

DEPARTMENT OF COMMERCE
BUREAU OF AIR COMMERCE

Washington

November 16, 1937

REPORT OF INVESTIGATING BOARD

Statement of probable cause concerning an accident which occurred to an aircraft of United Air Lines Transport Corporation near Humpy Ridge, Utah, on October 17, 1937

To the Secretary of Commerce:

On October 17, 1937, at approximately 9:00 P. M., Mountain Standard Time, at a point about 51 miles east of Salt Lake City, Utah, and 20 miles south and slightly west of Knight, Wyoming, an airplane of United States registry, while being flown in scheduled interstate operation, carrying mail, passengers and express, met with an accident resulting in death to all on board and the complete destruction of the aircraft.

The pilot, Earl D. Woodgerd, held a Federal transport pilot's license and a scheduled air transport rating. The report of his last physical examination, as required by the Department of Commerce and taken on August 9, 1937, showed him to be in good physical condition for flying. A subsequent physical examination, taken on October 13, 1937, in conformity with company regulations for first pilots, also showed him to be in excellent physical condition. This latter examination was taken shortly after Pilot Woodgerd's return from a vacation. Pilot Woodgerd's record shows that he had had a total of over 11,000 hours flying experience and had flown over the Cheyenne-Salt Lake Division of this air line for a total period of time of more than three years. The co-pilot, John B. Adams, held a Federal transport pilot's license and a scheduled air transport rating. His latest physical examination, taken on August 2, 1937, showed him to be in good physical condition. His record shows that he had more than 3,500 hours flying time as co-pilot with this air line. The testimony shows that both pilot and co-pilot enjoyed excellent professional reputations with their company and fellow pilots. The third member of the crew was Miss Leah Derr, stewardess.

Passengers on board were:

Mrs. Campbell Pritchett
Washington, D. C.

Charles D. Renouf
Washington, D. C.

D. A. McMillan
Murray, Utah

William Pischel
Salt Lake City, Utah

Curtis L. Jensen
San Francisco, California

Mrs. J. A. Hammer
Cleveland, Ohio

John Conboy
Cleveland, Ohio

Ralph McKeown
Glendale, California

William James Hart
Sharon, Pennsylvania

George Ferreira
Cheyenne, Wyoming

William H. Pitt
New York, New York

Mrs. Phyllis Ferreira
Cheyenne, Wyoming

James Pergola
Bronxville, New York

Charles S. Jamison
Denver, Colorado

Louis Cleaver
Portland, Oregon

Dr. Louis Gross
New York, New York

The airplane, a Douglas, model DC-3A, was owned and operated by the United Air Lines Transport Corporation of Chicago, Illinois. It was inspected and approved for license by the Department of Commerce on December 8, 1936, and bore Federal license number NC-16074. Minor changes accomplished by the company after this date were inspected and approved by the Department of Commerce on September 15, 1937. De-icing equipment had been installed on the propellers only. At the time of the accident, it was being operated between Cheyenne, Wyoming, and Salt Lake City, Utah, as a part of Trip One of October 17, 1937. This trip was scheduled to originate in Newark, New Jersey, at 8:00 A.M., Eastern Standard Time, October 17, 1937, and to terminate at Oakland, California, at 1:18 A.M., Pacific Standard Time, October 18, 1937. This operation was conducted under a valid Federal Letter of Authority. At Cheyenne, airplane NC-16074, which had been serviced subsequent to its arrival 15 hours previously, was substituted for the airplane which had arrived at Cheyenne. The first scheduled stop after departing Cheyenne was Salt Lake City, Utah.

The scheduled time of departure of Trip One from Cheyenne was 6:01 P.M., Mountain Standard Time. Actual departure was not made until 6:26 P.M. due to the late arrival of this trip at Cheyenne and a slight passenger delay. The United States Weather Bureau 5:41 P.M., MST, sequence reports for the airway between Cheyenne and Salt Lake City, the point to which the flight was cleared, were as follows:

	<u>Ceiling</u>	<u>Sky Conditions</u>	<u>Visibili- ity (mi.)</u>	<u>Temperature & Dew Point</u>	<u>Winds</u>
Cheyenne	Unlim.	Clear	60	54/36	NW 5
Medicine Bow	Unlim.	Scattered, lower scatter- ed 3000	40	47/37	SW 31
Laramie	Unlim.	Scattered 3000	30	47	WSW 32
Bitter Creek	Unlim.	High overcast, Lower scattered 2000	30	46	WSW 24
Cherokee	Unlim.	High broken, Lower scatter- ed 3000	20	45/39	SW 24

