

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: June 16, 1950

Released: June 23, 1950

**CAPITAL AIRLINES, INC., NEAR WASHINGTON NATIONAL AIRPORT,
WASHINGTON, D. C., DECEMBER 12, 1949****The Accident**

Capital Airlines' Flight 500, a DC-3 aircraft, NC-25691, at 2041,¹ December 12, 1949, crashed into the Potomac River, 1,875 feet southeast from the approach end of runway 36 of the Washington National Airport, Washington, D. C. Four of the 20 passengers were killed, 14 received serious injuries, and two received minor injuries. The pilot and the copilot of the crew of three were killed and the flight attendant was injured. The aircraft was destroyed.

History of the Flight

Capital Airlines' Flight 500 originated in Memphis, Tenn., December 12, 1949, and proceeded in a routine manner to Norfolk, Va. No difficulties of any kind were experienced. At Norfolk a new crew consisting of Captain William J. Davis, Copilot Lloyd L. Porter, and Flight Attendant Joseph W. Buell were assigned to the flight for the remainder of the trip to Newport News, Va., and Washington, D. C. Before takeoff from Norfolk, Captain Davis studied all weather data in the Capital Airlines office, and called the company's dispatcher in Washington who advised him that weather conditions would remain above landing limits until after midnight.²

Flight 500 took off from Norfolk at 1816; arrived at Newport News, Va., at 1836; and seven minutes later, at 1843, was again in the air en route to Washington by way of Richmond, Va., at a cruising altitude of 4,000 feet. On board were 20 passengers, the crew of three,

¹All times referred to herein are Eastern Standard and based on the 24-hour clock.

²Landing limits for Capital Airlines at the Washington National Airport, straight-in approach, are: Ceiling 400 feet, visibility 3/4 mile.

792 pounds of cargo and 3,000 pounds of fuel. Total aircraft weight was 25,472 pounds, which was 126 pounds in excess of the certificated aircraft weight. The load was distributed so that the center of gravity of the aircraft was within the certificated limits.

The trip continued without incident. It reported over Richmond at 1910, and was then cleared by Air Route Traffic Control to proceed at 8,000 feet to the Clifton Intersection, which is 32 miles southwest of the Washington National Airport. By the time that the flight arrived over Clifton, however, ceiling and visibility at Washington were below landing minimums, so instructions were given to the flight to "hold." Approximately 410 gallons of fuel remained on board, and weather conditions at the alternate airports of Richmond and Norfolk were remaining well above landing minimums.

At 2025, a weather observer stationed at the south end of runway 36 at the National Airport reported that the ceiling was 400 feet variable, and that the visibility was 3/4 of a mile. Since landing minimums were now indicated, the control tower cleared one aircraft to land and the Capital flight to descend to 3,500 feet in the holding pattern. The aircraft which had been cleared to land completed its landing at 2033 without incident using the instrument landing system (ILS). At 2033 another runway observation was made, reporting the ceiling to be 400 feet variable, and the visibility 1 1/2 miles restricted by light rain and fog. Immediately following the transmission of this observation, clearance was given to Capital's Flight 500 to descend to 1,500 feet and to commence its landing approach. Flight 500 acknowledged. Five minutes later, at 2038, the flight reported leaving the outer marker, five

miles south of the end of runway 36, at which time it was cleared by the tower to land.

From the holding pattern to the outer marker the aircraft was observed in the ground control approach (GCA) radar scopes which are in the Washington National Tower. Nothing unusual was noted. As the flight passed over the outer marker at 1,500 feet, entering its ILS approach, the GCA operator advised that the approach would be monitored. This message, as is customary, was not acknowledged, so it is not known whether either the pilot or the copilot was listening to GCA.

In the GCA radar scopes, the flight path and descent at first appeared to be normal. When the aircraft was 4 1/2 miles from its point of landing, it was 200 feet to the right of the intended track, an extended center line of the runway, and the glide was good. When it was three miles from intended point of touchdown, it was 50 feet to the right and the glide was still good. When two miles out, the aircraft was on the center line, and only 25 feet above the glide path. One and one-half miles out, it was on the center line, and on the glide path. Then, the flight began to deviate to the right from the center line. The GCA operator in his monitoring conversation advised the flight that it was drifting sharply to the right, and followed by saying that it had gone 1,500 feet off course. The flight then appeared to turn left, proceeding back to the center line, but when within 1,000 feet of the center line and only 1/2 mile from the end of the runway, it disappeared entirely from the scopes.

