

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: April 26, 1948

Released: April 26, 1948

EASTERN AIR LINES, INC.,—EAST BOSTON, MASSACHUSETTS—JANUARY 21, 1948

The Accident

Eastern Air Lines' Flight 604, a Lockheed Model 649, NC-111A, crashed and burned at Logan Airport, East Boston, Massachusetts, at 0417, January 21, 1948, due to loss of control of the aircraft during the landing roll and the resulting failure of the right landing gear. None of the crew of 5 or the 20 passengers was injured as a result of the crash or subsequent fire, however, 5 occupants were injured while evacuating the aircraft. The major portion of the aircraft structure was consumed by fire.

History of the Flight

Flight 604 departed Miami, Florida, at 2301, January 20, 1948, on an instrument flight rules clearance, non-stop to Newark, New Jersey, to cruise at 15,000 feet via Airway Amber 7 to Jacksonville, Florida, and Airway Amber 6 to Alma, Georgia, thence direct to Spartanburg, South Carolina, Winston-Salem, North Carolina, and Washington, D. C., and via Airway Amber 7 to Newark. Boston, Massachusetts, and Providence, Rhode Island, were designated as alternate airports. In order to remain above the overcast, the flight requested changes of cruising altitude between Winston-Salem and Washington, and at 0232, at which time it reported over Washington, the flight was cruising at 21,000 feet.

Shortly after passing Washington, Flight 604 was cleared to descend en route to Newark and to cross Philadelphia at 7,000 feet, and was advised that no traffic was reported above 7,000 feet. A descent was established and at 0253 the flight reported over Philadelphia "at 8,000 feet descending." Shortly thereafter the company radio station at LaGuardia Field, New York, advised the flight that the 0240 weather observation

for Newark indicated a ceiling of 700 feet and visibility of one-half mile. Immediately thereafter the flight was given an air traffic control clearance "to Flatbush and LaGuardia Approach Control" to cross Keyport and Flatbush at 2,500 feet. Upon receiving this clearance the captain immediately requested a confirmation from the New York dispatcher, inasmuch as no prior notice had been received of a change of destination from Newark to LaGuardia. In acknowledgment the flight was informed that the dispatcher desired the flight to proceed to LaGuardia Field.

During the period of the flight from midnight until 0300, the ceilings had lowered throughout the New York-New Jersey area. At the time of the reclearance the LaGuardia weather was being reported as ceiling 500 feet, visibility one and one-quarter miles, and light snow. The flight continued its descent on the east course of the Philadelphia radio range and reached 2,500 feet in the vicinity of Freehold, New Jersey, over which the crew reported passing at 0309. Immediately after this report the flight changed to the LaGuardia Approach Control frequency.

LaGuardia Approach Control immediately cleared the flight to descend to 1,500 feet and approved a straight-in landing on Runway 4. Since no material change had been observed in the LaGuardia weather, the flight was again informed that the ceiling was reported as 500 feet, the visibility one and one-quarter miles, and the wind calm. The flight passed directly over the airport without attempting a landing approach and shortly thereafter reported over the range station which is located three and two-tenths miles northeast of the airport. The flight was then cleared to use the reciprocal runway, 22, but the aircraft returned southeastward, passing to the east of LaGuardia Field again without attempting a landing approach.

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

During this period the LaGuardia weather observer completed the 0325 weather observation and approximately 3 minutes thereafter the flight was advised that this report indicated an indefinite ceiling 400 feet and visibility one and one-half miles. The flight continued southwestward in order to establish an approach to Runway 4. Approach Control asked the flight at this time whether it desired a GCA (Ground Controlled Approach Radar) monitored approach. The captain declined a controlled approach but stated that he would accept a monitored approach. At approximately 0330 the aircraft again passed over the airport in a north-easterly direction; the flight advised Approach Control that the ceiling was not 500 feet and requested a report of the current Boston weather.

