

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: August 24, 1948

Released: August 24, 1948

EASTERN AIR LINES, INC.,—OXON HILL, MARYLAND,—JANUARY 13, 1948

The Accident

At approximately 0436,¹ January 13, 1948, Eastern Air Lines' Flight 572, a DC-3, NC-28384, crashed near Oxon Hill, Maryland, 5.2 miles south of the Washington National Airport, Washington, D. C. Of the nine occupants aboard, five, including the pilot and co-pilot, were killed and four were injured. The aircraft was completely destroyed.

History of the Flight

Flight 572 arrived in Atlanta, Georgia, from its point of origin, Houston, Texas, at 2330, January 12, 1948. With a new crew, consisting of Captain Paul J. Saltanis, First Officer Ralph B. Sanborn, Jr., and Flight Attendant Peter L. Philliois,² the flight departed from Atlanta at 2355 for Greenville and Winston-Salem, North Carolina, and Washington, D. C. The flight as far as Winston-Salem was routine. At 0306, January 13, 1948, the flight took off from Winston-Salem carrying six passengers, a crew of three, and 600 gallons of fuel. It proceeded at the altitude of 9,000 feet specified in the flight plan, to Washington, via Blackstone and Richmond, Virginia.

Shortly after reporting over Blackstone, at 0405, 146 miles southwest of Washington, an airway traffic control clearance was transmitted by company radio to the flight authorizing it to cross the Doncaster fan marker, 27 miles southwest of Washington, at 5,000 feet. Captain Saltanis requested a lower altitude and ten minutes later received another ATC clearance approving 3,000 feet over Doncaster, and permission to descend to 2,500 feet immediately after crossing Doncaster. At 0427, the flight reported its position to the Washington control tower, stating that it was over Doncaster at 3,000 feet. It was instructed

by the tower to maintain 2,500 feet, and to report again when it was over Mt. Vernon, 9 miles south of the Washington National Airport. At about this same time another Eastern Air Lines' flight, No. 454, reported that it was at 4,500 feet over the Arcola range station, which is located 23 miles west-northwest of Washington, D. C.

Since the two Eastern Air Lines' flights were converging toward Mt. Vernon, the airport traffic controller thought that Flight 454 might fly over Mt. Vernon before it had descended to a safe altitude below Flight 572. To assure that both airplanes would not be over Mt. Vernon at the same time and altitude, the controller instructed Flight 572 to climb to 3,500 feet. Flight 572 acknowledged, advised that it was contact, and asked why it was necessary to climb. Less than a minute later, at approximately 0430, the east bound flight, No. 454, reported that it was "contact" at 2,000 feet and approaching Mt. Vernon. The controller then knowing that a safe altitude separation existed between the two aircraft, cleared Flight 572 back to its previous approach altitude of 2,500 feet.

At 0433, Flight 572 was again cleared to the airport by the Washington Tower, and advised to report when leaving 2,500 feet, when leaving Mt. Vernon, and when "VFR."² Following this transmission Flight 572 was asked to give a short count, since the tower wished to adjust its receiving frequency. The flight complied. Then at 0435, the flight was requested to report the altitude of the base of the clouds. The flight responded, "standby." According to the tower operator the pilot's voice when giving the tuning count was normal, but his "standby," sounded "hurried and preoccupied."

¹ All times noted in this report are Eastern Standard and based on the 24-hour clock.

² VFR—Visual Flight Rules—meaning that sufficient visibility existed to fly in accordance with visual flight rules as stated in the Civil Air Regulations.

One to two minutes after the east bound flight, No. 454, reported contact approaching Mt. Vernon, an aircraft was observed in the tower's surveillance radar scope over the vicinity of Mt. Vernon. This aircraft was then tracked continuously, first in the surveillance, and then in the precision beam radar scope until it had landed on runway 36.³ It was then identified as Eastern's Flight 454. Flight 572, however, was not observed in either scope.

From 0435 to 0445 several attempts were made to establish radio contact with Flight 572. Forty-five minutes later it was learned that it had crashed in the vicinity of Oxon Hill, Maryland, approximately 5.2 miles south of the Washington National Airport.

