

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: December 14, 1948

Released: December 15, 1948

CIVIL AERONAUTICS ADMINISTRATION—NAVAJO PEAK, WARD, COLORADO—
JANUARY 21, 1948**The Accident**

At approximately 1630,¹ January 21, 1948, aircraft NC-206, a DC-3 owned and operated by the Civil Aeronautics Administration, crashed 7 miles west southwest of Ward, Colorado, on Navajo Peak. The 3 occupants aboard were killed, and the aircraft was completely destroyed.

History of the Flight

NC-206 departed from Denver, Colorado, at 1602 for Grand Junction, Colorado. The crew, all employees of the Civil Aeronautics Administration, consisted of Fred L. Snavely, pilot; Warren L. Lungstrum, copilot; and Ross C. Brown, observer. Over the route to Grand Junction a check was to be made by these men of the VHF (very high frequency) airway facilities to determine whether they were operating normally. According to the flight plan, the flight was to proceed over Red Airway 6 at an air speed of 150 mph. Though only 2 hours were required for the trip, 8 hours supply of fuel was carried.

Information supplied to Copilot Lungstrum at the Denver United States Weather Bureau Office was to the effect that clear weather conditions existed generally over the intended route. Over Fraser, Colorado, located approximately 50 miles west northwest of Denver, however, broken clouds were reported. Since this layer of clouds was only 2,000 feet in depth, with tops at 13,500 feet above sea level, it appeared that a cruising altitude of 14,000 or 15,000 feet would be high enough for the flight. Winds at that altitude were from the northwest at 50 mph. Weather Bureau personnel advised that these winds would result in considerable turbulence.

¹ All times noted herein are Mountain Standard and based on the 24-hour clock.

Take-off was accomplished at 1602. Twenty-two minutes later, at 1624, the CAA communication station at Denver received a position report from the flight that it was at an altitude of 14,500 feet, 500 feet over the top of clouds, and 20 miles west of Denver. The flight also reported that they were experiencing severe turbulence. Since the flight plan specified that the trip would be made in accordance with visual flight rules, and since the position report indicated that the aircraft was being flown over the top of clouds, the flight was requested at the termination of their 1624 position to verify whether they were actually proceeding in accordance with visual flight rules. A response in the affirmative was received.

About one minute after the 1624 report the CAA communicator at Cheyenne, Wyoming, called NC-206 and asked for a check of his station's radio transmission. NC-206 responded, "Read Cheyenne Radio loud and clear." The communicator then asked for a position report from NC-206, and the flight replied, "We are approximately..." The remainder of this message, received shortly after 1625, was garbled and faded. The Cheyenne communicator attempted to contact the flight again but was unable to do so. Since interference to radio transmission could have resulted from the mountain ranges between Cheyenne and the aircraft, and since the Cheyenne communicator had overheard the report of severe turbulences, he presumed that the crew was completely occupied in flying the aircraft, and that either they had not heard the last transmission or were too busy at the time to acknowledge. Accordingly, he placed no significance on the failure of the flight to reply.

A request had previously been made by the communication station at Eagle, Colorado, for the flight to check the

radio transmission of that station. Since Eagle Radio did not receive any calls from NC-206, the station called the flight at 1645. No reply was received. Repeated calls were made by the communicator at Eagle on all available frequencies at three-minute intervals until 1735. Then the station requested information concerning the flight from Grand Junction Radio, but neither Grand Junction Radio nor any other radio station on the route had received a call from NC-206 since 1625. At 1825, 23 minutes after the estimated arrival time of NC-206 at Grand Junction, an emergency was declared.

Investigation

When it became apparent that something had happened to the aircraft, CAA Air Traffic Control at Denver gave notice of the missing aircraft to all the proper Federal officials, to Air Force's Search and Rescue, and to the Colorado State and County officials. A search was organized, and in spite of snowstorms and unfavorable weather on the night of January 21, 1948, search parties moved into the mountainous area from which the aircraft had last been heard. Snow continued for 7 days, covering the wreckage, and making it practically impossible to locate from either the air or the ground. As a result, the search parties were recalled January 28, but the aerial search continued. On May 23, 1948, the wreckage was located by an Air National Guard pilot. It was found slightly below the summit and on the north side of Navajo Peak, which is approximately 7 miles west southwest of Ward, Colorado, or about 45 miles west northwest of Denver. Immediately after the wreckage was located from the air, a ground search party was dispatched to the scene arriving there at 1325, May 27, 1948.

