CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: July 29, 1955

Released: August 3, 1955

NORTHEAST AIRLINES, INC. - NEAR BERLIN, NEW HAMPSHIRE, NOVEMBER 30, 1954

The Accident

Northeast Airlines' Flight 792, a DC-3 N 17891, crashed during an instrument descent to the Berlin, New Hampshire, airport on November 30, 1954, about 1115.1/
The first officer and a company flight superintendent, who was on the cockpit jump seat, were killed. The captain was seriously injured; the stewardess and two of the three passengers were uninjured; the third passenger was later treated for injury.

History of the Flight

Flight 792 originated at Boston, Massachusetts, for Berlin, New Hampshire, with stops at Concord and Laconia, New Hampshire. The crew consisted of Captain W. P. Carey, First Officer George D. McCormick, Stewardess Mary McEttrick, and Flight Superintendent John C. McNulty. Departure from Boston was at 0930, approximately on schedule, with a company clearance to Laconia under Visual Flight Rules. The first two segments of the flight, Boston-Concord and Concord-Laconia, were routine.

Departure from Laconia was on schedule at 1039. The aircraft carried fuel for about four hours, its gross weight was considerably under the maximum allowable, and its center of gravity was located within prescribed limits. Scheduled arrival at Berlin was 1112. A minute or so after takeoff the flight requested an IFR clearance for the 73-mile flight which was at once approved by the company dispatcher at Boston, and issued by the CAA's Air Route Traffic Control Center, "Boston ATC clears Northeast Flight 792 for an approach to the Berlin Airport via Blue 63 to cruise 8,000 feet."

At 1103 the flight called the company station at the Berlin Airport and asked for local weather. The station agent immediately gave the 1045 observation: Estimated 3,000 feet overcast; visibility 2-1/2 miles; light snow showers. The flight acknowledged but did not give its altitude and position. The agent then made a special weather observation at 1110 and transmitted the following information to the flight: 2,300 scattered, 3,000 overcast; visibility 2-1/2 miles; light snow showers; wind northwest 10; snow showers to the north. (This was close to the Berlin minimums of 2,300-foot ceiling and 2 miles visibility.) The flight's acknowledgement of this transmission was logged at

^{1/} All times herein are eastern standard and are based on the 24-hour clock.

Ill; however, the actual time may have been as much as two minutes earlier as the agent was alone and busy. There was no further contact. No position report was received for North Conway, a company-required reporting point about midway between Laconia and Berlin.

At 1125 the company's Boston station asked by teletype regarding the flight. Accordingly, the Berlin operator called the flight at 1128 but received no reply. At 1130 he sent a special weather report and suggested that the flight return to Laconia. Again there was no reply. (The accident had already occurred.) This special weather was: Ceiling estimated 1,500 feet broken, 3,000 feet overcast; visibility 2 miles; light snow; wind northwest 10 (below Berlin minimums).

Investigation

Search activities were started when it was evident that the aircraft was down. Continuing low ceiling and snow squalls hampered search.

About 0755 the following morning, December 1, a message from the aircraft was heard by the company's Berlin station. It was not clearly or completely understood but indicated that the flight was down approximately five miles northeast of the field on a hill. The station agent immediately acknowledged the message (which was not received by the aircraft) and quickly notified company headquarters.

Search by ground parties and from the air was as extensive as the prevailing bad weather would allow. Late in the afternoon of the same day ceiling and visibility improved and remained better through the night. Air search of the higher terrain was possible the next morning, December 2, when a Northeast Airlines DC-3 sighted and identified the wreckage on the southern slope of Mt. Success, 13 miles southeast of the Berlin airport.

An Air Force helicopter had been standing by at nearby Grenier Air Force Base, Manchester, New Hampshire. It was flown to the crash site and a doctor was lowered. Survivors and the bodies of the two crew members were then flown to the Berlin Airport, one at a time. In the meantime, Board investigators had also been airlifted to the scene allowing the immediate start of an on-the-spot investigation. The bare hilltop about one-fourth mile away afforded a convenient site for many subsequent flights.