Investigation

The wreckage was located on moderately wooded terrain, 5.2 miles south of the Washington National Airport, and 600 feet to the east of the Potomac River. The first contact with the ground was made when the right wing tip of the airplane struck the top of a sycamore tree, 106.1 feet above sea level. Due north 155 feet from this tree the right wing struck a birch tree at a point 109 feet above sea level. These two trees were in line with runway 36 and the ILS⁴ localizer at the Washington National Airport. A third tree, 425 feet north of the first, was struck at a point 113.4 feet above sea level; and 95 feet from this third tree the aircraft struck the ground in an inverted position, coming to rest at the base of two large oak trees. No fire resulted from the crash.

The 520-foot swath cut through the trees by the aircraft showed that it had been flying on a heading of 360 degrees in line with runway 36 at the Washington National Airport, and that it had rolled to the right into an inverted position during the course of the crash. Its attitude when it struck the trees was level flight, though it may have been climbing slightly.

Although no witnesses on the ground actually saw the airplane, several in the

immediate area of the crash were awakened by the sound of the aircraft passing overhead. All of these witnesses stated that it sounded as if it were flying very low.

Parts of the right wing were found scattered over the area of the crash. Since the left wing became elevated as the aircraft rolled to the right, it remained relatively intact and was found with the main body of the wreckage. The empennage and fuselage received relatively small damage, only minor damage resulting to the cabin aft of the cabin door. However, the forward cargo compartment and the cockpit were completely destroyed.

All control surfaces, hinges, torque tubes, cables, and other structural parts were accounted for. No indication was found of any failure prior to the time of impact. The landing gear was found in the down position; the flaps were found to be up. Both propellers showed signs of having been stopped as a result of impact. The rotational force of the right propeller had been absorbed to a large extent by the cutting of limbs of trees prior to the time that it actually struck the ground. The engines were torn down for examination and no indication was found of any mechanical failure or malfunctioning. Survivors testified that they heard no abnormal sounds which would have indicated to them a power interruption prior to the time of the crash. The company's maintenance records indicated that the airplane was in an airworthy condition at the time of its departure from Houston and Winston-Salem.

All instruments, vacuum lines, and electrical leads were examined, and no indication was found of any malfunction or failure prior to the time of impact. The right clock continued to operate, but the balance wheel of the left clock was broken from its shaft. It indicated the time of the crash to be between 0430 and 0445.

Both altimeters were recovered from the wreckage. The one which had been installed in the right instrument panel had been so severely damaged that it could not be repaired and made to operate. Its barometric pressure setting was 29.97 in hg. The altimeter which had been installed on the left or pilot's side of the instrument panel was found in relatively good condition, and its barometric pressure setting was 30.02 in hg. Barometric pressure at the airport

³ The surveillance radar scope and the precision beam radar scope are the essential components of G. C. A. (Ground Control Approach). Position, altitude, and direction of an aircraft close to the airport can be determined in the precision scope. Further out, only position and direction flown by the aircraft are determined in the surveillance scope.

⁴ I. L. S. — Instrument Landing System.

immediately before the accident was 29.98 in hg. After replacing the rear rocking shaft and the temperature compensating pins in the left altimeter, it along with a master altimeter was placed in a bell jar and tested. It proved capable of normal operation, indicating 250 feet lower than the master altimeter at 5,000 feet, and 420 feet lower at 10,000 feet. The test was conducted not to determine the altimeter error before the crash, but to ascertain whether the instrument was capable of smooth mechanical operation. Aircraft records indicated no abnormal operation of either the right or the left altimeters.

Most of the radio equipment was damaged severely. Parts that could be recovered, however, were bench checked and proved capable of normal operation. The ADF, automatic direction finding equipment, was found in relatively good condition, and though the condenser shaft had been pulled free from the tuning control, its indication was that the equipment had been set on 328 kcs. with the audio filter on "voice." The control box for the ILS (this aircraft was not equipped with a glide path receiver) was set on Channel Y, the ILS frequency for Washington. The inner mechanism of the switch had been damaged, however, and did not definitely indicate that the localizer was in use at the time of the crash. A thorough examination of generators, control boxes, fuses, wiring, and other electrical components indicated no sign of malfunction.

A study of the synoptic weather charts indicated that during the time of the flight from Atlanta to Washington an extensive low pressure area had developed between an Atlantic high pressure cell of relatively warm moist air, and a cold polar high pressure area centered over the midwestern states. In the low pressure area, extending northeast and southwest along the flight path, was rain, snow, and low ceilings and visibility. Wind at the cruising level of 9,000 feet was generally from 240 to 250 degrees at 45 to 50 miles per hour. The freezing level was at 6,000 feet, and little possibility existed for wing icing below 6,000 feet.