The 0230 Boston weather report was transmitted to the flight, indicating a ceiling of 8,000 feet, 3 miles visibility, smoke, and haze. Upon receiving this report, the flight requested and received clearance to Boston from Air Traffic Control and from the company dispatcher. At 0337, the flight reported leaving Rye, New York, en route to Boston, climbing to 5,000 feet. Shortly after the flight passed over Hartford, Connecticut, at 0354, the company station at Boston advised the captain that the flight was cleared to the Boston Tower. Before reaching Boston the flight was informed that the 0400 weather report for that station indicated "ceiling 600 feet, sky obscured, visibility one mile, light snow; surface wind southeast 8 miles per hour." After passing Franklin, Massachusetts, at 0409, the flight changed to the Boston Tower frequency.

When asked by the flight whether the Instrument Landing System (ILS) was operating, the tower advised the flight that the monitor panel indicated this system to be operating normally. Shortly thereafter the tower cleared the flight for a straight-in approach to Runway 4 and cautioned that due to the runway condition braking action was "fair to poor."

Initial touchdown was made on Runway 4, at 0417, approximately 2,000 feet beyond the approach end of the runway. After completing approximately 600 feet of its landing roll, the aircraft was seen to skid to the left and crash into a snowbank along the left side of the runway. The right landing gear and nose

gear collapsed and the aircraft fell on the right wing, coming to rest on the left side of the runway heading in a westerly direction. Fire broke out in the vicinity of the No. 3 and No. 4 engines and spread rapidly toward the fuselage. However, all passengers were deplaned and were removed from the vicinity of the aircraft without injury resulting from the crash or subsequent fire. Five of the occupants were injured during the evacuation due to the necessity for jumping from the rear exit, which was estimated to be 12 to 16 feet above the ground.

Several fire fighting units from the airport and from East Boston were alerted and proceeded to the scene of the accident; however, the aircraft continued to burn for approximately one hour and 30 minutes after the crash.

Investigation

The aircraft had come to rest on a heading of approximately 300 degrees with its nose over the left edge of the runway with the forward portion of the fuselage and the right wing supported by a snowbank approximately 4 feet in height. The right gear had failed leftward in a direction perpendicular to the horizontal axis of the aircraft, the nose gear had failed rearward and slightly to the left. The fuselage forward of the rear spar had been almost entirely consumed by fire. That portion of fuselage between the rear spar and the rear pressure bulkhead was completely gutted and only the shell remained fairly intact. The entire left wing and that portion of the right wing outboard of the No. 3 nacelle, with the exception of the area adjacent to the No. 4 nacelle, were intact, the remainder having been destroyed by fire.

Functional tests of the nose gear of this aircraft indicated that the steering control system operated normally stop-to-stop and, when cable tension was released, the gear immediately returned to the centered position as a result of the castering action of the gear itself. Moreover, the mechanical gear centering mechanism was intact and operated satisfactorily during these tests. Tests of the left gear brake system also indicated normal operation prior to failure of the landing gear wing attachments.

A detailed inspection of the remaining aircraft structure, including the main landing gear and nose wheel, failed

to disclose any indications of materiel malfunctioning. As far as could be determined, failure of both the right gear and the nose wheel occurred as the aircraft skidded sideward in the snow. Inspection of the aircraft maintenance logs revealed the aircraft to be in airworthy condition at the time of departure from Miami. The testimony of the flight crew indicated that the aircraft performed in a satisfactory manner throughout the flight from Miami to Boston.

At the time of departure of Flight 604 from Miami, a high pressure area covered the entire South Atlantic seaboard. A warm front extended from a low center in the Gulf of Mexico across Florida and thence off the coast to a point slightly northeast of Cape Hatteras. The warm, overrunning maritime air produced overcast conditions as far north as Delaware and caused sleet throughout the northern periphery of the precipitation area associated with this trough. Although at this time satisfactory weather existed in the New York-Boston area, this condition gave indications that precipitation would continue its movement northeastward along the coast.