Survivors testified that the seat belt sign came on several minutes before impact and all occupants, including the crew, had their belts fastened. No significant injuries were sustained by the stewardess and the three passengers in the cabin. However, all three flight crew members were thrown forward, and McCormick and McNulty received fatal injuries. Captain Carey, despite severe injury, supervised survival activities.

A fire started under the left engine mount as the aircraft came to rest. It was quickly put out with snow and a cabin fire extinguisher.

Survival was the chief concern. Outside temperature was far below freezing and cabin temperature was dropping fast. Occupants huddled closely to

conserve body heat, wrapping themselves with blankets, cabin insulation, upholstery, curtains, seat cushions, soundproofing material, and clothing from baggage.

The following morning Captain Carey managed to send a series of radio messages after experimenting with different frequencies and improvised circuits. Only one message, previously mentioned, was heard. He also marked his assumed position, some five miles northeast of the airport, on an aeronautical chart. It was decided not to try walking out because of the lack of proper footgear and clothing, and also because the captain, the only one with any knowledge of the local geography, was fast losing vitality.

Late that day the weather improved. Captain Carey could see the country-side and realized that his original position estimate was in error and that the crash site was southeast of the airport in the vicinity of Mt. Success. But the batteries were then depleted and the radio could not be used. Falling temperature made survival even more critical that evening and night. Early the second morning, the Northeast Airlines' search aircraft spotted the wreckage.

The aircraft had struck the wooded and deeply snow-covered southern slope of the mountain, approximately 100 feet below the crest, at an elevation of 3,440 feet. Snow was falling at the time. Impact occurred while the aircraft was on a heading of approximately 350 degrees and nearly level both laterally and longitudinally. Airspeed was about 140 knots into a wind that was probably of 40-50 knots making the groundspeed 100 knots or less at impact. Ahead, the ground sloped up at an angle of some 10 degrees. The aircraft crashed directly ahead through timber for only about 100 feet. No timepieces were impact stopped nor was the precise time of the crash noted.

Trees tore away the left wing tip, the left engine, and a large part of the right wing. The fuselage was bent to the right at the wing by some 12 degrees so that the forward portion was at a direction of 2 degrees, with the rear part at 350 degrees. The cockpit was generally smashed and telescoped backward and upward but there was relatively little damage to the cabin proper allowing survival of all cabin occupants. The landing gear had been extended and locked before impact. Propeller pitch settings were left blades 18 degrees, right blades 25 degrees.

Pertinent control and instrument readings were checked. Both altimeters were set to 29.66 inches, the latest altimeter setting given the flight. The directional gyro read 356 degrees. The No. 1 range receiver was tuned to 383 kc. and its volume was set at approximately 5%. The Omni (VOR) receiver was set at 117.5 mc. and its volume was 95%. The No. 2 range receiver ADF unit was tuned to 280 kc. and its volume was set at approximately 5%. The needle of the ADF indicator had broken so that it could swing freely. This No. 2 receiver (the one being used for ADF) was recovered from the aircraft and very thoroughly tested. No irregularity was found in the unit or any of its components. The 280 kc. setting was practically on the frequency of the Berlin beacon (281 kc.). This small difference would have little or no effect. However, the loop and the loop housing, mounted on the underside of the fuselage, were knocked off. The loop was not recovered until May 13. A detailed study of damage to its

main drive gear indicated that the most probable loop direction at the time of impact was 344 degrees. This would correspond, because of quadrantal compensation, to a cockpit indication of 335 degrees.

The H facility (a nondirectional continuous low power radio beacon) on the Berlin Airport was ground checked on the day of the accident, both before (routine) and after the crash, and found to be operating normally. It was flight checked three days later when weather allowed, and also found to be operating normally. This beacon is the only radio navigational facility at the Berlin Airport.

