

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: August 1, 1949

Released: August 2, 1949

PIEDMONT AIRLINES—NEAR BRISTOL, TENNESSEE, DECEMBER 28, 1948**The Accident**

Piedmont Airlines' DC-3, NC-37468, Flight 21 crashed near Tri-Cities Airport, Bristol, Tennessee, at approximately 1758, December 28, 1948, while attempting an emergency landing. All of the 18 occupants including a crew of three escaped injury. The aircraft was extensively damaged.

History of the Flight

Piedmont Airlines' Flight 21 of December 28, 1948, was en route between New Bern, North Carolina, and Cincinnati, Ohio. A routine crew change was made at Winston-Salem, North Carolina, a scheduled stop, and the flight departed at 1635 for Tri-Cities Airport, Bristol, Tennessee. The new crew consisted of Captain Herndon Hutcheson, First Officer James A. Craig, and Purser H. E. Moore. The flight arrived at Tri-Cities Airport with no mechanical difficulties reported by the crew. With 355 gallons of gasoline and 36 gallons of oil aboard, Flight 21 departed from the ramp at 1745, and was cleared by the control tower to taxi to the intersection of Runways 27 and 20. While waiting there for Piedmont Airlines' Flight 15 to take off, the pre-flight check, including engine run-up was made. This check took approximately two minutes, after which the tower cleared the flight to the end of Runway 27. The flight took off at 1750. The gross weight of 24,862 pounds was within the allowable limits and the load was properly distributed.

Copilot Craig, sitting on the right side of the cockpit, was at the controls. When over the obstruction lights, approximately 1,000 feet beyond the west boundary of the airport, the right engine oil pressure warning light came

on, and the pressure dropped to 40 pounds per square inch. Captain Hutcheson immediately took over the controls and started a left climbing turn. At this time the landing gear was fully raised. While turning, the flight notified the tower it was returning to the airport because of mechanical trouble. Both engines were developing normal power at this time. Cleared by the tower to any runway, the pilot elected to use Runway 27, which is approximately 4,500 feet long and from which they had just taken off. Asked if emergency equipment was desired to stand by, the flight replied in the negative.

At this time, the copilot noticed smoke or oil vapor streaming from the rear of the right engine. The purser was asked to make a visual check and he verified that the smoke was coming from under the right engine cowling. At an altitude of approximately 600 feet, on the down wind leg, power was reduced on the right engine. Captain Hutcheson then called the tower and asked that his company be notified of his decision not to feather the right propeller, as the engine was capable of producing some power. The flight made a gradual left turn on the base leg and the landing gear was lowered before the turn was completed. At this time, the hydraulic selector valve was changed from the right to the left engine. The flaps were lowered while turning on final approach. Flight 21 crossed the boundary of the airport at an altitude of approximately 200 feet. Nearing the intersection of Runways 27 and 20, three-thousand feet from the approach end of Runway 27, and at an altitude of about 100 feet the Captain started a missed approach procedure. Full power was applied to the left engine and the landing gear and flaps were raised. During this operation, the aircraft yawed to the right some 10 degrees. Over the

* All times noted in this report are Eastern standard and based on the 24-hour clock.

west boundary of the airport, power was increased to the right engine and a shallow right turn was initiated to avoid a hill. Rapidly losing both air speed and altitude, the aircraft struck the top of a ridge three-fourths of a mile northwest of the airport. A flash fire which developed in the left engine nacelle was quickly extinguished.

At the time of the accident there were clouds at 9,000 feet with good visibility and no wind. The airport lights were on.

Investigation

The aircraft stopped in a field 4,250 feet from the west end of Runway 27 on a bearing of 38 degrees from the takeoff direction. Investigation revealed that the tail wheel of the aircraft touched the ground first. The right propeller and engine struck 105 feet further on. Nine feet beyond this point the left propeller and engine made contact. From this point a series of shallow propeller blade cuts approximately 15 inches apart were made by the left propeller in the turf. After contacting the ground, the aircraft skidded on its belly approximately 300 feet, turning 90 degrees to the right of its line of travel.

Inspection of the aircraft revealed that the right wing and right aileron were extensively damaged. No damage was done to the left wing.

The flaps and landing gear were found in the up position.

The left propeller and left engine nose section broke away from the engine and struck the fuselage directly below the pilot's window; it rolled rearward until one blade punctured a fuselage bulkhead immediately in front of the left forward passenger seat. As the propeller blade entered the fuselage it severed a battery cable, disconnecting all electrical current. The blades of both propellers were bent rearward.

Examination of the cockpit revealed that both throttle controls were fully advanced and that the propeller controls were in low pitch, corresponding to the position of the propeller blades. The cowl flaps of both engines were one-fourth open (trail position).

The fire extinguisher selector valve was set to the left engine and CO₂ had been released.

The nose section, including propeller and reduction gearing, was broken from the left engine and two lower cylinders were damaged.

At the time of the accident a large quantity of oil was observed on the ground in the vicinity of the right engine. The main oil screen was removed and checked for foreign particles; none were found.