The search party found that the aircraft had struck the north northeast side of Navajo Peak approximately 500 feet below the summit, and at an elevation of 12,900 feet above sea level. Its geographic location was 40:04 degrees north and 105:37 degrees west. First point of impact was on an almost vertical wall of rock, and the places where the engines had struck were clearly defined by oil spots and scars in the rock. These scars indicated that at the time of impact the airplane was flying in a left turn with a bank of 15 to 20 degrees, and that it was on a compass heading of between 240

and 250 degrees.

Impact and fire which followed completely destroyed the airplane. The only instruments which could be identified were the air speed indicator which read 152 mph, one cylinder head temperature gauge which read 300 degrees, and the gyro-compass in the automatic pilot which read 260 degrees. The magnetic compass was also identifiable, but was not readable. Both wings, with ailerons still attached, and the fuselage from the cargo door to the rear tail assembly, though badly broken, appeared to be complete. All propeller blades were accounted for. Bodies were identified and removed from the scene of the wreckage. Death had obviously occurred at time of impact. Adverse weather prevented further examination of the wreckage at that time.

On July 17, 1948, conditions on Navajo Peak being favorable, a joint party of Civil Aeronautics Board Investigators and Civil Aeronautics Administration Agents returned to the scene of the accident to complete the investigation. The findings of this group confirmed those that had been made by the party which had arrived in May. They found the main body of the wreckage on a loose rock slide 30 feet below the initial point of impact. This slide had an estimated slope of approximately 45 degrees. All surface controls were accounted for and examined, and no indication was found that there had been any mechanical failure, disintegration, or malfunction of the controls prior to the time of the impact. Nor was any indication found in the examination of power plants, propellers, and other parts of the wreckage capable of examination that any mechanical trouble existed prior to the time of impact. Evidence indicated the landing gear to have been extended, and the elevator trim tab to have been in a position for a nose-high flight attitude.

NC-206 was a converted Army C-47 airplane. It was obtained by the Civil Aeronautics Administration from Army Surplus in Kansas City, Missouri, October 8, 1945, and was assigned to the Airways Section for flight checking of radio facilities. This airplane was approved under a type certificate July 10, 1944, and was relicensed for airworthiness on April 6, 1947. On August 31, 1947, it was ferried to Los Angeles, California, for a 4,000-hour check. During that inspection the wings were removed, inspected,

and reinstalled; all control surfaces were covered with new fabric; and a new Army surplus 1830-D Pratt and Whitney engine was mounted in the right engine nacelle. A 100-hour check was accomplished January 5, 1948, by the CAA Aircraft Service Division, Kansas City, at which time it was again deemed airworthy. Following this 100-hour inspection, the airplane was flown 20 hours and 10 minutes before the accident. The aircraft maintenance records show all current airworthiness directives had been complied with, and the airplane was in an airworthy condition at the time of its departure for its last flight.

A complete analysis of the weather conditions which existed over the intended route to be flown was made by the Board's meteorologist. This analysis showed that there was a strong flow of stable relatively-dry air over northern Colorado which was a result of a high pressure area over the northwestern portion of the United States, and a low pressure area in the central portion of the United States. No "fronts" were in the vicinity of the route, and fairly clear weather prevailed with broken clouds well above the intended flight altitude. There were patches of clouds with bases at 11,000 to 12,000 feet formed on the western slope and near the crest of the Continental Divide, resulting from the mechanical lifting of air as it flowed southeastward over the mountains. The formations were not more than 2,000 feet thick, but probably enveloped the peaks and ridges along the Divide. East of the Divide, patches of ragged cumulus and lenticular clouds had formed. Fast movement of the stable dry air over the mountains resulted in severe downdrafts and turbulence east of the Continental Divide.

