

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted November 28, 1947

Released December 2, 1947

EASTERN AIR LINES, INC., ALEXANDRIA, VIRGINIA—OCTOBER 11, 1946**The Accident**

Eastern Air Lines' Flight 564 crashed near Alexandria, Virginia, at 2325,¹ October 11, 1946, during an instrument approach to Washington National Airport. The Douglas DC-4, NC-88729, was demolished by impact and subsequent fire. The pilot was seriously injured, however, none of the remaining 3 crew members or the 22 passengers sustained other than minor injuries

History of the Flight

Flight 564 departed Miami, Florida, at 1620 October 11, 1946, with its destination Newark, New Jersey, and with stops scheduled at Tampa, Florida, Atlanta, Georgia and Washington, D. C. The flight progressed according to its flight plan to Atlanta, where a landing was made at 1943. A delay of approximately 30 minutes was occasioned at Atlanta as a result of a discussion between the captain and the company dispatcher at Atlanta and a telephone conversation between the captain and the New York dispatcher concerning the most acceptable plan of operations for the remainder of the flight. Because of low ceilings and visibility forecast for Washington, it was agreed that Flight 564 would be cleared from Atlanta to Newark, subject to possible reclearance en route in the event the weather at Washington was suitable for a landing.

The flight departed Atlanta at 2027 and proceeded on an instrument flight plan at 7,000 feet along Airway Green 6. Routine position reports were made en route and at 2234, after receiving clearance for a change of altitude, Flight 564 reported over the Richmond radio range station at 5,000 feet. At 2245 the flight was cleared to the Doncaster Fan Marker, to descend to 3,000 feet en route, and to

maintain 3,000 feet until further advised. At this point in the operation the flight came under the jurisdiction of Washington Approach Control and further instructions were received from that source. Approximately six minutes later the flight received an approach control clearance to the Mount Vernon Fan Marker to cruise at 2,500 feet and to hold southwest of Mount Vernon.

The aircraft was cleared to the Washington Tower at 2311, and one minute later the flight reported leaving Mount Vernon for final approach to the Washington National Airport. At 2316 the flight reported that it had missed its approach and requested clearance for a second approach. The traffic controller approved this request and instructed the flight to report when southbound over the range station and when making the procedure turn before final approach. These reports were made at 2318 and 2321 respectively, the latter report being the last radio contact had with the flight.

At 2340 a report was received from the Virginia State Police indicating that Flight 564 had crashed near Alexandria, Virginia.

Investigation

The wreckage was located in low rolling terrain approximately 2 1/2 miles south-southwest of Alexandria, Virginia, or 6 miles south-southwest of Washington National Airport. A reconstruction of the accident indicated that the aircraft had struck the crest of a low ridge at an elevation 200 feet above sea level or 183 feet above the elevation of Washington National Airport. Initial impact had been made on a magnetic heading of 29 degrees which is the inbound bearing of the southwest leg of the Washington radio range. The site of the accident was approximately 500 feet to the east of the right side of this leg.

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

The southwest leg is normally used for final instrument approach to Washington

Marks of collision with objects on the ground indicated that the aircraft was almost exactly in level flight at the moment of initial impact. Examination of the wreckage disclosed that the landing gear was fully extended at the time of the accident and that the flaps were partially extended. The first marks of impact were found in a hedge row which bordered the southernmost area on the crest of the ridge. The wheel marks were clearly identifiable and the swaths cut through this hedge revealed the lowest portion of the wheels to have been aligned almost exactly with the surface at the top of the ridge. After passing through the hedge row, therefore, the wheels skimmed along the muddy surface of the ridge crest and, thereafter, buried themselves more deeply as the aircraft progressed over the gradual up-slope. The aircraft continued in a slight right turn for approximately 500 feet during which time the landing gear failed and the right wing began to disintegrate as it struck and demolished two telephone poles in its path. As it passed over the top of the ridge and started down the northern slope, the aircraft momentarily left the ground making contact again on the left wing and causing the wing to break outboard of the No. 1 engine. Pivoting on the left inboard wing panel, the aircraft rolled into an inverted position and skidded tail first to a stop.