	<u>Ceiling</u>	<u>Sky Conditions</u>	<u>Visibili- ity (mi.)</u>	<u>Temperature & Dew Point</u>	<u>Winds</u>
Granger (Spl)	Estima- ted 5000	Light rain overcast	15	47	WSW 18
Rock Springs	Unlim.	High overcast	25	51/37	WSW 25
Knight	Estimat- ed 2000 ft.	Overcast, lower broken, light rain	20	40/39	SSW 22
Coalville	Estima- ted 3000	Overcast, light rain	15	48	SW 2
Salt Lake	Estima- ted 4000 feet	Overcast, sprinkling	15	55/52	SW 7

The United States Weather Bureau general forecast, issued from Salt Lake City and covering this area for the period 2:30 P.M. until 10:30 P.M., MST, on the date of this flight, was as follows:

Salt Lake to Cheyenne - Clear to scattered clouds southern Utah and southeastern Nevada Stop Scattered to broken changeable cloudiness remainder district with scattered showers with snow flurries higher mountains Stop Ceilings precipitation over mountains low otherwise in clouds 1 to 4 thousand Stop Visibility 10 or better except low to 5 in precipitation over mountains. Salt Lake, Rock Springs, Cheyenne terminals Stop Scattered to broken changeable high and lower cloudiness 2 to 5 thousand lowering to 1 to 4 thousand in occasional sprinkles to light showers Stop Visibility 10 or better.

According to the testimony of the company dispatcher at Cheyenne, the flight plan for this trip as partially prepared by him before consultation with the pilot and co-pilot, showed contact flying Cheyenne to Rock Springs and instrument flying Rock Springs to Salt Lake. The altitude was not entered by him. After consultation with Pilot Woodgerd, the dispatcher states that Pilot Woodgerd said that he would fly "intermittent instruments" instead of "instruments" between Rock Springs and Salt Lake and entered the altitude of 10,000 feet on the flight plan. No correction was made on the flight plan changing the previous entry "instruments" to "intermittent instruments". However, the preliminary dispatch message, said by the dispatcher to have been dictated to him by the pilot, read as follows:

6:12 to 6:13 P. M. Cheyenne to Rock Springs and Salt
Lake dispatch trip 1 of the 17th Woodgerd Adams Derr
74 estimated 6:22 P. M. cleared to Salt Lake, Rock
Springs-Salt Lake intermittent instruments Cheyenne
alternate; Cheyenne-Salt Lake 10,000, 3 hrs, 5 minutes,
alternate plan return to Cheyenne, Laramie alternate
622 gas stop 23-47
(Received at Rock Springs and Salt Lake)

The average wind expected, as entered on the flight plan, was WNW 35. At the time of departure from Cheyenne, there was on board 622 gallons of fuel and 200 quarts of oil, an amount sufficient for approximately seven hours of flight at normal cruising speed.

After leaving the immediate vicinity of Cheyenne, radio contacts with trip 1 were as follows:

- (1) 6:56 P.M. (Cheyenne log) - Adams United 1 - Two Rivers 55
10,000 high broken visibility unlimited temperature 38
slightly rough. Cheyenne acknowledged. Also shown in
Rock Springs log.
- (2) 7:14 P.M. (Salt Lake log) - Salt Lake to Cheyenne and
Rock Springs - advise trip one that United two reports
Knight range not operating. Signed Salt Lake. (United
1 acknowledged direct)
- (3) 7:41 P.M. (Salt Lake log) - Salt Lake to United 1 Copy
Rock Springs - Knight range operating on 382 kilocycles -
signed Salt Lake. United 1 and Rock Springs acknowledged.
Also shown in Rock Springs and Cheyenne logs.
- (4) 7:43 P.M. (Rock Springs log) - Adams United 1 - Cherokee
7:41 PM 10,000 high thin overcast few lower scattered
visibility unlimited temperature 37 smooth Rock Springs
gave Kollsman 2980. United 1 acknowledged
Also shown in Cheyenne log
- (5) 8:16 P.M. (Rock Springs log) - Adams United 1 - over
Rock Springs 8:15 PM 10,000 intermittent instruments
breaks below Rock Springs range compass course 248
temperature 35 slightly rough.
Rock Springs gave Kollsman 2976
United 1 acknowledged.
Also shown in Salt Lake and Cheyenne logs.
- (6) (At this point dispatcher Wunderlich came on remote
position at Salt Lake and talked direct to the Pilot)
8:18 P.M. (Salt Lake log - Salt Lake radio operator
copied through interphone) - Salt Lake to United 1 -
we have fairly heavy rain now ceiling estimated 6,000
drifting scud above field at 2200 visibility 10 miles
Western Air Express picked up ice at 10,500 expect it
to remain about the same.
United 1 acknowledged.
Also shown in Rock Springs and Cheyenne logs.
- (7) 8:19 P.M. (Salt Lake log) - United 1 to Salt Lake -
give us Salt Lake Kollsman please.
Salt Lake to United 1 - Kollsman rising rapidly 2986
and wind shifted to north about 45 minutes ago.
United 1 acknowledged.
Also shown in Rock Springs and Cheyenne logs.

