectively. Dome positions: 32, 33, 27, and 30 degrees; shim plates (average) 30, 33, 32, and 31 degrees. The low pitch position is 24 degrees. The propeller governors from engines Nos. 2 and 3 were recovered. The heads from these governors were installed on serviceable bodies and indicated on a governor test bench an r.p.m. of 2969 and 2971, respectively.

The elevators, ailerons, rudder surfaces, and associated hinge supports were found at the wreckage site. The wing flaps and the three landing gears were determined to have been in the fully retracted position upon impact. The aileron and rudder trim systems indicated a zero condition, and the elevator tab measured seven degrees down (aircraft noseup). A major portion of the fuselage, from the nose to the point where the empennage had separated, had been destroyed by fire. Examination of the control cables revealed they had been properly attached prior to impact. Both wing tips, both horizontal stabilizer tips, and the vertical stabilizer tip were located at the wreckage site.

One altimeter was found in the wreckage and it was set at 29.87 inches of mercury, which was the setting transmitted to the flight by Great Falls Center just prior to issuing the approach clearance. No other instruments could be found that gave any reliable readings. The barometer had been falling since the official reading was put on the teletype sequence report of 1057 and, at the time of the accident, the barometer was approximately 29.83 inches of mercury at Missoula. The difference of .04 inches was determined to be equivalent to about 48 feet of altitude, at 8,000 feet m.s.l.

Witnesses who had definitely seen the aircraft said it was not trailing smoke or flames and that no items were observed to fall or be hanging from the aircraft prior to impact. Extensive investigation was conducted to determine if the flight did or could have collided with another aircraft. There was no record of any aircraft, civil or military, having been near Flight 104 between Mullan Pass and Missoula, and examination of the wreckage gave no indication to that effect.

In an effort to determine whether the aircraft had struck any ground objects as it was descending, an extensive ground search of the area west of the accident site was conducted with negative results. The search party, on foot, inspected

an area along a line beginning at U. S. Highway 10 approximately eight statute miles along the mountain ridges to the Stark Mountain Lookout, 7,349 feet above mean sea level.

The approved instrument approach procedure to the Missoula Airport allows a straight-in approach from the west providing the aircraft remains at 9,000 feet m.s.l., until reaching the Alberton Fan Marker, located within two nautical miles west of the crash site. After passing the Fan Marker, an aircraft may descend to a minimum of 6,200 feet m.s.l., on a course of 097 degrees magnetic to the Omni Range, located on the airport, or 096 degrees to the low-frequency range, which is located 1.5 miles from the airport. If the field is not sighted or the landing accomplished by the time the aircraft reaches that point, the missed approach procedure must be followed.

A special flight check of communications facilities and navigational aids following the accident revealed that the Alberton Fan Marker and Missoula Omni Range were operating within prescribed limits. Communications with either Federal Aviation Agency or Northwest Airlines ground stations were satisfactory above 6,000 feet m.s.l. from Missoula to a point approximately 20 nautical miles northwest of the Alberton Fan Marker.

#### Analysis and Conclusions

The evidence supports the conclusion that the flight was properly dispatched in accordance with company procedures. The flight crew was properly certificated and currently qualified in the aircraft and over the route from Spokane to Missoula, and had had sufficient off-duty time prior to the flight. The aircraft was properly certificated and loaded within allowable limits.

All radio conversations between the flight and ground stations gave no indication that anything had gone wrong. The estimated arrival time over the Missoula Omni Range calculated by both the flight and Great Falls Center was identical, therefore, there was no apparent reason to suspect that the flight's progress would be anything but as planned. The approach clearance to the Missoula Airport issued by Great Falls Center to the flight at 1136 meant that no traffic existed that would conflict with the flight's planned approach and that it was cleared to continue.

In comparing the 0957 and 1057 reports of the Missoula weather, the overcast lowered 1,100 feet but the visibility increased 20 miles. Then, during the time the flight was en route, the clouds forming the overcast at 3,900 feet began breaking up and raised 400 feet. There was an overcast at 6,500 feet - 3,500 feet above the minimum approach altitude over the field. This latter conclusion is supported by the 1159 observation 20 minutes after the accident. Exactly what the conditions were at the Missoula reporting station at 1139 is not known, but the trend was toward improvement.

The testimony and evidence bear out the fact that ceilings and visibilities usually are considerably lower in the mountains than over the reporting stations and were, in fact, lower in this case.

Weather Bureau data revealed the existence of light to moderate icing conditions probably in clouds and precipitation above the freezing level, which was 6,500 feet m.s.l. between Spokane and Missoula. Light to moderate turbulence

should have been present from the surface to 9,000 feet on the route from Spokane to Missoula. The average cloud bases in the vicinity of the accident site were at or near 5,000 feet m.s.l., with haze and light showers. Tops of the mountains above 5,000 feet m.s.l. were obscured by the overcast. The visibility was from one to three miles with one mile in light showers.

The Board is of the opinion that the visibility from the weather station in the direction of the accident site and at the time of the accident was at most about nine miles - the visibility being in that case obstructed by mountains at ground level and low clouds or showers at a reasonable flight level. From Flight 104's viewpoint, however, as it approached and entered the bowl (formed by the two intersecting valleys mentioned earlier), the visibility toward the Missoula Airport at the flight's apparent altitude of 500 feet above the valley floor was blocked not only by the mountains but by the showers or wall of dark clouds. Whether the captain thought, from his knowledge of the weather reports, that he would have 20 or even 40 miles visibility when nearing Missoula, and was therefore under a misconception as to the exact visibility, is a matter of conjecture. Moreover, whether the visibility of less than 40 miles (in the direction from which Flight 104 was expected to approach the Missoula Airport) was of enough operational significance to require reporting, it is noteworthy in the interest of safety in that possible misunderstanding on the part of the captain might have existed.