All occupants of the aircraft were evacuated without difficulty. While the passengers and crew were leaving the aircraft, some small gasoline fires were observed nearby, and as the gasoline drained from the ruptured tanks these fires gradually spread. Shortly after the aircraft had been completely evacuated one of the fuel tanks became ignited and the fire rapidly increased in intensity until the entire fuselage was enveloped in flames. The fire continued to burn for several hours consuming the major portion of the fuselage and the wing center section.

Inspection of the wreckage failed to disclose any evidence of structural or mechanical malfunctioning prior to impact. Statements of the crew indicated that the aircraft operated satisfactorily throughout the flight from Miami. The company maintenance records contained no indication that the aircraft was not in

an airworthy condition at the time of departure from Atlanta.

During the period of this flight the Atlantic Seaboard States were covered with marine air which in the north portion was polar and in the south region tropical in origin with a transitional zone lying between Washington and Richmond. The flow of moist air from the Atlantic brought stratus and stratocumulus clouds over the entire area east of the Appalachians and was particularly conducive to advection fog during the evening of October 11. The company forecast which was attached to the flight plan at Atlanta indicated that contact flight conditions were anticipated at Washington but that ceilings below 500 feet were expected at Baltimore.

A later special forecast was issued for Washington at 1900 and was available at Atlanta prior to the departure of Flight 564. This forecast predicted a variable ceiling at 500 feet, overcast, light drizzle and light fog, with the base of the clouds varying from 300 to 800 feet and the visibility varying from 1/2 to 1 1/2 miles. At 2238, while the flight was near Richmond, Virginia, a regular forecast was filed at Washington which predicted a variable ceiling at 400 feet, overcast, light drizzle and light fog, with the bases of the clouds varying from 300 to 700 feet and the visibility varying from 1 to 3 miles.

The company communication records disclosed that a special weather report for Washington was transmitted to the flight before it reached Richmond. This report indicated a ceiling of 300 feet and visibility of 3 miles existing at Washington. Shortly thereafter, at 2226, the pilot was advised that the "Weather Bureau expects no change" in the Washington weather during the next hour. At 2230, approximately one hour before the accident occurred, the regular Washington hourly weather sequence reported a measured ceiling of 300 feet, 3 miles visibility, light fog. At 2245, the flight received another weather report which indicated an indefinite ceiling of 300 feet, overcast, 3 miles visibility, light fog. The same weather conditions were reported in the hourly weather sequence approximately five minutes before the accident occurred.

After learning that the weather was being reported as below minimums, the

pilot, at 2221, requested the Washington radio station to inquire of the company dispatcher at New York "what they want us to do." In reply to this request a company clearance was transmitted which authorized the flight to continue over Washington to Newark. During this conversation the aircraft was in the Blackstone-Richmond area between 100 and 140 miles south of Washington and was proceeding toward Washington.

At 2236 the flight again called Washington and requested that the New York dispatcher be asked for authorization "for us to come up to Washington and take a look." No reply was made to this request. However, immediately after receiving this request, the company radio station advised the flight that New York Airway Traffic Control was accepting no other flights in the New York area. The flight, therefore, requested the latest Washington weather report and was advised that the ceiling was "indefinite 300 feet" and the visibility 3 miles. Immediately after receipt of this report the flight requested clearance to Washington tower. At this time New York was reporting a measured ceiling of 800 feet and seven miles visibility. The weather at New York remained above instrument minimums through the period of time required to complete the flight to New York according to the original flight plan.

The testimony of the pilots indicates that, while on final approach to Washington National Airport, they were unable to identify either the Alexandria Fan Marker or the Washington "Z" Marker. The captain stated that static on the radio range frequency band hindered reception but that he was nevertheless able to identify clearly passage over the Washington station. The co-pilot testified that he was watching the automatic direction finding indicator during the approach and observed the needle reverse its direction while the flight crossed the Washington range station.

According to the testimony of the pilots, the aircraft crossed the range station at an altitude of 700 feet and descended to 500 feet between the station and the field. Both pilots testified that they were able to identify the lights of the airport as they passed over; however, because the aircraft was too high for a safe straight-in-landing from this approach, the captain elected to execute a missed approach procedure.