Weather data compiled from the weather stations at Washington National Airport, at Bolling Field, Anacostia Naval Air Station, and Andrews Field, Maryland, indicated that at the time of the accident

instrument weather conditions prevailed in the vicinity of the Washington National Airport. The ceiling was highly variable, and the overcast broken into small and large formations of clouds with bases varying from 100 feet to 2,000 feet above the ground. The air at low altitudes was stable and saturated. Testimony of witnesses in the vicinity of the crash indicated that heavy rain was falling at the time of the accident. Washington National Airport, approximately 30 minutes before the accident, reported a measured ceiling of 600 feet with visibility of 4 miles and light rain and fog. Ten minutes before the accident it was reporting a ceiling of 500 feet with visibility 4 miles and light rain and fog. At approximately the time that Flight 572 crashed, the weather station at Washington National Airport reported an overcast with ceiling at 1,400 feet, scattered clouds at 600 feet, visibility 4 miles, light rain and fog.

Prior to December 10, 1947, the outer marker for the instrument landing system on runway 36 of the Washington National Airport was located at a point 3.6 miles south of the Washington National Airport. According to the airport approach chart for Washington published in Eastern's operation manual and dated November 11, 1947, the ILS approach procedure was to fly from Mt. Vernon on a course of 60 degrees and at an altitude of 1,500 feet. Then, after intersecting the localizer, to follow the localizer toward runway 36, crossing the outer marker at an altitude of 1,000 feet. The outer marker was moved to a point 5.2 miles south of the airport December 10, 1947. On January 9, 1948, Eastern published a new airport approach chart in their operation manual showing the new location of the outer marker, and specifying 1,500 feet rather than 1,000 feet as the altitude to cross over this outer marker.

The operation manual recovered from the aircraft did not have the range approach plate, dated January 9, 1948, showing the latter procedure and the new location of the outer marker. The first location of the marker was over the river while the location of the marker at the time of the accident was on terrain approximately 85 feet above sea level. A letter was introduced into evidence to the effect that Captain Saltanis had instructed another Eastern Air Lines' pilot on a previous flight into Washington that

the outer marker had been moved out 1 1/2 miles further back from the end of the runway.

Testimony from those familiar with the performance of the radar equipment at the Washington National Airport was to the effect that an aircraft flying at 1,500 feet or above over the vicinity of Mt. Vernon would be visible in the surveillance scope. Below 1,500 feet the aircraft would probably not appear in the scope because of the interference of ground objects to radar reception. Closer to the airport the aircraft would be received at lower altitudes. Five miles south of the airport and in the vicinity of the outer marker, according to one operator, an aircraft would appear in the scope if flying only 200 feet above the ground.

Discussion

All evidence of record indicated that the aircraft was operating normally at the time of the crash. The surviving passengers and crew member observed no unusual sounds which would have indicated engine failure. Radio reports received from the flight contained no mention of mechanical trouble, and none was recorded in any of the aircraft's papers. Tear-down and examination of the engines revealed no signs of engine failure. Furthermore, both propellers showed signs of having considerable rotational force at the time of the crash. It is concluded that Flight 572 had power available at all times.

The procedure as described in Eastern Air Lines' operation manual required a minimum approach altitude of 1,500 feet over the outer marker. The tree tops that the aircraft struck first were 109 feet above sea level. Since no indication of maloperation of either altimeter was found during the course of the investigation, it is unreasonable to suppose that both altimeters in the aircraft could have been in error 1,391 feet immediately prior to the accident.

Since weather conditions below 2,000 feet were not conducive to the formation of wing icing, and since no icing was reported at any time by this flight, the possibility of the aircraft crashing because of icing conditions also appears to be extremely remote.

It is significant that Flight 572 was not observed in either the surveillance or precision beam radar scopes, even

though it flew to within 5 1/2 miles of the airport before crashing. The other Eastern Air Lines' flight, No. 454, had been observed over the vicinity of Mt. Vernon, approximately 9 miles from the airport. The only explanation of why only Flight 454 was observed appears to be that Flight 572 approached the airport at an altitude too low to be discernible in either of the radar scopes. Since an aircraft can be observed when in the vicinity of Mt. Vernon if at an altitude of 1,500 feet or more, it would seem that Flight 572 must have been below that altitude when passing over Mt. Vernon, though 1,500 feet was the prescribed minimum for an instrument approach until over the outer marker.