Flight 104 was below the clouds and on a heading toward Missoula within 6 to 6-1/2 nautical miles west of the accident site at or near an altitude level with the tops of the surrounding mountains and was descending. This would put the aircraft below 9,000 feet m.s.l., the minimum en route altitude to which it had been assigned by ATC, in accordance with his IFR clearance. Whether at this time the flight had received its clearance to the Missoula Airport is not known; but under the assumption that it had received the clearance, it being one omitting a specific type of approach, Flight 104 was free to descend to approach altitude of 6,200 feet m.s.l. after passing the Alberton Fan Marker and proceed on to the airport. Then, if VFR flight conditions were encountered, the flight would be free to proceed in accordance therewith.

The Board believes the captain knew his approximate position and was familiar with the terrain and the general course of the Clark Fork Valley leading on to Missoula, and was also familiar with the intersection of the Clark Fork and Nine-Mile Valleys. It also appears to the Board that the flight was attempting to proceed to Missoula under VFR and was descending to stay beneath the ceiling that was lowering as the aircraft approached and entered the bowl. The visibility through the airspace leading around the mountains that had to be circumnavigated in order to continue on to Missoula was reduced to the extent that instrument flight was required. The hazard involved if the flight had continued VFR around the mountains at low altitude in reduced visibility was obvious, and at that point a sharp left turn of about 90 degrees was necessary in order to proceed up the intersecting Nine-Mile Valley under VFR conditions. In attempting this turn, the aircraft was maneuvered in a manner wherein control of it was lost and the crash resulted. It is also obvious that the pilot should have made an IFR approach in view of the mountainous terrain and the weather conditions surrounding the accident site which precluded VFR flight.

Examination of the wreckage supports the conclusion that the aircraft was completely intact prior to impact. This was corroborated by witness statements,

the extensive ground search, and examination of the wreckage. Moreover, the results of the exhaustive inquiry as to the existence of other air traffic in the area at the time Flight 104 was en route from Mullan Pass to Missoula indicated conclusively that no midair collision with other aircraft had occurred. Although the barometer had fallen .04 inches of mercury since the time the altimeter in the aircraft had been set, the error is not considered to have been harmful in this case since it was only about 48 feet and the crew apparently had visual contact with the ground.

The powerplants were capable of normal operation up to the time of impact and in no way contributed to the cause of the accident. The engines were developing power at the time of impact and, although the exact amount of power being developed was undetermined, it is most probable that each engine was developing cruise-to-climb power.

There was no evidence of the malfunction of any aircraft system.

Probable Cause

The probable cause of this accident was the failure of the pilot to continue in accordance with his IFR flight plan by attempting a VFR approach during instrument weather conditions.

BY THE CIVIL AERONAUTICS BOARD.

/s/ ALAN S. BOYD  
Chairman

/s/ ROBERT T. MURPHY  
Vice Chairman

/s/ CHAN GURNEY  
Member

/s/ G. JOSEPH MINETTI  
Member

/s/ WHITNEY GILLILLAND  
Member

## S U P P L E M E N T A L   D A T A

### Investigation and Hearing

The Civil Aeronautics Board was notified of this accident at 1230, October 28, 1960. An investigation was immediately initiated in accordance with the provisions of Title VII of the Federal Aviation Act of 1958. A public hearing was ordered by the Board and held in the Florence Hotel, Missoula, Montana, on January 18 and 19, 1961.

### Flight Personnel

Captain James R. Perkins, age 37, of Spokane, Washington, held a valid FAA airline transport pilot certificate with ratings in DC-3 and DC-4 with single and multiengine land privileges. He had a total of 11,620 flying hours with 8,070 in the DC-4 and C-54 type aircraft. The date of his last first-class medical examination was September 23, 1960 (no waivers). Captain Perkins' last line check was February 28, 1960; his last proficiency check was October 14, 1960; and he attended a CAR refresher course on June 13, 1960.

Copilot Harry C. LaBart, age 36, of Bellevue, Washington, held a valid FAA commercial pilot certificate with ratings in DC-4, DC-6, and DC-7 aircraft with single and multiengine land privileges. He had a total of 3,221 flying hours of which 446 hours were in the DC-4 and C-54 type aircraft. Mr. LaBart's last physical examination was a first-class type with no waivers given on October 13, 1960. His last copilot proficiency check was given on June 10, 1960, he was requalified in the DC-4 equipment on October 14, 1960; and he attended a CAR refresher course on May 26, 1960.

Miss Louise Kight, stewardess, age 22, of Spokane, Washington, had been with the company since October 16, 1959. She had attended an Air Sea Rescue course on October 5, 1960.

Miss Ethel DeFreese, stewardess, age 24, of Spokane, Washington, had been with the company since February 27, 1959.

### The Carrier

Northwest Airlines, Inc., is a Minnesota corporation with its principal office at 1885 University Avenue, St. Paul, Minnesota. The corporation holds a current certificate of public convenience and necessity granted by the Civil Aeronautics Board, and possesses valid air carrier certificates for its operations.

### The Aircraft

N 48762 was a Douglas C-54A-DC. Date of last overhaul was May 21, 1960, with a total time on the aircraft at that date of 35,961.19. The last periodic check had been completed on October 6, 1960, with a total time since overhaul of 881:55.

It was powered by four Pratt & Whitney, model 2SD13G engines with Hamilton standard propellers, model 23E50.

Specific Data Engine No. 1, TSO 1632:26, engine No. 2, TSO 73:42; engine No. 3, TSO 871:56; engine No. 4, TSO 606:32. Propeller No. 1, TSO 172:57; propeller No. 2, TSO 1614:58; propeller No. 3, TSO 269:49, and propeller No. 4, TSO 567:08.