- (8) 9:05 P.M. (Salt Lake Log) - Salt Lake to United 1 - Salt Lake gave 843PM weather sequence and I can see the lower beacon in Emigration and all the city lights visible dimly see lights of 33rd and flash of Saltair beacon.
United 1 did not acknowledge.
Salt Lake to United 1 - light rain now at Salt Lake
United 1 did not acknowledge.
Also shown in Rock Springs and Cheyenne logs.
- (9) 9:11 P.M. (Salt Lake log) - Salt Lake to United 1 - no Knight report received. Salt Lake Kollsman 2986
United 1 did not answer.
Also shown in Rock Springs and Cheyenne logs.
- (10) 9:15 P.M. - Following this time numerous transmissions were made by Salt Lake, Rock Springs and Cheyenne in an effort to establish communication with the plane but were unsuccessful.

When Trip One did not arrive at Salt Lake City within a reasonable time of schedule and failed to respond to radio calls, steps were taken to organize search flights. The first airplane left Salt Lake City at about 1:30 A.M., MST. Weather and darkness hampered the search considerably. However, the wreckage was located from the air at about 9:35 A.M., October 18th. Due to the inaccessibility of the location, it was 10:00 P. M., October 18th, before ground parties reached the wrecked airplane. It was found to have crashed into the side of a mountain known locally as Humpy Ridge at an elevation of slightly more than 10,000 feet.

A careful examination of the wreckage indicated conclusively that the airplane had struck the side of the mountain while traveling in approximately normal level flight, on a compass heading of approximately 235° and at or near cruising speed. All blades of the propellers were found at the scene and internal damage incurred alike in both engines indicated that they were functioning normally at the time of impact. There was no evidence of structural or control failure. It was established that the landing wheels were in the "up" position. There was recovered from the wreckage the flight analyzer, an instrument which records the altitude of flight, indicates the periods of flight during which the automatic pilot is in use and shows those periods when the aircraft radio transmitter is being used for transmission. The recording made by the flight analyzer indicated that after the initial climb at Cheyenne, the airplane had been flown consistently at an altitude of between 10,000 and 10,400 feet and that the automatic pilot had been in constant use since a few minutes after take-off. The record of radio transmission from the aircraft agrees in time and number with ground radio logs. Both radio range receivers were tuned to the Knight, Wyoming, Radio Range frequency. Apparently, one of the pilots had been listening in over the main receiver, the other, the auxiliary receiver.

The trip log, a record of the flight maintained by the co-pilot, giving pertinent data concerning the flight from Cheyenne to a point approximately 15 miles east of Knight, was recovered from the wreckage in a damaged condition and restored to fair legibility. An analysis of this log shows the following: On departure from Cheyenne, the flight immediately climbed to an

altitude of approximately 10,000 feet and the trip log and other evidence indicate that an altitude of between 10,000 and 10,400 feet was maintained throughout the flight. Check points on this trip log were Two Rivers, Dana, Cherokee, Rock Springs and Knight, in the order named. Ground speeds indicated were Cheyenne to Two Rivers, 130 miles per hour, Two Rivers to Dana, 130 miles per hour, Dana to Cherokee, 145 miles per hour, and Cherokee to Rock Springs, 145 miles per hour. On the approach to Rock Springs, the compass course heading of 248° was shown. Shortly after passing Rock Springs, a compass heading of 240° was shown, indicating a turn to the pilot's left (south) of 8°. Approximately half way between the Rock Springs and Knight check points, the compass heading was changed to 235°, indicating an additional turn to the pilot's left of 5°. This is the last course entry shown in the trip log and apparently was made approximately 50 miles east of the scene of the accident.