Forecasts compiled by both company meteorologists and the U. S. Weather Bureau during the evening of January 20, 1948, indicated that instrument conditions would exist in the vicinity of Washington by 0300 the following day. Ceilings at LaGuardia and Newark were forecast to remain above 1,500 feet, however, the visibility was expected to be restricted to one mile, due to light snow and smoke. Both Providence and Boston, the alternate airports, were expected to remain well above visual flight rules minimums. These forecasts were based on the expectation that a relatively strong ridge of high pressure which extended from Delaware southwestward into Alabama would restrict the flow of maritime air into the New England states.

When it became apparent, however, that the precipitation area would continue to move into southern New York and Massachusetts, both Weather Bureau and company forecasts were amended before midnight of January 20, 1948, to indicate conditions at or below instrument minimums throughout the area from New York to Boston at approximately the estimated time of arrival of the flight at these terminals. Shortly before the flight

reached Washington, the company was advised that the ceiling at Boston was expected to lower to 600 feet with one mile visibility, light snow by 0430. The weather at more northerly stations, such as Portland, Maine, and stations west of the Catskill Mountains were forecast to remain well above visual flight rules minimums. An aftercast of the weather conditions throughout the New England area indicated that the amended forecasts for this period were unusually accurate.

According to the position reports from Flight 604, the average ground speed was 322 miles per hour between Philadelphia and the LaGuardia range station. Since the pilot stated that a relatively high speed descent was maintained between Philadelphia and Freehold, it is obvious that the ground speed between these points would have been considerably higher than the average ground speed between Philadelphia and LaGuardia. On the basis of the flight's position report over Freehold and the time the aircraft was heard over LaGuardia Field, this portion of the flight consumed three minutes. Under the conditions of this flight at least eight minutes would have been required for the 45 mile flight between these points. It is obvious, therefore, that an error of at least five minutes was made by the flight in transmitting the Freehold position report.

During the descent between Philadelphia and Freehold, the pilot maintained an indicated air speed of approximately 260 miles per hour. The average temperature between 2,000 and 8,000 feet in this area was approximately 15 degrees, and the true air speed at these levels would have approximated 271 miles per hour. The winds at these levels averaged between 35 and 45 miles per hour from 200 to 220 degrees. Since these winds were almost direct tail winds, the resulting ground speed should have been between 306 and 316 miles per hour. It is apparent that such a high air speed could not have been maintained from Freehold to LaGuardia since the aircraft was in level flight at 2,500 feet for most of this distance. During this portion of the flight, the ground speed would have been approximately 280 miles per hour.

At approximately 0310, LaGuardia Approach Control was informed by the flight that it had passed over Freehold at 0309. In intercepting this report,

the GCA operator searched the area south of Flatbush, New York, in an attempt to locate Flight 604, on the surveillance radar scope. At 0312, while this search was being made, an aircraft was heard to pass over the airport. When asked by the approach controller whether the flight had passed over the airport at 0312, the flight replied in the negative and reported that it was still southwest of Maspeth, New York, which is approximately 6 miles southwest of LaGuardia Field. Approximately one minute later the radar observer tracked an aircraft approaching the LaGuardia radio range station north-east of the airport. This aircraft was subsequently identified as Flight 604. The flight proceeded to the New Rochelle Fan Marker, which is 6 miles northeast of the range station. The aircraft was tracked through its procedure turn by Ground Control Approach, and the position report of the flight over New Rochelle was confirmed by the GCA surveillance radar.

The flight was cleared for an approach to Runway 22, however, although the aircraft was tracked directly over the range station, the GCA observer who was monitoring the flight noted that the aircraft was headed to the left of the final approach course for Runway 22. This information was transmitted to and acknowledged by the flight. At College Point, approximately one mile east of the airport, the aircraft disappeared into the "blind" area above the GCA unit.