Captain Carey stated, in substance, that he climbed to 8,000 feet altitude as called for in his clearance, while en route to Berlin. At this altitude he was above broken clouds until he was approximately 18 miles south of the airport. Beyond that point he was above a solid overcast. He had been using his ADF in obtaining a tail bearing on the Conway beacon and when about halfway to the city of Berlin, tuned it to the frequency (281) of the Berlin Airport beacon. The needle swung shead and he followed it. He testified that he did not stay at 8,000 feet (his assigned cruising altitude and also the minimum en route altitude for that segment of the flight) until he overheaded the Berlin beacon as required in the company's operations manual and as shown on his Jeppeson Berlin Plate. (See attachment B.) Instead, he started descent before reaching it.

The captain further testified, also in substance, that he entered the overcast at an altitude of about 6,000 feet, and thought that he passed over the beacon, as shown by the reversal of his ADF needle, at approximately 5,500 feet while in clouds; also, that he immediately started the prescribed letdown procedure, taking up a heading of 351 degrees and then turning to 25 degrees, rather than 36 degrees as specified, to allow for a northwest wind. While reversing his course in the procedure turn he struck the ground without seeing it. (See attachment B.) He experienced sharp turbulence and one or more severe downdrafts while in the overcast, one just before impact. Passengers corroborated the rough air.

For many miles surrounding the crash site the region is sparsely inhabited and extremely rugged. But a number of people came forward with statements of seeing and/or hearing an airplane in the area about the time of the crash. Search planes were in the air soon after the aircraft was known to be down and these, in all probability, were the aircraft seen and heard.

Two men flying a privately owned Piper Apache saw Northeast Flight 792 shortly before it crashed. They were en route from Plymouth, New Hampshire, to Greenville, Maine. This course is about 50 degrees and passes about 11 miles to the southeast of Berlin, New Hampshire. Both men were pilots and one was primarily concerned with navigation which he was studying. Their radio compass was tuned to the commercial broadcast station at Berlin. Their cruising altitude was 7,000 feet where they were in clear weather with a quite solid overcast about 1,000 feet below them.

In the distance, to their right, they saw another airplane and as they came approximately abeam of the city of Berlin, 11 miles to their left, the

other airplane was close enough to identify (by its blue and white tail marking) as a Northeast DC-3. They watched it start down from their own altitude of about 7,000 feet and descend, with wheels down, into the overcast at 6,000 feet headed in a northwesterly direction. As it did so the Apache pilot retuned his radio compass to the beacon at the Berlin Airport. The needle swung nearly abeam to the left pointing at the Berlin Airport and also at the DC-3, just then entering the overcast about two miles from the Apache.

The Apache pilots landed at their destination and learned that Northeast Flight 792 was missing. Believing it was the DC-3 they had seen, they immediately computed their position and the approximate time when they saw it enter the overcast. The position was 18 statute miles southeast of the Berlin Airport; the time was 1105. (See attachment A.)

Analysis

Captain Carey attributed the accident to a premature reversal of the ADF needle. But, as already stated, a detailed study of the ADF receiver disclosed no malfunctioning or irregularity in any of its components that could cause a premature reversal. It is only fair to state, however, that there have been a few - extremely rare - cases of unexplained premature ADF reversals.

Captain Carey testified that he interpreted his clearance "... to cruise 8,000 feet," as meaning that he could descend from 8,000 feet before overheading the Berlin beacon and even go as low as 5,000 feet before starting his 171-degree approach track toward the airport. (See attachment B.) However, the operations specifications approved by the Administrator for the Berlin, New Hampshire, airport and the company's Manual for guidance of pilots, called for maintaining 8,000 feet until overheading the Berlin beacon. It is difficult to understand why Captain Carey, in view of his long experience including 15 scheduled landings at Berlin, interpreted his clearance to give him authority to descend when he did, contrary to company requirements.

According to the Flight Information Manual, the term "cruise" rather than "maintain" is used in air traffic clearances to signify that descent may be commenced at the pilot's discretion. Its use is normally confined to relatively short flights under circumstances permitting the issuance of a clearance authorizing an aircraft to proceed to and land at the destination without further clearance. However, the Flight Information Manual also points out that "aircraft operated in accordance with IFR must be flown at not less than the minimum altitude established by the Administrator . . . for that portion of the route over which the operation was conducted."