Weather notations on the trip log show the following: High thin broken clouds in the vicinity of Cheyenne, high thin scattered clouds in the vicinity of Two Rivers and a temperature of 38°, high scattered clouds at Dana with lower broken clouds between 10,000 and 11,000 feet, high thin overcast at Cherokee with lower broken clouds at approximately 9,000 feet and a temperature of 37°. Between Cherokee and Rock Springs, the flight passed through clouds with occasional breaks, light and moderate snow and just prior to reaching Rock Springs, light rime ice and a temperature of 32°. Just after passing Rock Springs, slightly rough air is shown. The occasional breaks apparently continued to a point approximately 20 miles east of Knight where a notation was made showing overcast, lower scattered clouds and snow static with air conditions rough. These last notations approximately coincide with the last recorded compass heading of 235° and no further weather notations were made. The cloud conditions encountered by Trip One between the last noted location and the scene of the accident are unknown.

Two witnesses who were camped 12 miles south of the Rock Springs Radio Range Station, testified that through a break in the clouds they saw an airplane pass directly overhead, traveling in a westerly direction, at a time between 8:10 and 8:20 P.M., MST. Another witness, located 20 miles to the west and slightly south of the last referred to witnesses, testified that through a break in the clouds, he saw an airplane pass directly over his head at about 8:30 P.M., MST, traveling in a westerly direction. The Board believes that the airplane seen by these witnesses was the airplane in question. A straight line drawn between these two points and extended to the west would pass approximately over the Knight Radio Range Station. West of the last described point, no witness was found who claims to have seen the airplane before the accident. Several witnesses were found who testified that they heard an airplane at the approximate time Trip One is believed to have passed. All of these witnesses were not in agreement, but the greater weight of testimony of witnesses claiming to have heard the airplane, taken in connection with the three eye-witnesses and the change of course from 240° to 235°, between Rock Springs and Knight, leads the Board to the conclusion that this airplane never progressed farther north than a straight line between the Rock Springs and Knight intermediate landing fields.

A study made by the Board during the course of its investigation of this accident to determine the probable weather encountered by Trip One between Rock Springs and the point of the accident indicates the following:

(1) A cold front approaching from the north and west passed Salt Lake City at 7:55 P.M., MST, and passed Knight at between 8:25 and 8:41 P.M. Testimony of expert weather analysts indicates that this front should have passed the scene of the accident at approximately 11:30 P.M., MST. All of these times represent surface indications.

(2) The testimony of weather analysts indicated that unstable air conditions existed ahead of the cold front.

(3) Another airplane, flying north out of Salt Lake City, encountered static, rough air and heavy icing conditions at an altitude of 10,500 feet, at approximately 7:20 P.M., when over Brigham City, Utah, which is about 50 miles north of Salt Lake City.

(4) Flight One encountered light snow, then moderate snow, and light rime ice at approximately 10,000 feet between 8:00 and 8:15 P.M., just prior to reaching Rock Springs.

(5) Trip One experienced snow static sometime between 8:35 and 8:50 P.M., which would place it approximately 20 to 45 miles east of Knight. While the trip log does not show exactly what time this was first encountered or how long the condition continued, the Board believes it continued until the time of the accident.

(6) The trip log shows rough air immediately prior to the accident and the flight analyzer recorded this rough air for approximately the last 10 minutes of flight.

(7) Weather analysts testifying in the public hearing in connection with this accident agreed that it was improbable that the airplane passed through this cold front but that the proximity of the cold front would affect the velocity and direction of the winds along the course between Rock Springs and the point of the accident at the time the flight was between these points.

(8) Lay witnesses testified that equally changeable weather conditions, with considerable precipitation at times, existed between Rock Springs and the scene of the accident during the hours of 6:00 and 10:00 P.M.

Radio ranges serving the western portion of the Cheyenne-Salt Lake Course are as follows: a full power (BRA-DT) station at Rock Springs with its west course directed toward Knight; a medium power (MRL) station at Knight with its east course directed toward Rock Springs and its west course directed toward Salt Lake City; and a full power (BRA-DT) station at Salt Lake City with its east course directed toward Knight. Normally, a full power (BRA-DT) station will adequately cover a radius of 100 miles. However, in mountainous country, it has been found that due to refracted or multiple courses, directive radio is not always usable for as great a radius. Such conditions are known to exist over this airway and had been advertised in previous notices to airmen. The medium power station at Knight augments the full power stations at Rock Springs and Salt Lake City

and serves as a radio check point between these stations. On the day of the accident, monitor reports made once each hour of the day on all of the ranges concerned, established that these ranges were functioning normally.