The control tower personnel neither saw nor heard the aircraft pass over the field and no witnesses were located who were able to identify this aircraft as having passed over Washington National Airport during its first approach.

The crew indicated that a normal "missed approach" procedure was executed including a climb to 1,500 feet on the northeast leg before proceeding southwest for a new approach. According to their testimony, the aircraft remained at 1,500 feet until starting the procedure turn at Mount Vernon. The descent was started during the procedure turn and continued after the aircraft was aligned with the southwest leg. The prelanding check was completed while the aircraft was at approximately 1,000 feet and neither pilot remembered any altitude indication less than 1,000 feet during the second instrument approach, nor had they any recollection of what transpired during the descent from 1,000 feet to 200 feet.

Discussion

From the outset of this flight it should have been apparent to the crew that a landing at Washington would not be practicable. The company flight plan indicated the probability that a landing would not be made at Washington but that reclearance into Washington would be given further consideration en route. The decision to pass Washington was made jointly by the New York dispatcher and the pilot before the flight departed from Atlanta, and approximately one hour before reaching Washington the flight was again cleared by the company over Washington to Newark. However, the pilot requested permission to "take a look" at Washington in order to determine to his own satisfaction whether a landing was feasible. When advised of the traffic restriction in the New York area, the pilot asked for clearance from Airway Traffic Control to attempt an approach to Washington without having received the approval of the company dispatcher for such a clearance. At the time this request was initiated, several suitable alternate airports were nearby and the gasoline aboard the aircraft was sufficient for seven to nine hours' operation at cruising power.

Airway Traffic Control messages relating to traffic congestion in a

particular area are transmitted to air carriers in order to permit those air carriers concerned to give particular attention to traffic capacity during their planning of scheduled operations. These notices, therefore, concern primarily flights which have not been dispatched as of the time of the notice. The notice of traffic delay in this instance did not exclude Flight 564 from the New York area and, in fact, several flights were subsequently cleared to New York during the night of October 10 without difficulty. Whether or not this flight would have been received by New York Airway Traffic Control could have been determined only by a specific request from the flight for clearance to New York and, in this instance, no such request for clearance was made by the flight. It is evident, therefore, that no necessity existed for Flight 564 to deviate from its original flight plan.

According to the provisions of the Civil Air Regulations in effect at the time of the accident, "no pilot shall, at any airport, let down below his last approved cruising altitude or continue descent when he has received United States Weather Bureau information that the *measured* ceiling is below or the visibility is less than the authorized minimums prescribed in the air carrier operating certificate for landing at that airport."² Although the regular hourly sequence report at 2230 defined the ceiling as "measured," a special report was transmitted to the pilot at 2245 which classified the ceiling as "estimated." With such a change in classification, it became permissible for the pilot to descend to the minimum approved altitude for instrument approach, which, for Washington, is 500 feet above the elevation of the airport or 517 feet above sea level. It is this action of the pilot in descending to the minimum approved altitude over the airport in order to check visually the existing weather which is spoken of as "taking a look."³

²CAR 61 752, Approach Limitations (August 1, 1946)
³Since the date of this accident the Board has adopted an amendment to the above quoted regulation which prevents the pilot from descending below his last approved altitude when reported ceilings are below authorized minimums regardless of their classification (CAR Amendment 61-3 January 8, 1947.) This subject of approach limitations is being reviewed further by the Board in the light of the larger, faster and more numerous multi-engined aircraft employed in air carrier operations and their relation to over-all control of airway traffic. It is anticipated that additional and more comprehensive revisions of the Civil Air Regulations will be necessary in the near future.

The pilot was provided with all available reports and forecasts of the Washington weather and was given the latest altimeter setting shortly before the accident occurred. The aftercast of the weather discloses no essential discrepancy between the existing weather conditions and the weather reports at Washington for the period concerned. It can therefore be concluded that the crew of this flight had adequate knowledge of the existing weather conditions and the weather trends in the Washington area.