The flight was again cleared for an approach to Runway 4. It will be noted that the flight was advised at this time that the ceiling was 400 feet. Although the pilot testified that he utilized the Instrument Landing System (ILS) on the approach to Runway 4, the aircraft at no time appeared in the precision scopes of the GCA system, which system is oriented along the same runway as that served by ILS. Testimony of passengers aboard the aircraft indicated that the neon sign atop the TWA hangar at LaGuardia Airport was visible to the left of the aircraft during this approach. This sign is approximately 1/2 mile east of the approach end of Runway 4. The pilots, however, stated that no lights on the ground were visible to them. It was after this approach that the pilot reported that a 500-foot ceiling did not exist at LaGuardia.

After having received clearance to Boston, the flight to that station was accomplished without incident. At the time of arrival of the flight in the vicinity of Boston, the crew was able to see lights on the ground when between 1,000 and 2,000 feet above the surface, although the Weather Bureau was reporting a precipitation ceiling of 600 feet. According to the testimony of the pilot, the visibility at the time of his approach to Boston was more than 1 1/2 miles. The approach lights and the high intensity lights were clearly visible to him throughout the approach. The pilot stated that the aircraft passed over the boundary at approximately 140 miles per hour, and that initial touchdown was made about 2,000 feet down the runway at an air speed of approximately 95 miles per hour. At the moment of touchdown, the contours of the snowbanks on either side of the cleared area on the runway were clearly visible to the pilot, however, deep shadows were cast across the cleared area of the runway. The entire runway, as well as the snowbanks, was covered by newly-fallen snow, approximately one-half inch in depth. Both pilots stated that the touchdown was normal and that the veering action of the aircraft which ended in impact with the left snowbank occurred so rapidly that neither was able to initiate any conscious corrective action.

Inspection of the runway disclosed patches of ice from previous snowfalls covering a major portion of the runway. The snow had been cleared from the center of the runway toward the Bartow high intensity lights which are installed along both sides, the snowbanks varying in height from 4 to 6 feet. The left snowbank extended from the edge of the runway to a maximum distance of 40 feet toward the runway center line; the right bank was aligned approximately with the right runway lights. Runway 4 had been well sanded earlier January 20, 1948, but at the time of the accident approximately one-half inch of newly fallen snow covered the runway and the snowbanks. It was noted that several long narrow drifts of snow projected from the left snowbank at an angle approximately 45 degrees to the runway in the opposite direction of the landing roll. These drifts were approximately 24 inches in height at the base of the snowbank and

tapered to the snow level on the cleared surface between 15 and 20 feet from the left bank. No lights were installed on the runway outlining the usable portion between the snowbanks.

A detailed inspection was made of the runway surface and the surface of the snowbanks on the left side of the runway in order to determine whether tire marks, propeller marks, or other indications of contact with the aircraft remained. This inspection, however, could not be made until approximately one hour and 30 minutes after the time of the accident. During this interval, at least 30 vehicles had been driven up and down the runway obliterating all wheel marks which might have existed. Furthermore, approximately one-half inch of snow had fallen between the time of the accident and the time of the inspection of the runway. No marks on the snowbanks could be positively identified as having been made by the propellers.

Discussion

From the inspection of the wreckage, testimony of the crew, and the inspection of the maintenance history of the aircraft, it must be concluded that the aircraft was in an airworthy condition at the time of departure from Miami, and that no material malfunctioning was experienced en route or during the landing which contributed to this accident.

It is clear that the position report of the flight over Freehold was in error. Because of this error, it appears that the pilots were not aware that the aircraft was as close to LaGuardia Field as was the case, and for this reason no instrument approach was established at that time. It is apparent that, throughout the maneuvers of the flight after returning to the range station, the aircraft remained in an area so close to the airport that it was not possible for GCA surveillance radar to identify its location. Since the Maspeth marker is at a point 6 miles southeast of the projected center line of Runway 4, had Flight 604 been at Maspeth, it would doubtless have been observed in the GCA precision scopes. Furthermore, in view of the testimony of passengers who observed the neon sign over the TWA hangar, it is clear that the aircraft was considerably to the right of Runway 4, and that no landing could have been made from this approach. The transmission from the

pilot that a 500-foot ceiling did not exist at LaGuardia cannot be understood in view of the fact that he had been previously informed by the approach controller that the ceiling was 400 feet.

