

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: May 27, 1954

Released: June 2, 1954

PIEDMONT AIRLINES, TRI-CITY AIRPORT, BRISTOL,
TENNESSEE, FEBRUARY 28, 1954

The Accident

A Piedmont Airlines DC-3D, N 43V, collided with a tree top while making an instrument approach to the Tri-City Airport at Bristol, Tennessee, at approximately 2140, ^{1/} February 28, 1954. Recovery and pull-out was effected and the aircraft proceeded to Winston-Salem, North Carolina, its alternate. There were no injuries to the three crew members or six passengers. The aircraft was substantially damaged.

History of the Flight

Piedmont Airlines' Flight 83 of February 28, 1954, was a scheduled operation between Norfolk, Virginia, and Knoxville, Tennessee, with intermediate stops at Newport News, Lynchburg, and Roanoke, Virginia, and Bristol, Tennessee.

The crew consisted of Captain Walter H. Tackenberg, First Officer Thomas A. Bachan and Purser R. D. Dean. The flight departed Norfolk, Virginia, at 1728 and was routine through the scheduled stops to the landing at Lynchburg at 1917. At Lynchburg, the Roanoke segment of the flight was cancelled due to weather conditions and the Roanoke passengers were deplaned. Prior to departure from Lynchburg the latest weather report available to Flight 83 for Tri-City Airport, Bristol, Tennessee, was the 1928 observation: ceiling 600 feet broken, 800 feet overcast, visibility 2 miles, light rain showers.

According to company records there were 604 gallons of fuel on board, at the time of takeoff from Lynchburg. The aircraft's weight was 23,626 pounds which was within the allowable gross weight of 25,346 pounds; the load was properly distributed so that the center of gravity of the aircraft was within the approved limits.

Flight 83 departed Lynchburg at 1949 on an IFR (Instrument Flight Rules) flight plan for Tri-City Airport to cruise at 8,000 feet via Airways Red 37 and Green 5 with Raleigh-Durham and Winston-Salem, North Carolina, as alternates. The flight made routine position reports en route and at 2035 received an ARTC (Air Route Traffic Control) clearance as follows: "83 cleared to the Tri-City Range Station climb to and maintain 9,000. Report leaving 8,000. Contact Tri-City Approach Control at 2059 for further clearance." The flight then

^{1/} All times referred to herein are based on the 24-hour clock and are Eastern Standard Time.

reported leaving 8,000 feet. Over the Abingdon intersection^{2/} at 2059, Flight 83 was cleared to the Tri-City Range to descend to and maintain 7,500 feet. The flight estimated over the range at 2109. At 2110 approach control cleared Flight 83 for an ILS approach, descent from 7,500 feet to 5,500 feet to be made east of the outer marker eastbound. Tri-City weather was given the flight: precipitation ceiling 600 feet, obscuration, visibility 3/4 mile, light snow.

Sometime after 2110 Flight 83 reported being unable to receive the compass locator at the outer marker due to precipitation static and requested ARTC clearance to Winston-Salem. This clearance was relayed to the flight. At 2127 the flight reported receiving the compass locator and was then cleared for an ILS approach to Tri-City Airport.

At 2128 Flight 83 reported eastbound over the range, leaving 7,500 feet. At 2134 when over the outer marker inbound at 4,500 feet, the flight advised it would circle and come over the outer marker a second time. At 2137 approach control was advised that Flight 83 was over the outer marker at 3,200 feet, inbound. Three minutes later the flight advised it was pulling up after "hitting the ground" and requested another clearance to Winston-Salem. This clearance was immediately granted and Flight 83 proceeded to that station.

En route to Winston-Salem, some roughness in the left engine and smoke in the cockpit were encountered. Oil from the left engine dripping on the exhaust manifold caused smoke to enter the cockpit through the heater duct. The heaters were shut off and the smoke dissipated. A normal landing was made at Winston-Salem at 2245.

Weather at the time of the accident at the Tri-City Airport was: precipitation ceiling 600 feet, obscuration, visibility 3/4 mile, light snow, temperature 34, dew point 32, altimeter 29.57, wind west-southwest 5-10 m.p.h.

Investigation

Investigation disclosed that the aircraft contacted a tree during the approach instead of the ground as reported by the crew. This tree was located on a bearing of 80 degrees, 7,500 feet from the approach end of Runway 27 and 1,300 feet north, to the right, of the extension of the localizer course. The tree is at an elevation of 1,560 feet MSL (mean sea level); the top of the tree is 60 feet above the ground and about 100 feet above the runway level which is 1,523 feet MSL. The top of the tree was 319 feet below the glide path and the upper ten feet of it was severed by the aircraft. Contact with the tree damaged the left engine, the left propeller and the leading edge of the left wing.

Examination of the aircraft, the engines and aircraft ILS instruments revealed no evidence of a structural failure or malfunction having occurred prior to impact.