The Washington radio range station is located .9 miles south of the Washington National Airport. At an airspeed of 140 mph a DC-4 would cover this distance in 23 seconds. A descent of 500 feet per minute from an altitude of 700 feet over the range station would bring the aircraft to the 500-foot level approximately at the south boundary of the airport. From this position it would be impossible for the aircraft to accomplish a straight-in landing. A pilot making an instrument approach to Washington National Airport with a 500 foot ceiling would, therefore, be confronted with the necessity for circling the airport in order to effect a landing in accordance with standard instrument approach procedures. In this instance, according to his testimony, the pilot desired to avoid the necessity of circling under the overcast because he believed such a maneuver to be unnecessarily hazardous. The only practicable alternative at Washington is to cross the range station at an altitude low enough to enable a descent to be made to the surface at the airport. Such an altitude would, however, be below the minimums prescribed by the Civil Aeronautics Administration for passage over the range station.

Similar situations with varying degrees of hazard exist at other airports throughout the country. Their correction requires either the relocation of the existing range stations or the introduction of new navigational aids. These new navigational aids consist of the very high frequency navigational (VOR) and low approach (ILS) facilities. They are intended eventually to replace the low frequency radio range. Because of the imminence of the introduction of very high frequency facilities, relocation of low frequency radio ranges has been abandoned generally in favor of programmed expenditures for very high

frequency equipment. But in those instances, such as the Washington National Airport, where straight-in approaches are not practicable because of the location of existing low frequency installations and where, because of obstructions, considerable hazard attends the "circle underneath" approach, some consideration should be given to the provision of more suitable facilities or to compensating for the existing deficiencies through revised ceiling and visibility restrictions.

Since this accident, ceiling and visibility minimums, predicated upon the available radio facilities and their relationship to the airport concerned, have been established by the Civil Aeronautics Administration for four-engine aircraft. Where radio facilities for letdown are so located that a landing can be made at an airport without necessitating a turn of more than 30 degrees or a descent of more than 500 feet per minute, procedures and minimums have been so integrated as to permit a safe landing from a straight-in approach. However, where the relationship between the airport and the radio facility is such that a straight-in approach is not practicable, ceiling and visibility minimums have been established sufficiently high to allow circling the airport with safety. These latter minimums have been so established according to the Civil Aeronautics Administration, as to provide a clearance of at least 300 feet above the highest obstacle within an area 2 miles from the boundary of the airport.

Within an area 2 miles beyond the boundary of the Washington National Airport there exist six obstructions which are approximately 300 feet or higher. Between 2 and 2 1/2 miles from the boundary of the airport, there are three additional obstructions, the heights of which vary between 400 and 600 feet. Following an instrument approach to the airport, for instance, a circle to the left would carry an aircraft almost directly over an obstacle 370 feet high, a circle to the right would carry an aircraft almost directly over an obstacle 350 feet high. Since these obstructions are within all four quadrants from the airport, it appears that the 300-foot level, at least, should constitute the lowest obstruction reference. In view of the fact that the present policy of the Civil Aeronautics Administration calls for a

clearance of 300 feet above all obstructions, it would be difficult to understand how a circle-underneath minimum for Washington National Airport could be designated lower than 300 feet. In spite of this fact, the minimum ceiling for a circle-underneath approach for four-engine aircraft at that airport was retained at 500 feet. The Civil Aeronautics Administration has taken the view that "prominent" or well-lighted obstructions need not be considered in determining minimum approach altitudes and the Board concurs that such exceptions in some instances would be necessary. But where six obstruction hazards are located within a 2-mile area and three more within a 2 1/2 mile area about the airport, it appears that such exceptions have been granted with too much liberality.

Since only two minutes elapsed between the report of the missed approach and the position report southbound over the range station, the flight could not possibly have completed the climb to 1,500 feet as well as a procedure turn on the northeast leg as both pilots testified. Two minutes would have been approximately the time required to turn directly to the outbound bearing of the southwest leg and return to the range station after having retracted the landing gear and flaps and applied climbing power to the engines.