The requirements contained in this type of clearance are outlined in Civil Air Regulations 40.409.2/

^{2/ #40.409} Altitude maintenance on initial approach. (a) When making an initial approach to a radio navigational facility under IFR (excluding over-the-top conducted in accordance with the provisions of 40.408 (c), an airplane shall not descend below the pertinent minimum altitude for initial approach specified by the Administrator for such facility until arrival over the radio facility has been definitely established; (Footnote continued on p. 6.)

The type of clearance issued to this flight was an IFR clearance to cruise at 8,000 feet. An IFR clearance which does not specify "Over-the-top" requires that an airplane shall not descend below the pertinent minimum altitudes for the initial approach until arrival over the facility has been definitely established. In other words, CAR Part 40.409 applied to the subject clearance.

In this case the minimum en route altitude and the initial approach altitude were the same, 8,000 feet. Therefore the flight had no authority to descend below 8,000 feet prior to arrival over the H facility.

Had the flight been cleared to cruise at a higher altitude, say 10,000 feet, it would have been permissible to let down from 10,000 feet to overhead the station at 8,000 feet on the initial approach. A clearance to maintain 10,000 feet would require that the flight overhead the station at 10,000 feet.

Captain Carey's premature letdown from his 8,000-foot cruising altitude was the dominant factor leading to the accident. It must be borne in mind that the crash site was nearly in line with the runway of intended landing, that the direction of impact was extremely close to the direction of the airport, that the point of impact was only some 100 feet below the top of a hill which was the highest land between aircraft and airport, only 13 miles ahead, and that the last Berlin weather given the flight was close to Berlin minimums and becoming worse. The most probable position of the ADF indicator, 335 degrees, as mentioned under Investigation, is 25 degrees to the left of the aircraft's actual heading at time of impact. Because of many intangibles and unknowns entering into a determination of the probable direction, it is believed that the indicator may well have read zero (directly ahead) or close to it at time of initial impact, thus lending credence to the probability of a straight-in ADF approach.

In reconstructing this short flight from Laconia (only 73 statute miles) it is evident that Captain Carey started his descent too early and was attempting a straight-in approach to the runway, in order to get beneath the overcast while short of the airport and shead of the weather. His position, about nine miles to the right of course, when starting down through the overcast is believed not to be accidental due to wind drift, but planned to facilitate a straight-in approach. Since Captain Carey testified that he had visual reference to known objects on the ground up until a very few minutes before entering

2/ (Continued)

when making an initial approach on a flight being conducted in accordance with the provisions of 40.408 (c), a pilot shall not commence an instrument approach until arrival over the radio facility has definitely been established. In executing an instrument approach procedure under such circumstances, the airplane shall not be flown at an altitude lower than 1,000 feet above the top of the lower cloud or the minimum altitude specified by the Administrator for that portion of the instrument approach procedure being flown, whichever is the lower."

the overcast, it can only be concluded that he knew his ground position when starting his letdown. Moreover, testimony of the Apache pilots gives a clear time-position picture of the start of this letdown.

Findings

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

- 1. The aircraft, the crew, and the carrier were currently certificated.
- 2. The aircraft was properly loaded in respect to gross weight and location of its center of gravity.
- 3. All radio facilities, both ground and airborne, were functioning normally.
 - 4. The flight was on an instrument clearance.
- 5. The 1114 company weather message for Berlin reported marginal weather conditions; this was acknowledged.
- 6. The pilot started his descent not in accord with the approved instrument approach procedure for the Berlin, New Hampshire, airport.
- 7. In so doing he struck a hill while letting down directly toward the airport.

Probable Cause

The Board determines that the probable cause of this accident was a premature and unauthorized instrument descent to an altitude that did not permit terrain clearance.

BY THE CIVIL AERONAUTICS BOARD:

/8/	JOSEPH P. ADAMS
/s/	JOSH LEE
/s/	CHAN GURNEY
/s/	HARMAR D. DENNY

Ross Rizley, Chairman, did not participate in the adoption of this report.