United Air Lines' Flight 347 arrived over Denver 14 minutes after the departure of NC-206. It had flown from Los Angeles, California, and had passed over the intended route of NC-206 at an altitude of 15,000 feet. The captain stated that when passing Eagle he had flown over broken clouds, the tops of which were estimated to be about 14,000 feet. The captain also stated that north of the route the clouds appeared lower, and south of the route, higher. To the east of the Divide he observed the stratus deck descending the face of the slope and degenerating into a thin, rapidly moving veil of stratus at tree-top height five or six miles away and flowing rapidly to

the southeast. Further east, he also observed formations of lenticular cumulus, and since these were indicative of severe turbulence, he detoured north of the route to avoid them. North of Boulder, Colorado, while descending for the landing at Denver, the flight encountered a sudden updraft. This updraft was severe enough to lift the aircraft from 11,000 to 13,500 feet though power was retarded.

Discussion

Forty to fifty miles west of Denver, mountain peaks, including Navajo, extend to 13,000 and 14,000 feet above sea level. Red Airway 6 extends over this area. When wind conditions are similar to those which existed at the time of this accident, severe turbulence is created as the air spills over the Continental Divide to the plains immediately east of the mountains. Vertical currents of air have been encountered of such magnitude that they have carried aircraft several thousand feet up or down.

From past experience and observation it is known that when westerly winds are reported west and east of the mountains at velocities of 40 mph or higher, the velocities of the same winds will be greatly increased, and in some cases doubled, when they pass over the mountain ridges of the Continental Divide. Thus, a west wind at 14,000 feet reported to have a speed of 50 mph at Grand Junction and also at Denver would actually be flowing over the high terrain, 45 miles west of Denver, at a much higher rate, possibly as high as 100 mph. This increase in velocity, sometimes referred to as the venturi effect, occurs when air is lifted over a mountain ridge and is particularly noticeable in the case of stable air. When such conditions prevail, patches of ragged cumulus and lenticular clouds usually form to the lee side of the mountain ridge, and are recognized by pilots experienced in mountain flying as indications of severe turbulence.

There is little evidence in this case from which to deduce probable cause. All existing evidence, however, indicates that the accident did not result because of any mechanical difficulty with the airplane. Almost constant communication was maintained with the flight until 1625, and during this time no mention was made of engine failure, or any type of maloperation. Therefore, it appears reasonable to associate the accident with

the severe turbulence which existed over the area in which the airplane crashed, and which is the only known possible cause. The intensity of the turbulence was illustrated by the statement of the United Air Lines' captain who said that when north of Boulder, which is in the immediate vicinity of Mount Navajo, his aircraft was carried from 11,000 to 13,500 feet with power retarded.

Furthermore, the captain's description of the stratus clouds descending the face of the slope and dispersing in a thin, rapidly moving veil at treetop height to the east of the Divide, is definitely indicative of a downdraft area.

Having encountered extreme turbulence, it is probable that the crew reduced air speed by extending the landing gear, which requires the aircraft to be flown in a higher angle of attack than normal for level flight to maintain altitude; consequently, the crew would place the elevator trim tab control in a position for nose-high flight. As pointed out above, the landing gear was found extended, and the elevator trim tab was found in a nose-high position at the scene of the accident. These facts, in conjunction with the crew's own statement that they were experiencing severe turbulence, confirms the supposition that the flight was in severe turbulence immediately before the crash.

It is also logical to conclude that the airplane crashed immediately after its last radio transmission given at 1625: "We are approximately..." The fading or the blocking out of this transmission can be accounted for by the aircraft being carried below surrounding mountain peaks by a severe downdraft. This downdraft could have been of such intensity that the aircraft was carried below surrounding terrain before a corrective course could be flown. It may have been that the airplane was carried into cloud formations and the mountain was struck simply because it was obscured from view. Evidence is lacking from which the manner of the accident can be determined, but from all that is known,

it appears that the aircraft crashed into a mountain as a result of excessive loss of altitude in a downdraft through an area of severe turbulence.