Altitude may have been reduced for the purpose of flying by visual reference to the ground over the Potomac River to the airport. Weather conditions which were highly variable may have led the pilot to believe that once contact over the river he could remain so for the short distance remaining to the field. No other reason for the flight's approach into Washington below the specified altitude of 1,500 feet for instrument approaches appears from the facts disclosed by investigation. In any event, instrument weather conditions were reported over and in the vicinity of the Washington National Airport, and restriction in visibility and ceiling could have been reasonably anticipated. It is evident that had Flight 572 followed the prescribed instrument procedure, maintaining 1,500 feet until after crossing the outer marker, it could not have possibly crashed 5 miles south of the airport into trees 109 feet above sea level.

Findings

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

1. The aircraft, carrier, and crew were properly certificated.
2. The investigation disclosed no evidence of structural failure or mechanical malfunctioning prior to the time of the accident.
3. At the time of the accident weather conditions were highly variable in the vicinity of Washington, ceilings ranging from 100 to 2,000 feet above the ground. Ten minutes before the accident the ceiling over the Washington National Airport was 500 feet, and at the time of the accident it was 1,400 feet with scattered

clouds at 600 feet. Visibility was restricted to 4 miles, and there was light rain and fog.

4. Flight 572 flew to within 5.2 miles of the Washington National Airport without being observed in either the surveillance or precision beam radar scopes installed in the tower of the airport, though another flight at approximately the same time was observed continuously as it flew from the vicinity of Mt. Vernon, approximately 9 miles south of the airport, until it landed on the end of runway 36 at the Washington National Airport.

5. Flight 572 when approaching the Washington National Airport passed over the vicinity of Mt. Vernon at an altitude below 1,500 feet.

6. The prescribed procedure for Eastern Air Lines for an instrument approach to the Washington National Airport, using the instrument landing system, requires a flight to maintain a minimum altitude of 1,500 feet until over the outer marker on the localizer path, 5.2 miles south of the airport.

7. The aircraft first made contact

with the ground by striking a tree at a point 106.1 feet above sea level, at which time it was in a straight and level flight attitude and in line with runway 36 and the I.L.S. localizer at the Washington National Airport.

8. After first impact, as described above, the aircraft crashed 520 feet through trees, and came to rest in an inverted position 5.2 miles south of the Washington National Airport.

Probable Cause

The Board determines that the probable cause of this accident was the failure of the flight to follow prescribed instrument procedure and to maintain a safe altitude during the course of an instrument approach to the Washington National Airport.

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 the accident at 0635, January 13, 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 Washington, D. C., February 2 and 3, 1948.

Air Carrier

Eastern Air Lines, Inc., a Delaware corporation with headquarters in New York, New York, was operating as an air carrier under a certificate of public convenience and necessity and an air carrier operating certificate, both issued pursuant to the Civil Aeronautics Act of 1938, as amended. The certificate authorizes the corporation to fly persons, property, and mail between various points in the United States, including Atlanta, Georgia, and Washington, D. C.

Flight Personnel

Captain Paul J. Saltanis, age 36, possessed a valid airline transport pilot rating. He was employed by Eastern Air Lines August 26, 1941. At the time of the accident he had accumulated a total of 7,271 flying hours, 5,111 of which were in DC-3 type equipment. His last physical examination was accomplished

December 11, 1947. First Officer Ralph B. Sanborn, Jr., age 30, possessed a valid commercial pilot rating. He was employed by Eastern Air Lines January 29, 1947. Mr. Sanborn had been previously trained as a pilot in the United States Navy. He had a total of 4,593 flying hours, 1,003 of which were in DC-3 type equipment. His last physical examination was accomplished August 28, 1947. Both pilots were properly certificated for the flight and the captain was qualified on the route. Peter L. Philiois was the flight attendant.

The Aircraft

NC-28384 was a Douglas DC-3 operated and registered in the name of Eastern Air Lines, Inc. The aircraft had accumulated a total of 29,974 hours since its manufacture February 8, 1941. It was equipped with two Wright G202A engines on which Hamilton Standard propellers were installed. The left engine had been operated a total of 7,345:26 hours and 643:37 hours since overhaul. The right engine had been operated a total of 21,471:14 hours and 548:13 hours since overhaul. At the time of departure from Atlanta the total weight of the aircraft was approximately 1,737 pounds less than the maximum allowable and the load was distributed with respect to the center of gravity within approved limits.