The aircraft was neither seen nor heard by any of the control tower operators, nor by the weather observer stationed at the end of runway 36. A few minutes after the accident, the runway observer reported the ceiling to be 400 feet variable and visibility to be 3/4 of a mile. There was light rain and fog, and the wind was from the south-southwest at nine miles per hour. The aircraft struck the water, left wing and nose first, in a steep nose down, left turning attitude.

Investigation

The wreckage was recovered from five feet of water in the Potomac River 1,875 feet southeast of the south end of runway 36 of the Washington National Airport. The left wing was mangled, torn, and broken, and it, as well as the left portion of the center section, had been forced rearward in reference to the fuselage through an arc of about 35 degrees. The right wing with parts of the right portion of the center section had been forced forward through an arc of about 20 degrees. The leading edges of both the right and left wings were flattened in a rearward direction. The fuselage was partially detached from the center section, and broken at the locations of the leading edge and at the trailing edge of the wing. The nose section, including the pilot compartment, was buckled, torn and compressed.

The vertical stabilizer, rudder, and the left horizontal stabilizer remained attached to the fuselage. The left elevator was partially separated from the stabilizer, remaining attached by only one hinge, and the right horizontal stabilizer and elevator were partially separated from the fuselage, having been forced downward through an arc of approximately 70 degrees from their normal position. The left power plant was found 20 feet ahead of the main body of the wreckage, and the right one was located beneath the center section. Flaps and landing gear were found to have been fully extended.

Since the control pedestal and the control cables were badly damaged, the position of the controls found in the cockpit could not be considered as a reliable indication of their settings before the crash. The fuel selector and cross-feed valves were found: Left cross-feed valve closed, right cross-feed valve partially open, left engine selector valve in the right main tank position, and the right engine selector valve in the right main tank position. No determination could be made as to what position the carburetor heat valves were in when the aircraft was in flight; accordingly, it is not known whether

carburetor heat was being applied during the course of the instrument approach.

No defects or indications of malfunctioning which could have resulted in power failure prior to the time of the accident were found in the disassembly of the engines. Insofar as possible, all accessories on the engines were tested, and no unsatisfactory condition was found. No defects other than impact damage was found in any of the electrical, radio or navigational equipment. All maintenance records for the aircraft were in order, containing no items which could have resulted in mechanical trouble. An examination of the propeller blades, propeller domes, engines, crankshafts, accessories, and impeller drives showed that little if any power was being developed at the time of impact.

Survivors testified that before the aircraft struck the water the engines raced momentarily, and that the entire aircraft shuddered. The flight attendant, one of the survivors, said that before the aircraft struck the water he observed the ailerons working violently.

At the time of the flight there was an overcast between Norfolk and Washington at 8,000 feet. Below this layer of clouds there was a second cloud deck, the top of which was between 4,000 and 5,000 feet. In the vicinity of Washington this second cloud deck lowered to within 300 or 500 feet above the ground. A light rain was falling, and a shallow fog formed over the river and drifted over the airport. As a result, visibility was variable from 3/4 to 2 miles. Wind remained light from 8 to 10 miles per hour from the southwest.

An airway forecast issued at 1209, December 12, 1949, predicted improving conditions during the remainder of the day for the Washington National Airport. The ceiling was to raise to 3,500 feet and the visibility to 6 miles by midnight. Later that day, however, it became apparent that there would be no improvement. The next regularly issued forecast, at 1720, reported that the ceiling at Washington National would lower to 400 feet, and the visibility to 2 miles. Further, that by 2330 the ceiling would lower to 200 feet and the visibility to 1/2 mile. This forecast was available prior to the flight's departure from Norfolk. A Flight Advisory Weather Service forecast

for the period 1945 to 2145, issued when the flight was en route to Washington, stated that river fog drifting over the airport would reduce ceiling and visibility to near zero conditions.

According to instructions existing at the time, visibility was measured by the runway observer from his position at the south end of the runway to the north, in the direction that the aircraft was to land. No measurement of visibility was made in the opposite direction, that from which the aircraft was to approach. Conceivably, zero conditions could exist along the approach path even though visibility over the runway would be unlimited. In this case, however, the observer stated that he could see the red obstruction lights on the radio range towers which were .9 mile south-southwest of the south end of runway 36.

At the time of the accident all Washington National Airport radio and lighting facilities were operating normally.

