

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: June 8, 1953

Released: June 10, 1953

PIEDMONT AIRLINES - GREENSBORO-HIGH POINT AIRPORT, NORTH CAROLINA,
OCTOBER 20, 1952

The Accident

A Piedmont Airlines DC-3, N 65384, was extensively damaged while landing at the Greensboro-High Point Airport, North Carolina, on October 20, 1952, about 1232 EST. There was no fire and no personal injury.

History of the Flight

The flight, designated as No. 20 of October 20, originated at Cincinnati, Ohio. It was scheduled to make eight intermediate stops between there and Wilmington, North Carolina, the destination. At Winston-Salem, the fourth stop, the crew was changed in accord with company scheduling, and the aircraft was fueled to a total of 500 gallons.

Captain W. W. Cox, First Officer K. C. Lineback, and Purser V. Hoelscher comprised the crew. A flight plan specifying visual flight over the entire route to Wilmington was filed. The aircraft was off from Winston-Salem for Greensboro-High Point, 16 miles away, with 13 passengers at about 1225 EST. Its gross weight was well below the authorized maximum, and its center of gravity was within prescribed limits. However, the rear baggage compartment was not loaded in accordance with company specifications; this was caused by the last minute appearance of the 13th passenger and will be discussed later in this report.

Flight 20 proceeded at its planned altitude of 2,400 feet in moderately rough air. At 1228 it reported to the company at Greensboro-High Point as in range of the Greensboro Tower, changed to tower frequency and called for landing instructions. The tower replied, "Piedmont 20 in sight over Kernersville, two eight (1228) VFR. Cleared left turn in runway five, wind north, varying both sides two zero to three zero (20-30 m.p.h.). Occasional gusts up to four five (45 m.p.h.). Over."

The flight acknowledged this message and the tower replied, "Piedmont twenty cleared to land." Captain Cox then asked if Runway No. 32 would be more nearly aligned with the wind. The tower replied, "It's varying thirty to forty (m.p.h.) at the present time. North varying both sides. According to my indicator up here it's holding -- just holding on -- well its favoring 5 (Runway 5) most of the time but the tets (tetrahedron) swinging free -- you

can see it." The captain replied that he would use Runway 5, the tower said "OK," and then transmitted, "Varying twenty-five to thirty (m.p.h.) now." Just before the flight crossed the airport boundary the tower gave the wind as 27 m.p.h. This was acknowledged. Both captain and first officer were listening to the tower during all of these contacts.

Previously, about four miles from the airport, the landing check had been made and the landing gear extended and locked. At about three miles from the approach end of Runway No. 5 the aircraft was turned to the left into final approach. The air speed at the time was about 120 m.p.h., and the altitude about 500 feet. Wing flaps were then lowered to the 1/4-down position. Air speed was decreased by gradual reduction of power and further extension of flaps. The captain estimated that the air speed was about 100 m.p.h. upon passing over the end of the runway, by which time the flaps were fully lowered.

Approximately 200 feet beyond the approach end of the runway the aircraft touched down in a three point attitude, or nearly so. The crew stated that it did not contact the runway; competent witnesses on the ground stated that they believed it did. Captain Cox estimated an air speed of 85 m.p.h. at that time.

In either event, the aircraft rolled on the runway, or flew extremely close to it, for the relatively short distance of about 300 feet when the left or windward wing started to rise. The right wing dug into earth on the downwind side of the runway; the captain decided to go around, applied full power and ordered the gear and flaps up. The copilot complied at once, starting the gear and flaps up. He stated that the flaps were retracted at short spaced increments. However, the left wing then went down until it struck the ground at a point about 700 feet from where the right wing struck.

The aircraft skidded nearly sidewise to its right for a short distance before coming to rest within the boundary of the airport. Evacuation by the 13 passengers was quick and orderly, and via the main cabin door.

Investigation

All propeller blades were bent and the bottom of the fuselage was generally abraded and crushed. Both landing gears were collapsed to the left and both wings and the center section were somewhat damaged.