The manner in which snow was banked inside the runway lights on the left side of Runway 4 at Logan Field must be subject to criticism. It will be noted that there exists no instruction of the Administrator of Civil Aeronautics or any Civil Air Regulation which specifies the manner in which snow is to be removed, or which prescribe any restrictions for the use by transport category aircraft of runways, a considerable portion of which may be rendered unserviceable due to excessive snow accumulation. However, the responsibility for determining the condition of the runway as it affects the landing of the type of aircraft involved in this accident falls jointly upon the air carrier's station manager, the Civil Aeronautics Administration's operations inspector, and the airport management, any one of whom were in a position to restrict the use of Runway 4 for Flight 604. It appears, in this instance, that none of the foregoing considered the drifts of snow projecting from the left snowbank as hazards to safe landing. These drifts, however, were of sufficient length and depth as to have seriously restricted the movement of the left landing gear during the landing roll. Such restriction would have been progressively increased as the aircraft began to skid to the left and as the broad side of the wheel came in contact with the deep snow. Its heading on the runway having altered to a considerable extent, the aircraft skidded toward the deep snow at the base of the snowbank. Contact with the deep snow and the snowbanks during the skid resulted in failure of the right main landing gear and nose landing gear, the entire process having taken place over a landing roll of approximately 600 feet. Since initial touchdown was made at approximately 95 miles per hour, the length of time between initial touchdown and the crash must have been less than 10 seconds.

Despite the fact that the conduct of the passengers and the crew during the evacuation was orderly and no panic was noted, this accident forcibly points toward the necessity for the development of more suitable passenger evacuation facilities. Although the crew made no attempt

to use any emergency evacuation equipment with which the aircraft was equipped, there is considerable question as to whether the use of the rope would have minimized injuries during the evacuation, and there is no doubt that use of the ladder would have materially increased the time required for evacuation. In the darkness the placards describing the location and operation of evacuation equipment and emergency doors were not legible. None of the passengers, therefore was able to open the cabin entrance door or any of the emergency doors, nor was any of the passengers aware that emergency evacuation equipment was carried aboard the aircraft. Although the light from the burning gasoline illuminated the cabin interior to some extent in this instance, this accident indicates the necessity for independent auxiliary lighting facilities to illuminate such areas as emergency exits, emergency evacuation equipment, first aid equipment, and survival craft equipment, when applicable, in the event of failure of the electrical system.

Findings

As a result of the investigation of this accident, the Board finds that:

1. The air carrier, aircraft, and crew were properly certificated.
2. The flight from Miami, Florida, to Philadelphia, Pennsylvania, was entirely routine.
3. During the latter portion of the flight the visibility at Newark, the destination, lowered to 1/2 mile, and the ceiling varied between 300 and 700 feet.
4. Shortly after passing Philadelphia, the flight was given an air traffic control clearance to LaGuardia Field which clearance was confirmed by the company dispatcher.
5. The position report of the flight over Freehold, New Jersey, was in error by approximately 5 minutes.
6. After having contacted LaGuardia Approach Control, the flight was cleared for a straight-in landing on Runway 4 but being considerably closer to the airport than the pilot believed, no approach was established.
7. After passing the range station the flight was cleared for an approach to Runway 22, but the aircraft returned to the range station and passed to the left

of LaGuardia Field without establishing a landing approach.

8. While passing LaGuardia Field southwest-bound, the flight was advised that the ceiling at that station was reported as being 400 feet.

9. An approach was established for Runway 4, however, the flight passed over LaGuardia Field at least 1/2 mile to the right of Runway 4 on a track from which a landing on that runway was not possible.