Analysis

The flattening of the leading edges of the wings, the destruction of the nose section, the displacement of the left wing rearward and the right wing forward, along with other breaks, tears, and bends in the wreckage, showed that the aircraft struck the water in a steep, nose down, left turning attitude. This fact, coupled with the testimony of the survivors to the effect that the aircraft shuddered and that the ailerons worked violently immediately prior to the time of impact, admits of only one conclusion—the aircraft had stalled. The only explanation for a stall in this case is that sufficient air speed was not maintained.

The stall could have resulted in the right turn from the center line of the approach, or the turn could have been caused by a loss of power of the right engine. There are several possibilities which could account for a temporary loss of power on one or both of the engines. There may have been carburetor ice, for weather conditions were suitable for its formation. However, no determination could be made as to whether carburetor heat was being applied, and if there had been ice in the carburetors it would have melted as soon as the engines were submerged in water. There is also the

possibility that all fuel in the right main tank, to which the engine selector valves were found positioned, may have been exhausted. Ordinarily, each engine selector valve would be positioned to its respective main tank for the landing approach. Again it is impossible to make a determination, for the position of the engine selector valves could have been changed by impact forces and the evidence of how much fuel may have been in the right main or any of the other tanks was destroyed when the tanks and fuel lines were submerged and filled with water. There is also the possibility that both engines did not respond simultaneously to a rapid advancement of throttles after the engines had cooled during the long glide of the instrument approach.

Any of the above possibilities could account for a temporary loss of power on one or both engines. If the left engine had responded to an open throttle while the right sputtered and missed, the aircraft would have turned right unless the unequal thrust had been immediately compensated for by use of flight controls. However, a power failure does not in itself account for a loss of safe flying speed; it remains that flying speed was lost during the landing approach which, of course, resulted in loss of control. Likewise, Captain Davis would have known during the last part of the approach that he did not have safe flying speed if he had given proper attention to the air speed indicator or even if he had had the copilot call out changes in air speed. Accordingly, it appears that Captain Davis did not give enough attention to

all of the flight instruments, and, as a result, permitted the aircraft to stall.

Findings

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

1. The carrier, aircraft and crew were properly certificated.
2. No indications of mechanical difficulty in the operation of the aircraft or any of its components were found.
3. At the time of the accident all radio and lighting facilities for the Washington National Airport were operating normally.
4. At the time of the accident the ceiling was 400 feet, variable and the visibility was 3/4 of a mile to the north of point of observation.
5. Immediately before the accident, and during the execution of an instrument approach, the aircraft was stalled at too low an altitude to effect recovery.
6. The aircraft struck the Potomac River in a steep, nose down, turning attitude, 1,875 feet southeast from the approach end of runway 36.

Probable Cause

The Board determines that the probable cause of this accident was the stalling of the aircraft at an altitude too low to permit a recovery.

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 of this accident at 2203 EST, December 12, 1949, by CAA Communications and investigation was immediately initiated in accordance with 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 Washington, D. C., December 22 and 23, 1949.

Air Carrier

Capital Airlines, Inc., is a Delaware Corporation and operates as an air carrier under certificates of public convenience and necessity and an air carrier operating certificate issued pursuant to the Civil Aeronautics Act of 1938, as amended. These certificates authorized Capital Airlines to engage in air transportation with respect to persons, property, and mail between various points in the United States, including Washington National Airport, Washington, D. C.

Flight Personnel

Captain William Jarman Davis, age 45, was first employed in May 1932 by Capital Airlines in a non-flying position. In September of 1942, he qualified for a commercial pilot's license, and was sent through a company flight training course.

Additional training was received in 1943 after which he was assigned as copilot. Two years later, he again attended a company school, following which he received an airline transport pilot rating and a promotion to captain. All of Captain Davis' certificates and ratings were current at the time of the accident. He had a total of 5,476 flying hours, of which 5,296 were in DC-3 equipment. His total instrument time was 453 hours.

Copilot Lloyd Leroy Porter, age 28, received flight training in Army Air Forces and was employed by the company in October 1945. He held a currently effective airman certificate with a commercial pilot rating. Of his total flying time of 6,590 hours, 2,559 were in DC-3's and 258 were under instruments.

The Aircraft

The aircraft, a currently certificated Douglas DC-3, NC-25691, was manufactured September 21, 1940. At the time of the accident it was owned by Capital Airlines and had been flown a total of 27,396 hours. It was equipped with two Wright G-102-A engines and two Hamilton Standard Hydromatic propellers. The total time on the left engine was 11,492 hours, and 376 hours were accumulated since the last overhaul. Total time on the right engine was 23,430 hours, and 317 hours were accumulated since the last overhaul.