All other airway facilities functioned normally throughout the period of this flight with the exception of the temporary interruption of one teletype drop and the outage of one auxiliary flasher light beacon. During the 8:41 teletype weather sequence, the weather reports being received by the Rock Springs station became unintelligible due to a faulty circuit and the 8:55 P.M., MST, broadcast from this station, therefore, was comprised of the local weather only. This complete sequence, however, was broadcast by Salt Lake City Radio Station at 8:50 P.M. At 8:55 P.M., Trip One was in the proximity of the south leg of the Knight Radio Range and at the time of the accident, five minutes later, was found to be tuned to the Knight frequency. One auxiliary flasher light beacon, located 49 miles west of Rock Springs and about 11 miles north of the straight line course between Rock Springs and Knight and situated midway between two standard rotating airway beacon lights, had not been operating since October 12, 1937, due to power supply failure. This fact was made available to all concerned through dispatch notices sent over the teletype circuit on the evening of October 12, 1937, stating that this beacon would be inoperative until further notice.

In reviewing this flight, it is the opinion of the Investigating Board that, from the weather sequences and forecasts available at the time of dispatch, this did not appear to be a particularly difficult or unusual flight, and that from the flight plan and the Cheyenne dispatcher's testimony, it was the pilot's intention to fly contact at 10,000 feet to Rock Springs, Rock Springs to Knight on intermittent instruments and to determine from weather conditions encountered in the vicinity of Knight whether to proceed into Salt Lake City on visual contact via the light beacons or to climb to a higher altitude and complete the trip on instruments. Approximately 50 miles east of Knight, the flight encountered snow static which interfered with the reception of radio range signals. It is believed by the Board that the snow static encountered on the approach to Knight interfered with the reception of the radio range signals to the extent that the pilot was unable to identify his position relative to that station. The fact that the trip failed to radio its position report when passing Knight and that both of the airplane's radio receivers were tuned to the Knight Station at the time of the accident tend to confirm this belief. From the location and heading of the wrecked airplane and the fact that the airplane was not heard to pass over or near Knight leads to the belief that at this point it passed approximately 10 miles to the south of the radio range station. The presence of Mt. Elizabeth to the southeast of Knight, which had to be passed to the north at the elevation at which the airplane was flying, and the location of the accident approximately 15 miles south of the west leg of the Knight Range, fix the flight path over the last 18 miles fairly definitely. In the opinion of the Board, this change of flight path was due to drift caused by a change in wind direction, velocity or both, induced primarily by the proximity of the cold front. This drift evidently

was not and could not have been reasonably anticipated by the pilot and was not recognized by him, due to his inability to receive intelligible radio range signals or see anything on the ground by which to locate himself. The fact that the wreckage was distributed in a direction of approximately 235° leads to the opinion that the flight had maintained its last logged compass course of 235°.

It is the opinion of the Investigating Board that the probable cause of this accident was a combination of the following three factors:

(1) Static conditions encountered in the last portion of the flight which rendered the reception of radio range signals unintelligible.

(2) The continuation of the flight into mountainous country at an altitude below the higher mountains without the aid of ground visibility or radio signals to definitely identify position.

(3) A change in the weather caused by the approach of an unpredicted cold front.

Advisory:

W. D. Hammond, Chairman,
Utah Aeronautics Commission,
State of Utah.

J. E. Garn, State Aviation
Director, State of Utah.

J. W. Lankford, Chief
Accident Analysis Section,
Bureau of Air Commerce
Department of Commerce.

Respectfully submitted,

Miller Foster, (Chairman)
Assistant to Assistant
Secretary of Commerce,
J. M. Johnson.

B. M. Jacobs, Chief, Certificate
and Inspection Division,
Bureau of Air Commerce,
Department of Commerce.

E. L. Yuravich, Chief, Air Line
Inspection (Foreign) Bureau of
Air Commerce, Department of
Commerce.

APPROVED: Nov. 17, 1937
Daniel C. Roper
Secretary of Commerce