All the evidence disclosed in this investigation indicates that the aircraft, its engines, and its instruments were functioning properly until the moment of impact. Since the pilot observed no irregularity in altimeter indication during his first approach to Washington, at which time he apparently descended to an indicated altitude of 500 feet, the final approach altitude should have provided adequate clearance above the terrain. However, because the elevation at the point of initial impact was exactly 200 feet, it must be concluded that the pilot failed to stop his descent during his second approach at an altitude which would provide adequate clearance above the terrain.

Findings

On the basis of all available evidence the Board finds that

1. The aircraft, carrier and crew were properly certificated.

2. Prior to departure from Atlanta, the total weight of the aircraft was less than the maximum allowable and the load was distributed with respect to the center of gravity within approved limits.

3. When in the vicinity of Richmond the flight was cleared by the company over Washington to Newark because of weather conditions at Washington reported as below authorized minimums.

4. The pilot requested company clearance to "take a look" at Washington, but no clearance for an approach was received from the dispatcher.

5. When informed that no further flights were being accepted in the New York area, the captain, without checking whether such a restriction included this flight, elected to attempt an approach to Washington National Airport and requested and received Airway Traffic Control clearance to Washington tower.

6. At the time of the request for clearance to Washington Tower the weather at New York was being reported as ceiling 800 feet, visibility seven miles.

7. The first approach was completed at a point over the airport from which a landing could not safely be made and, rather than circle the airport underneath the overcast, the pilot initiated a "missed approach" procedure.

8. During the second approach the aircraft descended to an altitude of 200 feet and struck the ground 6 miles southwest of the airport.

9. After coming to rest all occupants were safely deplaned.

10. The aircraft was totally destroyed by collision with objects on the ground and the subsequent fire.

11. No structural failure or equipment malfunctioning occurred in the aircraft prior to impact.

12. Because of the existing minimum altitude for crossing the Washington radio range station and the proximity of the range station to the airport, a straight-in landing at Washington National Airport is not practicable when ceilings are at or close to the minimum prescribed by the Administrator for landing.

Probable Cause

The Board finds that the probable cause of this accident was the failure of the pilot to maintain flight at or above the minimum safe altitude for instrument approach to Washington National Airport.

BY THE CIVIL AERONAUTICS BOARD

/s/ J. M. LANDIS

/s/ HARLEEE BRANCH

/s/ JOSH LEE

Oswald Ryan, Member did not take part in the decision.

Supplemental Data

Investigation and Hearing

The Civil Aeronautics Board received notification of the accident at 0030, October 12, 1946 and immediately initiated an investigation in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. Air safety investigators of the Board's Washington office arrived at the scene of the accident at 0045 the same day and were later assisted in the investigation by other members of the Safety Bureau staff. A public hearing was ordered and held in Alexandria, Virginia, October 29 and 30, 1946.

Air Carrier

Eastern Air Lines, Inc., a Delaware corporation with headquarters in New York City, 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. These certificates authorize 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 Joseph S. Morris, age 36, of Coral Gables, Florida, pilot of the

aircraft, possessed an airline transport pilot rating and until the date of the accident he had accumulated a total of 11,065 hours' flying time, of which 1,227 hours had been obtained in DC-4 aircraft. First Officer Paul K. Zepernick, age 31, of Miami, Florida, was co-pilot. He possessed a commercial pilot certificate and until the date of the accident had accumulated a total of 3,032 hours' flying time, of which 79 hours had been obtained in DC-4 aircraft. Both pilots were properly certificated for the flight and the captain was qualified on the route. J Johnson and M. Camera, both of Miami Beach, Florida, were purser and stewardess, respectively.

Aircraft

NC 88729 was a Douglas DC-4 operated and registered in the name of Eastern Air Lines, Inc. The aircraft had accumulated a total of 2,045 hours since its manufacture in November 1944. It was equipped with four Pratt & Whitney R-2000-13G engines on which Hamilton Standard propellers were installed. All engines had been operated a total of 259 hours. At the time of departure from Atlanta the total weight of the aircraft was approximately 3,000 pounds less than the maximum allowable gross and the load was distributed with respect to the center of gravity within approved limits.