10. The flight informed Approach Control that the ceiling was not 500 feet at LaGuardia and requested the Boston weather.

11. Clearance was obtained from both Air Traffic Control and the company to proceed to Boston.

12. The weather at both Boston and Providence, the alternate airports, was expected to be below alternate minimums during the following hour.

13. The flight to Boston was completed without incident and a clearance was obtained from Boston Approach Control for an ILS approach to the airport and a straight-in landing on Runway 4.

14. Snowbanks between 4 and 6 feet in height lined the runway between 30 and 40 feet from the left edge, long narrow drifts of snow projected from the base of the bank approximately 20 feet into the cleared area of the runway and approximately 1/2 inch of newly fallen snow covered the runway, drifts, and snowbanks.

15. The approach lights and high intensity lights were clearly visible during the approach.

16. Shortly after initial touchdown approximately 2,000 feet from the approach end of the runway, the left landing gear struck snow drifts on the left side of the runway which retarded the left wheels and caused the aircraft to skid to the left.

17. The direction of motion changed suddenly causing the aircraft to crash into the left snowbank resulting in failure of the right landing gear and nose gear.

18. Fire broke out in the vicinity of the No. 3 and No. 4 engines and soon spread inboard to the fuselage.

19. Five of the aircraft occupants were injured in jumping from the rear cabin exit, which was approximately 15 feet above the ground.

20. No emergency evacuation equipment was used.

21. The aircraft burned for approximately one hour and 30 minutes, and the major portion of the fuselage and right wing was destroyed by fire.

Probable Cause

On the basis of the above findings, the Board determines that the probable cause of this accident was the loss of directional control of the aircraft on the runway due to excessive snow accumulation. A contributing factor was the lack of precaution exercised by the air carrier's station manager, the Civil

Aeronautics Administration's operations inspector and the airport management in determining that the conditions of the runways were adequate for safe aircraft landing.

BY THE CIVIL AERONAUTICS BOARD:

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

/s/ HARLLEE BRANCH

/s/ JOSH LEE

/s/ HAROLD A. JONES

Ryan, Vice Chairman, did not take part in the decision.

Supplemental Data

Investigation and Hearing

The Civil Aeronautics Board was notified of the accident at 0500, January 21, 1948, and an investigation was immediately initiated in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. The Board's investigators proceeded immediately to East Boston, Massachusetts, arriving at the scene of the accident at approximately 1730 the same day. A public hearing was ordered and was held at Boston, Massachusetts, February 5 and 7, 1948.

Air Carrier:

Eastern Air Lines, Inc., a Delaware corporation with headquarters in New York City, was operating under a certificate of public convenience and necessity and an air carrier operating certificate, both issued under the Civil Aeronautics Act of 1938, as amended. These certificates authorized the company to engage in the transport of persons, property, and mail between various points in the United States including Miami, Florida, and Boston, Massachusetts.

Flight Personnel:

Captain M. E. Thayer, age 38, of Coral Gables, Florida, was pilot of the aircraft.

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He possessed an airline transport pilot rating and until the date of the accident had accumulated approximately 10,312 hours flying time, of which approximately 363 hours had been obtained in the Lockheed Model 49. Pilot R. B. Smith, age 27, of Miami, Florida, was co-pilot. He possessed a commercial pilot rating and instrument rating, and until the date of the accident had accumulated a total of 3,001 hours, of which approximately 145 hours had been accumulated in the Lockheed Model 49. The remainder of the crew consisted of H. D. Coonley, flight engineer, L. Wilkerson, flight attendant; and J. McGuire, flight attendant.

Aircraft

NC-111A, Lockheed Model 649, had been operated a total of 1,499 hours since its manufacture in July 1947. It was equipped with four Wright C-18BD engines, on which Hamilton Standard 2C1FG1-OB propellers were installed. At the time of departure from Miami, the total weight of the aircraft was less than the maximum allowable gross, and the weight was distributed with respect to the center of gravity within approved limits.

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