Findings

On the basis of all available evidence, the Board finds that:

1. The aircraft, and crew were properly certificated.
2. No evidence was found which indicated structural failure or mechanical malfunctioning of aircraft prior to the time of the accident.
3. At the time of the accident general winds at 14,000 feet were reported from the northwest at 50 mph. These winds resulted in an accelerated flow of severe turbulence over the Continental Divide in the vicinity of the crash.
4. Twenty minutes after takeoff, the flight reported being at an altitude of 14,500 feet, 500 feet over the tops of clouds, 20 miles west of Denver, and flying in an area of extreme turbulence.
5. During the course of radio transmissions from the flight to CAA Ground Communications Stations, no mention was made of any mechanical trouble.
6. The last communication from the aircraft was to Cheyenne Radio at 1625, which faded out and was not completed.
7. Between 1625 and 1630, the aircraft NC-206 collided into Navajo Peak at an elevation of 12,900 feet above sea level, and at a point approximately 45 miles west northwest of Denver, Colorado.

Probable Cause

The Board determines that the probable cause of this accident was an excessive loss of altitude resulting from a downdraft in an area of severe turbulence.

BY THE CIVIL AERONAUTICS BOARD:

/s/ JOSEPH J. O'CONNELL, JR.
 /s/ OSWALD RYAN
 /s/ JOSH LEE
 /s/ HAROLD A. JONES
 /s/ RUSSELL B. ADAMS

Supplemental Data

Investigation and Hearing

The Civil Aeronautics Board was notified at 2300 MST, January 21, 1948, that NC-206, a DC-3, assigned to and operated by the Civil Aeronautics Administration, Kansas City, Missouri, had been missing since the afternoon of January 21, 1948. 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. A public hearing was ordered by the Board and was held in Denver, Colorado, August 3, 1948.

Civil Aeronautics Administration

The Civil Aeronautics Administration, a U. S. Government Agency, is authorized, by virtue of statutory authority, to own and operate aircraft in performance of certain mandatory requirements. The purpose of the flight involved was in accordance with official duties of personnel concerned.

Flight Personnel

Pilot Fred L. Snavely, age 42, possessed a commercial pilot certificate with all ratings; however, at the time of the accident, he was operating under the provisions of a private pilot certificate, in accordance with Civil Air Regulations, Part 43.402(b). He was an Army-trained pilot and commenced flying in 1927. Mr. Snavely was employed by the Civil Aeronautics Administration in December 1939, and in December 1945 he was appointed Chief of the Flight Inspection Staff, assigned to the Kansas City, Missouri, office. He had a total of 3,662 flying hours, of which 872 hours had been in DC-3 aircraft. His last

physical examination was accomplished on December 31, 1946. Copilot Warren L. Lungstrum, age 26, possessed a valid commercial pilot certificate with all ratings. He was employed by the Civil Aeronautics Administration in May 1946, and in October 1947 was appointed Airways Flight Inspector. Mr. Lungstrum had been previously trained as a pilot in the U. S. Navy. He had a total of 1,403 flying hours, of which 53 hours had been in DC-3 aircraft. His last physical examination was accomplished March 29, 1947. Both pilots were properly certificated for the flight involved.

Ross C. Brown, age 41, Scheduled Air Carrier Agent, Operations, Denver, Colorado, had accompanied Pilot Snavely in NC-206 as an observer for purpose of checking the Instrument Landing System facilities at Grand Junction, Colorado.

The Aircraft

NC-206 was a Douglas DC-3, operated and registered in the name of Civil Aeronautics Administration. The aircraft had accumulated a total of approximately 4,000 hours since major overhaul. It was equipped with two Pratt & Whitney 1830-D engines, on which Hamilton Standard propellers were installed. The left engine had been operated a total of 2,676 hours, and 560 hours since overhaul. The right engine had been operated a total of 107 hours only. At the time of the accident, the total weight of the aircraft was approximately 1,180 pounds less than its allowable maximum gross, and the load was distributed with respect to the center of gravity within approved limits.