Monitoring records of navigational and landing facilities indicate normal operation during the time of the flight's approach. A flight check by the CAA the day following the accident found all facilities to be operating within specified limits.

^{2/} This reporting point is on the northeast course of the Tri-City low frequency range, twenty-two miles northeast.

According to a chart in the company's flight manual two ILS approaches^{3/} at Tri-City are approved: (1) Descent inbound to begin at 5,500 feet MSL from the Emmett MHW marker which is 14.5 miles from Runway 27 after a procedure turn east of the marker and north of the localizer course has been made, (2) Descent inbound to begin at the outer marker (glide path interception altitude minimum of 2,740 feet MSL) after a procedure turn at 3,000 feet MSL outbound and north of the localizer course. Minimums for a straight-in approach to Runway 27 are 600 feet ceiling and 3/4 of a mile visibility. In addition to the charts in the company's manual, an excerpt from Chief Pilot Letter #19 dated October 8, 1952, gives the following instruction to all company pilots: "Glide Path Check - After the completion of the turn (procedure) the aircraft should be flown to the outer marker at the altitude specified in the ILS procedure chart for glide path interception ...

"In order that this check may be performed it is absolutely necessary that no attempt be made to institute an ILS approach by turning inside the outer marker, since the outer marker site provides the initial localizer and glide path check at an altitude which will insure safety. The flight should continue past the outer marker for a sufficient distance to insure that the inbound track will permit a stabilized course prior to reaching the outer marker site. The above check should be completed prior to inaugurating any ILS approach."

According to crew statements, the aircraft was flown by the captain from the Abingdon intersection descending to 7,500 feet MSL at the Tri-City Range. The crew testified that in the descent to 4,500 feet, a southwest wind of 40 to 50 knots existed which necessitated a 20-degree heading correction on both the east and west legs of the pattern. A procedure turn was made outbound at 4,500 feet MSL and the aircraft came inbound over the outer marker at this altitude which is in excess of the prescribed height of 2,740 feet MSL and too high for glide path interception. A right 360-degree descending turn was then made and the outer marker was crossed inbound the second time at 3,200 feet MSL. The crew stated that the localizer needle was centered with the glide path needle indicating full "fly-down" deflection at the outer marker. An air speed of 120 m.p.h. with a descent of not more than 535 feet per minute was maintained after passing the marker. Captain Tackenberg stated that he checked his descent on approaching an indicated altitude of 2,200 feet--700 feet above runway level--and the landing gear was retracted and carburetor heat removed. Then, according to the crew a severe downdraft with moderate turbulence forced the aircraft from above to below the glide path until the left wing struck the top of a 60-foot tree knocking off the top 10 feet. The aircraft was in an approximately level attitude when the left wing struck. Some yaw was experienced but control of the aircraft was not lost and a climb out and a missed approach procedure was accomplished and a new clearance to Winston-Salem obtained.

The 1330 synoptic map of February 28, 1954, showed a low pressure trough and a cold front extending south-southwestward from eastern Ohio through eastern Kentucky, extreme southwest Virginia, and between Tri-City and Knoxville, Tennessee. A rapid fall in temperature was occurring behind the cold front from Tennessee northward. The cold front passed Tri-City at about 1725 and was approximately 50 miles east of Tri-City at the time of the accident.

^{3/} See Attachment A.

It appears that the entire flight was either in the overcast or between layers and that intermittent moderate to possibly heavy turbulence existed to near the Abingdon intersection which is about 22 miles northeast of Tri-City. Light to moderate turbulence is indicated thereafter until the flight descended below 5,000 feet after which only intermittent light turbulence is indicated. Strong southerly winds of 30 to 40 knots existed en route but the wind velocity decreased in descent and became westerly 10-15 knots below 4,000 feet in the Tri-City area. The inflow of cold air behind the cold front stabilized the air in the lower levels. This condition was confirmed by the testimony of other flight crews in the area near the time of the accident.

Flight 83 reported that it was unable to receive the audio signal of the Emmett MHW ("H") marker due to precipitation static and therefore could not commence the ILS approach from that point.

Analysis

Captain Tackenberg had requested and received a clearance to Winston-Salem, an alternate, due to poor reception of the outer locator. However, he later requested an ILS approach after ascertaining that the compass locators at the middle and outer markers could be received. As testified, it was his intention to descend to 700 feet above the ground, the company's low frequency range minimum altitude, rather than to 600 feet, the ILS minimum altitude.

It is evident that his ILS approach was not made in accordance with the company's flight manual and the chief pilot's instructions. Both passages over the outer marker inbound were higher than the glide path interception altitude. The procedure turn outbound was 1,500 feet above the specified minimum altitude and this altitude was maintained inbound to the outer marker. The 360-degree right descending turn to 3,200 feet MSL at the outer marker did not allow sufficient time or distance to establish a stabilized course or air speed for the final approach. The second attempt to intercept the glide path was too high; therefore, the corrective action by the captain should have been to execute a missed approach procedure or, after advising approach control, to proceed outbound again on the localizer course a sufficient distance to make his procedure turn and return inbound descending to the specified altitude.