SUPPLEMENTAL DATA

Investigation and Hearing

The Civil Aeronautics Board was notified of the aircraft being one hour overdue about 1215, November 30, 1954. 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 ordered a public hearing which was held at the Manger Hotel, Boston, Massachusetts, on January 20 and 21, 1955.

Air Carrier

Northeast Airlines, Inc., is a Massachusetts corporation with its principal offices at Boston, Massachusetts. The company is engaged in the transportation by air of persons, property, and mail 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. The company conducts scheduled operations over the route described in this report, and others.

Flight Personnel

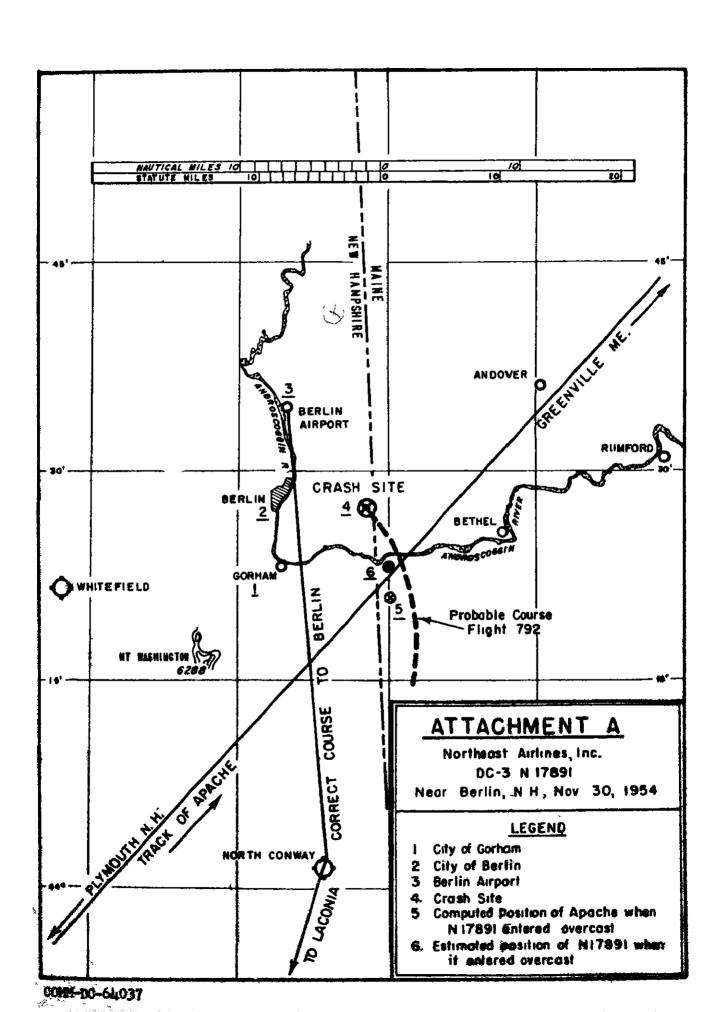
Captain W. P. Carey, age 37, held a currently effective airline transport pilot certificate with appropriate rating for the subject aircraft. He had been employed by Northeast Airlines as a captain since 1946. At the time of the accident his total flying time was 7,900 hours, of which about 5,500 hours had been in DC-3's. He had passed his last flight physical examination in October 1954 and his last six-month flight check in November 1954.