The engines were removed and shipped to Winston-Salem, North Carolina, for further examination where the damaged parts of the left engine were replaced, the engine placed on a test stand and a test run made. During this test, 1,100 horsepower was developed and after 25 minutes the master rod bearing failed and the engine seized. The seizure was caused by the crankshaft being out of alignment due to the forces imposed at the time of impact.

A check was made of the oil remaining in the engine sump of the right engine. This oil was diluted with gasoline, a sample analyzed showed a 43 percent gasoline content. The spark plugs were removed from the right engine, examined and reinstalled. Fresh oil was put in the engine and a five minute test run made. During this test, oil pressure and temperature readings were normal. On a similar engine installation, the oil dilution valve was opened and in approximately five or ten seconds the oil pressure dropped and the warning light came on. Gasoline flowed thru the line at the rate of 3-3/4 quarts per minute. Both solenoid valves, controlling the oil dilution, were removed and checked for leakage and the electrical system for continuity. No irregularities were found.

In accordance with the Company operational planning, the cockpits of all their DC-3s were being standardized. New instrument panels were designed and changes made, especially in those panels located above the windshield. NC-37468 was the first aircraft to be standardized. Before these changes, the engine primer and oil dilution switches were combined in single toggle switches, one for each engine. The "up" position of these switches was used for oil dilution and the "down" position for priming, both positions were spring loaded. On the redesigned panel both positions of

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these switches were used for oil dilution and the "up" position was not spring loaded and once moved upward would remain until changed. The oil dilution switch for the right engine was placed on the new panel four inches away from the left magneto switch and horizontally in line with it. The crew had not been briefed concerning these changes.

Maintenance and historical records of NC-37468 were carefully examined. They showed that the airplane was released from the repair shop on December 21, 1948, after a 5,000 hour inspection and overhaul and with newly overhauled engines.

Analysis

As stated, an analysis of the oil in the right engine revealed a 43 percent gasoline dilution and a flow test made of a similar oil dilution line showed that gasoline flowed thru it at the rate of 3-3/4 quarts per minute. The oil dilution switch for this engine was located on the panel where it could be inadvertently moved upward while working the left magneto switch, and once moved to this position would remain there until manually changed. With this uninterrupted flow of gasoline thru the oil dilution line with the switch in the up position, the few intervening minutes after the airplane left the ramp were sufficient to cause the right engine's oil pressure to drop and the warning light to come on. Thus, it is evident that the oil became diluted at that time since no previous engine malfunctioning was reported. It is apparent that the crew's unfamiliarity with the modification of the instrument panel caused this accidental oil dilution.

After the take-off from Tri-Cities Airport, Captain Hutcheson elected to make a left turn and return to Runway 27. That this afforded him a continuous view of the landing area is substantiated by his statement that with the airport lights on and with no haze and good visibility, he could see the runway at all times. Though the oil pressure of the right engine dropped to below operating limits and the warning light came on shortly after take-off, there was no loss of power. Therefore, no difficulty was experienced in climbing to 600 feet which, under existing conditions could

be considered a safe altitude to circle and land.

When the Captain decided that he was too high and that there was insufficient runway remaining to accomplish a safe landing, power was applied to the left engine. As the aircraft was losing both air speed and altitude, the right engine throttle was quickly advanced. Since this engine was operating under reduced power throughout the latter part of the emergency flight around the airport and its cowl flaps had been at trail position, allowing the engine to cool, it is questionable how much immediate power was available from it. A number of well qualified witnesses stated that the aircraft appeared to be mushing (settling) with its nose high throughout the missed approach procedure. As the aircraft was approximately 100 feet above the runway at this time and the terrain ahead was at a higher elevation, it was impracticable to gain air speed by nosing down. As losing altitude was impracticable and gaining it appears to have been impossible, the aircraft settled to a rolling open field beyond the airport.

Since the right engine was operated under reduced power with cowl flaps in trail position while the flight circled the field and attempted landing, the engine cooled; accordingly, full power was not produced immediately when the throttle was later advanced. In any event, when it was decided that the landing could not be completed, considerable air speed and altitude had been lost, and with the aircraft held in nose-high attitude even though the landing gear was retracted, there was not sufficient power or air speed available to maintain altitude. An additional cause of the loss of altitude was the full retraction of the flaps. As a result, the aircraft settled to the ground, and skidded to a stop.

Findings

Upon due consideration of all available evidence, the Board finds that:

1. The carrier, the aircraft, and the crew were certificated.
2. The gross weight of the aircraft was within the allowable limits and the load was properly distributed.
3. Immediately after take-off the right engine's oil pressure dropped as

result of the engine oil being diluted by gasoline, and the oil pressure warning light came on.

4. Although the oil pressure for the right engine dropped below a safe operating limit, there was no immediate loss of power, and the aircraft circled the field for a landing.

5. Oil from the right engine was diluted with 43 percent gasoline.

6. The oil dilution switch for the right engine was located in such a position that it could be inadvertently opened when operating the left magneto switch, and was not spring loaded so as to return to the closed position.

7. The cowl flaps of the right engine were allowed to remain at trail position after power was reduced resulting in the engine overcooling sufficiently to retard acceleration.