A special local weather observation was made by the United States Weather Bureau personnel as soon as possible after the accident, in accordance with Weather Bureau procedure. The ceiling and visibility were unlimited, and the wind was from the north, 20 m.p.h. with strong gusts up to 38 m.p.h.

Investigation revealed that for several hours before and after the accident wind conditions at Greensboro-High Point Airport had remained about the same. The tower testified that during this period some 30 transport aircraft (both Douglas DC-3's and Martin 404's) landed there. Most of them used Runway No. 5, while the others used No. 32; none experienced any difficulty.^{1/} Nor were any scheduled landings passed up during the period.

^{1/} Greensboro-High Point Airport has two runways, Nos. 5 and 32, intersecting at right angles.

Investigation of the overloading of the rear baggage compartment disclosed the following: The company's loading chart specifies that with 10-12 passengers, the total weight in the rear baggage compartment for this flight could have been as much as 185 pounds. This maximum allowable weight is reduced with increasing number of passengers, and in this case the addition of the 13th passenger reduced the allowable weight in that compartment to 50 pounds. As stated, the 13th passenger arrived late, and his 13 pounds of baggage were erroneously placed in the rear compartment with the 176 pounds of baggage already there. Thus, according to the company's loading chart, the rear baggage compartment was overloaded by approximately 139 pounds. However, subsequent computations showed that the aircraft was actually loaded well within the authorized specifications for center of gravity limits.

Investigation into the attitude of the aircraft at the time of touchdown, or near touchdown, revealed the following: The captain stated that the aircraft was struck by a gust from the left just prior to touching down, and that this gust dropped the tail, as well as the right wing, the latter sufficiently to touch the ground. Two tower operators, both of them commercial pilots as well as certificated controllers, and three airline pilots in the cockpit of a scheduled aircraft awaiting takeoff on Runway No. 5 testified that the aircraft actually did touch down, in a tail low or nearly three point attitude, about 200 feet down the runway. They further stated that the right wing went down while the tail was in this low position. These five witnesses were in extremely advantageous positions to observe precisely what happened at or about the time of touchdown.

Investigation also revealed that the raising of the flaps was not done in accordance with the company's operating procedure. The company operations manual specifies that at the start of a go-around flaps be raised over a 60-80 second period. A computation of the distance, speed, and the consequent time interval from when the captain ordered the flaps up until the aircraft came to rest with them fully up, indicated that they must have been raised practically without interruption.

Company training records indicated that Captain Cox had received better than average grades during his five years of employment by Piedmont as a captain for both ground courses and six-month flight checks, the latter including cross-wind landings.

Examination of the aircraft's maintenance records and of previous flight logs (squawk sheets) failed to disclose any item that may have been pertinent to this accident.

Piedmont Airlines' operations manual states in part:

"5. Cross-Wind Landing

- a. Keep the nose of the airplane lower than usual during the final approach.
- b. Lower the windward wing, or crab the aircraft, head the airplane toward the wind sufficiently to maintain a course parallel to the runway.

- c. Make a tail up landing.
- d. When the wheels contact the ground lower the airplane nose slightly, idle the leeward engine, and retract the wing flaps.

NOTE: The airplane is much less affected by horizontal wind gusts when the wing flaps are retracted.

- e. Increase the power of the windward engine as necessary in order to maintain the directional course of the airplane."

The company's operations manual does not set forth maximum cross-wind components for landing. (This is not required under the CAA type certification of the company's DC-3's although some DC-3 operators do specify such maxima.) Rather, the decision to land or not is entirely at the captain's discretion. The actual method of making cross-wind landings is also a matter of the techniques of the company's individual pilots, subject, of course, to the above general rules.

Analysis

It is obvious that the loading of the rear baggage compartment had no significant adverse effect upon the aircraft's center of gravity.

It is also clear that the crew was thoroughly and currently kept aware of the existing ground wind conditions as they approached the airport.

The evidence indicates that the aircraft touched down in a tail low attitude during a strong and gusty cross wind. This is contrary to the above-stated instructions in the company's operations manual -- instructions which are so basic and sound that they have long been accepted as good operating procedure. Furthermore, the pilot had made innumerable landings at Greensboro-High Point over a long period of time. He was therefore thoroughly familiar with the airport and the surrounding topography. However, it is entirely possible that Captain Cox encountered a peak gust, during which he lost control of the aircraft.