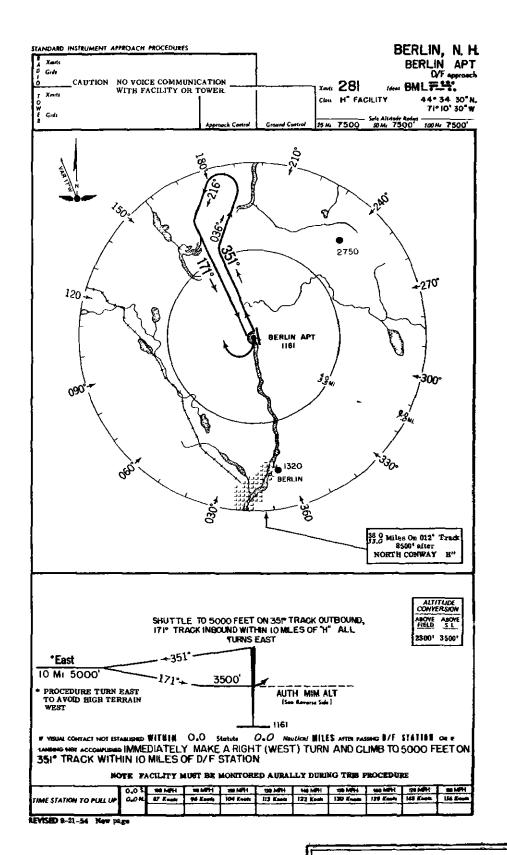
First Officer G. D. McCormick, age 37, held a currently effective commercial pilot certificate with instrument and DC-3 ratings. He had been employed by Mortheast Airlines since 1950. His piloting experience totaled 4,300 hours, of which 831 had been in DC-3's. He had passed his last flight physical examination in August 1954.

Stewardess Mary McEttrick had been employed by Northeast Airlines as a stewardess since June 1953. She had satisfactorily completed the company's training course in emergency procedures.

The Aircraft

N 17891, a Douglas DC-3, Company Number 91, was purchased from the USAF in 1945 and modified for civil use by Aero Services, Inc. The aircraft had had a total time of 26,000 hours, of which 24,000 hours had been by Northeast Airlines. All inspections and maintenance on the aircraft, its engines, and its propellers were up-to-date.





ATTACHMENT B

Northeast Airlines, Inc. DC-3 N 17891

Near Berlin, N H., Nov. 30, 1954

CIVIL AERONAUTICS BOARD

WASHINGTON 25, D. C.

FOR RELEASE:

CAB 55-4

IMMEDIATE January 18, 1955

CAB SETS HEAKING FUR NORTHEAST AIRLINES ACCIDENT NEAR BERLIN, N.H.

The Civil Aeronautics Board announced today that it will convene a public hearing to determine the cause of a fatal accident which occurred November 30, 1954, near Berlin, New Hampshire, involving a DC-3 aircraft operated by Northeast Airlines, Inc.

The hearing will be held in Boston, Mass. on January 20, 1955, at the Manger Hotel, and will start at 9:00 A.M. local time. The Presiding Officer will be Harold A. Crowley of the Hearing & Reports Division of the Bureau of Safety Investigation in Washington. He will be assisted by James N. Peyton, Chief, Investigation Division, and George M. French, Meteorologist, also from the Board's Bureau of Safety Investigation in Washington, D. C., and Mr. Joseph O. Fluet, Investigator-in-Charge of the Board's New York Regional Office. Mr. Vernon R. Radcliffe, Assistant to CAB Member Harmar D. Denny, will represent the Board as a member of the investigating panel.

The DC-3 crashed on the side of a mountain approximately 10 miles east of Berlin, N.H., at an elevation of about 3,000 feet, and resulted in the death of the copilot and a Northeast employee. The plane's pilot and stewardess, and the three passengers aboard suffered injuries and exposure. An engine fire, which occurred after impact, was extinguished by the survivors with snow. The mountainous terrain and a severe snowstorm hampered rescue parties in their search for the aircraft, but rescue operations were successfully conducted by helicopter on December 2, 1954, from Westover Air Force Base, Massachusetts.

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UNITED STATES OF AMERICA GIVIE AERONAUTIOS BOARD WASHINGTON, D. C.

Docket No. 34-275

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IN THE MATTER OF INVESTIGATION OF ACCIDENT INVOLVING AIR-GRAFT OF UNITED STATES REGISTRY IN 17801, WHICH OCCURRED MEAR SERS IN., NEW PHANSINIRE, NOVEMBER 30, 1954

HOTICE OF PEARING

Mottee to hereby given, portuent to the Civil Aeronguties Act of 1938, as amended, particularly Section 702
of said Act, in the above-untitled proceeding that hearing
is hereby assigned to be keld on thursday, January 20,
1935, at 9390 e.m. Hocal time! In the Consolin Room,
Hotal Manger, 190 Causeway Street, Easton, Massachusetts.