8. The emergency landing attempt was abandoned after the aircraft had progressed more than 3,000 feet from the end of the runway and a descent had been made to approximately 100 feet above the ground.

9. The aircraft was in a near stalled attitude and at a low air speed during

the missed approach procedure, the mushing effect of which was accentuated by the retraction of the flaps.

10. Lacking sufficient air speed the aircraft settled to the ground in a nose-high attitude causing extensive damage, but without injury to any of the occupants.

Probable Cause

The Board determines that the probable cause of this accident was that, while attempting to land the pilot overshot the field and delayed initiating the missed approach procedure until the air speed was critical for single engine operation.

BY THE CIVIL AERONAUTICS BOARD:

/s/ JOSEPH J. O'CONNELL, JR.

/s/ OSWALD RYAN

/s/ RUSSELL B. ADAMS

Josh Lee and Harold A. Jones, Members of the Board, did not participate in the adoption of this report.

Supplemental Data

Investigation and Hearing

The Civil Aeronautics Board was notified of the accident at 1825, December 28, 1948, and 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 Winston-Salem, North Carolina, February 18, 1949.

Air Carrier

Piedmont Aviation, Inc., a North Carolina corporation operating under the name of Piedmont Airlines, with headquarters in Winston-Salem, North Carolina, was operating as an air carrier under a temporary certificate of public convenience and necessity and an air carrier certificate, both issued pursuant to the Civil Aeronautics Act of 1938, as amended.

Flight Personnel

Captain Herndon H. Hutcheson possessed a valid airline transport pilot

rating and had logged a total of 3860 flying hours, of which 2100 were in DC-3 type equipment. His last instrument check was taken September 9, 1948, and his last CAA physical examination was on December 13, 1948. Copilot James A. Craig, Jr., possessed a valid airman certificate with commercial pilot and instrument ratings and had logged a total of 2366 flying hours of which 356 were on DC-3 type equipment. His last instrument check was accomplished June 26, 1948, and his last CAA physical examination was on August 10, 1948. The other member of the crew was Purser Hollis E. Moore.

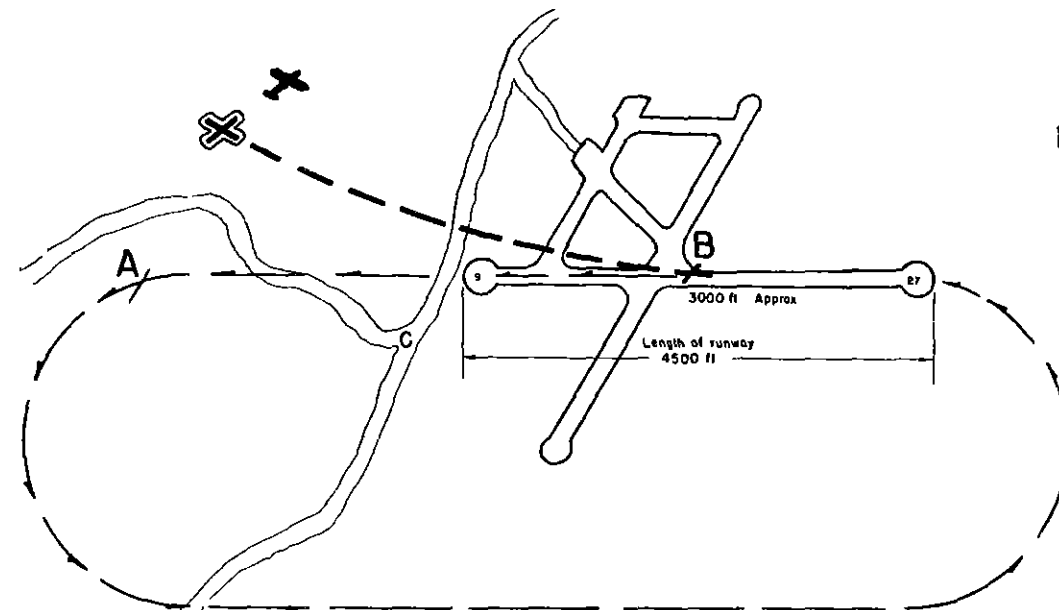
The Aircraft

NC-37468, a Douglas DC-3D aircraft was manufactured January 11, 1946, had a total of 4043.13 hours and was currently certificated. It was equipped with two Pratt and Whitney R-1830-92 engines with Hamilton Standard Hydro-matic propellers. Both engines had 14 hours since overhaul.

FLIGHT PATH OF NC 37468
TRI-CITY AIRPORT - BRISTOL, TENN.

DECEMBER 28, 1948

15276



- ORIGINAL TAKE OFF PATH
- A APPROXIMATE POINT AT WHICH THE PILOT ADVISED THAT HE WAS RETURNING TO LAND
- B APPROXIMATE POINT AT WHICH IT WAS APPARENT THAT THE AIRCRAFT WAS GOING AROUND
- - - FLIGHT PATH OF ATTEMPTED GO-AROUND
- + POINT OF IMPACT - AFTER WHICH THE AIRCRAFT TURNED APPROXIMATELY 100 DEGREES TO THE RIGHT
- C ROAD