The Board recognizes that downdrafts can be isolated and transitory and the fact that other flights did not encounter any downdrafts in the Tri-City Airport area is not alone sufficient evidence to state that none existed. However, both that evidence and the analyzed structure of the air in the area fail to lend any support for the severe downdraft described by the pilots of N 43V.

A study of all available weather data indicates smooth air to light turbulence below 5,000 feet MSL. The air was stable in this lower layer, and precluded the formation of downdrafts within it and prevented downdrafts that might generate at high levels penetrating this stable air mass. Downslope air flow was likely on the lee (east) side of the hills at low altitudes, but due to the configuration of the hills in the approach zone and the light winds at hilltop levels, not only would the downward component have been very small but the duration in such downslopes at 120 m.p.h. air speed would have been only

a fraction of a minute. Therefore, it seems improbable that the flight encountered the single severe downdraft described by the crew as forcing the aircraft downward several hundred feet to a position well below the glide path. It seems more probable that with the aircraft over the outer marker nearly 500 feet above the glide path the descent was steepened in an attempt to get on the glide path and the aircraft went through and below the glide path before the "pull-up" was made. According to the captain contact with the top of the tree occurred within 30 seconds after he had started his missed approach. The tree which was struck is 2.9 miles west of the outer marker and 1,300 feet to the right of the localizer course and 319 feet below the glide path. If the captain had maintained a constant air speed of 120 m.p.h. and a constant descent of not over 535 feet per minute after passing the outer marker inbound, according to his testimony he would have been several hundred feet above the top of the tree and above the glide path. It is obvious, considering that the point of impact was 1,300 feet to the right of the localizer course, that the aircraft had deviated seriously from the intended course.

Findings

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

1. The carrier, the aircraft and the crew were properly certificated.
2. The aircraft's weight was less than the maximum allowable and the load was distributed so that the center of gravity of the aircraft was within the approved limits.
3. All CAA navigational and landing facilities were operating normally.
4. The captain did not follow the approved approach procedure.
5. On both approaches to the outer marker the aircraft was too high to intercept the glide path at the specified altitude.
6. The aircraft struck a tree at a height 319 feet below the glide path and at a point 1,300 feet to the right of the localizer course.
7. No evidence was found to indicate that structural or mechanical failure had occurred prior to the impact.

Probable Cause

The Board determines that the probable cause of this accident was the action of the pilot in not following the approved procedures for an ILS approach which resulted in the aircraft striking a tree.

BY THE CIVIL AERONAUTICS BOARD:

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

/s/ OSWALD RYAN

/s/ JOSH LEE

Joseph P. Adams, Member, did not participate in the adoption of this report.

S U P P L E M E N T A L D A T A

Investigation and Hearing

The Civil Aeronautics Board's Atlanta field office was notified of this accident at 2215 on February 28, 1954, by a long distance phone call from Piedmont Airlines at Winston-Salem, North Carolina. 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 was ordered by the Board and the hearing was held in Winston-Salem, North Carolina, on March 18 and 19, 1954.

Air Carrier

Piedmont Aviation, Inc., the parent company, conducts a general aircraft sales and service type of operation. The company is incorporated in the State of North Carolina with its principal offices in Winston-Salem, North Carolina. In December 1947, the company established the Piedmont Airlines division. The company operates 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 company to transport by air, persons, property and mail between various points in the continental United States, including the route involved.

Flight Personnel

Captain Walter H. Tackenberg, age 38, held a currently effective airline transport pilot certificate with an appropriate rating for the subject aircraft. He was employed by the company in March 1949. He had a total pilot time of 8,945 hours of which 4,350 hours were in DC-3 aircraft. His last en route check was on February 6, 1954, and last six-month proficiency check on February 10, 1954. His last CAA physical examination was taken December 30, 1953.

First Officer Thomas G. Bachan, age 25, held a currently effective airman certificate with commercial and instrument ratings. He was employed by the company in February 1952. His total copilot time was 1,870 hours and his total first pilot time on DC-3 equipment was 943 hours. His last CAA physical examination was taken December 30, 1953.

Aircraft

N 43V, a Douglas DC-3D, serial #42958, was manufactured in December 1945. It had a total of 18,650 flying hours and was properly certificated by the Civil Aeronautics Administration. Aircraft time since overhaul was 6,633 hours. The aircraft was equipped with Pratt & Whitney R-1830-92 engines and Hamilton Standard hydromatic propellers.

PIEDMONT AIRLINES, N43V, FEB 28, 1954
TRI-CITY AIRPORT, BRISTOL, TENN.
ILS GLIDE PATH SHOWING RELATIVE POSITION
AND ALTITUDE OF TREE STRUCK BY N43V

PROCEDURE TURN
NORTH SIDE OF E COURSE
3000' WITHIN 5 MILES OF OM