Dated at Washington, D. Ces January 6, 1855.

March G. Rowler
Presiding Officer

CIVIL AERONAUTICS BOARD Washington

December 3, 1954

TO: Messrs. Gurney, Denny, Ryan, Lee, Adams,

The Executive Director

FROM: Director, Bureau of Safety Investigation

SUBJECT: Accident Notification - Northeast Airlines!

flight 792, Douglas DC-3, N 17891, near Berlin. New Hampshire. November 30, 1954

Northeast Airlines' flight 792, reported missing in our memorandum of December 1, was located about 8:15 a.m., December 2, crashed on the side of a mountain approximately 10 miles east of Berlin, New Hampshire, just inside the Maine border, at an elevation of about 3000 feet m. s. 1. First Officer George McCormick and flight Superintendent John McNulty, who was riding the jump seat, were killed; Captain W. P. Carey, Stewardess Mary McEttrick, and the three passengers suffered injuries and exposure. An engine fire, which occurred after impact, was extinguished by the survivors with snow.

Rescue operations were effected by helicopter from Westover Air Force Base and all persons, including bodies of the deceased, have now been brought from the crash site.

Preliminary investigation by CAB investigators, who were transported to the accident scene by Air Force helicopter, indicates no malfunctioning or mechanical failure of the aircraft or its components prior to the crash. It appears that an instrument approach was being made to the Berlin Airport when the aircraft, with landing year and flaps extended, struck trees on the mountainside. It is not now known why a letdown was made in mountainous terrain 10 miles from the airport.

Investigation is continuing and an Air Force hell-copter from langley Field has been made available for transporting investigators to and from the accident scene, which is in rugged, mountainous terrain that would be extremely difficult to reach otherwise.

In addition to Investigators Fluet, Searle, and Van Epps of the Board's New York office, Hearing Officer Harold G. Crowley has been dispatched from the Washington office to Berlin to take depositions.

WK Andrews
W. K. Andrews

CIVIL AERONAUTICS BOARD WASHINGTON

December 1. 1954

TO: Messes. Gurney, Denny. Ryan. Lee. Adams.

The Executive Director

Director. Bureau of Safety Investigation FROM:

Notification of Missing Aircraft -SUBJECT:

Northeast Airlines DC-3, N 17891. November 30, 1954, en route Laconia, New Hampshire, to Berlin, New Hampshire

Northeast Airlinest Flight 792 departed Laconia, New Hampshire, at 1037 EST on an IFR flight plan for Berlin. New Hampshire, with Captain W. P. Carey, First Officer George McCormick. Stewardess Mary McEttrick. Flight Superintendent John McNulty, and three passengers.

Airway Traffic Control cleared the flight for an approach to Berlin Alrport, cruise 8000 via Blue Airway 63. At 1117 EST the flight acknowledged Berlin weather from NEA operations at Berlin; however, no position was given. This was the last contact. Fuel on board the aircraft was estimated to have been exhausted at approximately 1445 EST.

Weather at Laconia was 4000 feet, overcast, and at Berlin 2500 feet, overcast. A military pilot in the area reported turbulence and icing conditions.

Air Search and Rescue, C.A.P., and law enforcement agencies of New Hampshire are searching for the missing aircraft. Manufacturers representatives have been alerted.

The alrway between Laconia and Berlin is only 66 nautical miles long with North Conway, New Hampshire, the mid point on the dog leg course; there is an "H" radio facility for navigation at Laconia, North Conway, and Berlin. The radio facility at Berlin is operated by the New Hampshire State Aeronautical Commission.

Mr. Joseph Fluet of the New York office has been designated investigator-in-Charge. investigators Searle and Van Epps of the New York office are en route to Conway, the center of operations of the search activities.

> LOKandrus W. K. Andrews