In reference to the use of wing flaps during the subject landing, the following seems pertinent:

The captain used flaps as prescribed in the company's pilot training manual. It stated that one of the common faults made during cross-wind landings is using too little flap. It further advocated the use of from 3/4 to full flap during a cross-wind landing.

During this approach the cross wind was not only unusually high but was accompanied by reported gusts of 45 m.p.h. Under those conditions the use of a large amount of flaps is questionable. Common practice and good operating procedure would call for the use of little if any flap, a tail high touchdown

and immediate retraction of flap if any. The entire subject of flap usage should not be set forth in an inflexible manner in the company's training manual, but should be a matter of flight training.^{2/}

Although the company did not specify a maximum cross-wind component for DC-3 landings, and was not required to, it is now considering adding such data to its operations manual.

Findings

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

1. The carrier, the aircraft and the crew were properly certificated.
2. At the time of the accident the aircraft was airworthy and was properly loaded with respect to its center of gravity.
3. The crew were kept continually informed of the surface winds at Greensboro-High Point during their approach.
4. The carrier's procedures prescribed a tail up landing with 3/4 to full flap during cross winds; the prescribed use of flaps was later changed to not more than 1/2 flap.
5. The pilot followed company procedure with respect to use of flaps and endeavored to follow procedure relative to the aircraft's touchdown attitude.
6. Due to strong, gusty cross winds, the aircraft contacted the runway tail low and control was lost.

^{2/} As a result of this accident the carrier has revised its operations and training manuals as follows:

5 "Cross-Wind Landing:

- a. Keep the nose of the airplane lower than usual during final approach and not more than half flaps are to be used when landing in cross winds of more than 12 mph. The only variation from this is to be when landing area makes use of all flaps necessary. The judgment of whether to use more than half flaps will remain with the pilot at the time of landing, taking all circumstances under consideration."

Probable Cause

The Board determines that the probable cause of this accident was loss of control of the aircraft while attempting a landing during strong, gusty cross winds.

BY THE CIVIL AERONAUTICS BOARD:

/s/ OSWALD RYAN

/s/ HARMAR D. DENNY

/s/ JOSH LEE

/s/ JOSEPH P. ADAMS

/s/ CHAN GURNEY

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 about 1300 EST by the Greensboro-High Point Control Tower. An investigation was immediately initiated in accordance with the provisions of Section 702 (a)(2) of the Civil Aeronautics Act of 1938, as amended. A public hearing, ordered by the Board, was held at the Robert E. Lee Hotel, Winston-Salem, North Carolina, on November 25 and 26, 1952.

Air Carrier

Piedmont Airlines is the operating division of Piedmont Aviation, Inc., which is incorporated in North Carolina. The company's main offices are at Winston-Salem. Piedmont Aviation operates as a scheduled air carrier under a currently effective certificate of public convenience and necessity issued by the Civil Aeronautics Board, and an air carrier operating certificate issued by the Civil Aeronautics Administration. These certificates authorize the transportation by air of persons, property and mail between various points in the United States, including Winston-Salem and Greensboro-High Point.

Flight Personnel

Captain William W. Cox held a currently effective CAA airman certificate, with an airline transport pilot rating. He had been hired by Piedmont as a captain some five years prior to the accident and had flown steadily for the company during that period. Captain Cox had logged about 7,000 hours of piloting, of which some 4,000 hours had been in DC-3's.

First Officer Kenneth C. Lineback had been employed in that capacity by Piedmont since August 1951. He held a CAA airman certificate with appropriate ratings for the subject flight. He had a total piloting time in DC-3's of about 1,000 hours.

The Aircraft

N 65384 was a Douglas Model DC-3C, and was owned by Piedmont Aviation, Inc. It was built in November 1943, and had a total of 17,017 hours of operation. Its engines were Pratt & Whitney R-1830-S1C3G, and the propellers were Hamilton Standard. The aircraft was airworthy and was properly certificated.