

## CIVIL AERONAUTICS BOARD

**ACCIDENT INVESTIGATION REPORT**

Adopted: October 19, 1951

Released: October 26, 1951

**NATIONAL AIRLINES, INC.—PHILADELPHIA INTERNATIONAL AIRPORT,  
PHILADELPHIA, PENNSYLVANIA, JANUARY 14, 1951****THE ACCIDENT**

At 1413<sup>1</sup> January 14, 1951, a Douglas DC-4, N-74685, owned and operated by National Airlines, Inc., crashed and burned following an overshoot landing at the Philadelphia International Airport, Philadelphia, Pennsylvania. Aboard were twenty-five passengers, including three infants, and a crew of three. Six passengers and one crew member lost their lives and the aircraft was substantially destroyed by impact and fire.

**HISTORY OF THE FLIGHT**

National Airlines' Flight 83 departed Newark, New Jersey, at 1333, January 14, 1951, for Norfolk, Virginia, with a scheduled stop at Philadelphia. The crew consisted of Captain Howell C. Barwick, Copilot Edward J. Zatarain, and Stewardess Mary Frances Housley. The aircraft's total weight at takeoff was 58,601 pounds, which was within the allowable gross takeoff weight of 64,211 pounds, the load was properly distributed.

Flight 83 was scheduled to leave Newark at 1300, but was delayed 33 minutes due to the replacement of a malfunctioning generator. The company flight clearance was filed at 1215 for the scheduled departure at 1300, and this clearance was also used for the delayed departure. Attached to it was the weather information for the flight, and a notice that the ILS (instrument landing system) glide path at Philadelphia was inoperative until further notice. Immediately before taking off, the pilot requested and received from the tower the latest Philadelphia weather (reported on the 1328 CAA teletype sequence report and received at Newark after he boarded the aircraft), which was ceiling measured 1,000

feet, overcast, wind south-southwest at four miles per hour, and visibility 1 1/2 miles, with light snow and smoke. Flight 83 was cleared by the New York Air Route Traffic Control to proceed to North Philadelphia range station via Amber Airway No. 7, to maintain 4,000 feet, with Newark designated as the alternate airport.

Thirteen minutes after takeoff, at 1346, Air Route Traffic Control issued the flight a new clearance to proceed to the Philadelphia ILS outer marker, to maintain 4,000 feet, and to contact Philadelphia Approach Control when passing the Northeast Philadelphia range station. At 1354 the flight reported over Northeast Philadelphia at 4,000 feet and was cleared by Approach Control to descend, crossing the Philadelphia range station at 3,000 feet, and to advise the tower when leaving the 4,000- and 3,000-foot levels. It was also advised that the altitude was unrestricted after passing the range station, and that it was cleared to make a straight-in approach to Runway 9. With the above clearance, local weather was given precipitation ceiling 500 feet, sky obscured, visibility 1/4 miles, snow and smoke, and wind south-southwest two miles per hour. Following this clearance, the flight descended and reported over the Philadelphia range station at 3,000 feet, was again cleared for an approach to Runway 9, and was advised to report leaving thousand-foot levels. The flight acknowledged and reported leaving 3,000 feet at 1404, but no report of leaving 2,000 feet was received by Approach Control. According to the captain, they then proceeded to the outer marker and executed a procedure turn.

At 1408 the flight reported over the outer marker, inbound, and stated that it was at 1,600 feet and descending. A clearance was immediately reissued to land on

<sup>1</sup>All times referred to herein are Eastern Standard based on the 24-hour clock.

Runway 9, and the wind was given as south-southwest, three miles per hour. The flight was advised that the glide path was inoperative, that the frequency of the ILS localizer was 110.3 mc, that a 2,000-foot extension to the west end of the runway was under construction, and that braking action on Runway 9 was poor-to-fair. According to tower personnel this transmission was acknowledged. The crew, however, stated that they did not receive it.<sup>2</sup>

The flight continued its approach past the middle marker to the airport, and was first observed by ground witnesses beneath the overcast and directly over the intersection of Runways 4/22 and 9/27, located approximately 1,200 feet east of the threshold of Runway 9. Although the aircraft was first seen beneath the overcast and within the boundaries of the airport, the crew stated that they became contact at an altitude of approximately 500 feet, between the outer and middle markers.<sup>3</sup>

The aircraft was next seen to descend steeply, flare out for a landing in a normal manner, and float a considerable distance. After making contact with the runway the aircraft continued straight ahead, passed beyond the end of the runway, and crashed into a ditch at the east boundary of the airport. Fire immediately followed. Seven of the twenty-eight occupants did not evacuate the aircraft, and were fatally burned. The airport fire-fighting equipment was dispatched immediately to the scene, but efforts to extinguish the fire and rescue the remaining occupants were futile.

## INVESTIGATION

Investigation disclosed that the aircraft had traveled a distance of 243 feet from the end of the runway before striking the ditch. During this portion of the ground roll it struck and damaged a floodlight attached to a concrete stanchion. The ditch, approximately 30 feet wide at the point of impact, varies in depth from 7 1/2 feet on its west side to 5 1/2 feet on the east side. A

<sup>2</sup>The recorded transmissions in the tower showed that all the above messages were transmitted to the flight. This automatic recorder does not record transmissions from aircraft to tower.

<sup>3</sup>The outer marker and the middle marker are 5.66 and 0.66 miles respectively from the approach end of the runway.

heavy wire boundary fence seven feet high runs lengthwise through the center of the ditch. Adjacent to the ditch to the east is a road. When the aircraft struck the ditch a large portion of the fence was torn down and the aircraft came to rest with its nose resting in the road. The rear section of the fuselage remained suspended with the sill of the main cabin door six to eight feet above the east bank of the ditch. Fire originated in the vicinity of the No. 2 and No. 3 engine nacelles and rapidly spread rearward, substantially destroying a large portion of the aircraft.

The nose wheel assembly was separated from its fastenings by the impact, and the nose gear strut was severed just above the fork. The lower portion of this strut, which contained the axle and wheel, was found on the ground near the aircraft, the tire had been completely consumed by fire. Both of the main landing gear struts were bent rearward and had pulled loose from their respective fittings on the main spar. Heat caused three of the main gear tires to blow out, the outboard tire on the right side was not badly damaged, and still retained air. The main landing gear wheels and brake assemblies were subsequently removed and tested. They were found capable of normal operation.

Both wings of the aircraft were extensively burned from the fuselage to the outboard wing panels. Approximately one-half of the left wing flap and a portion of the right wing flap were damaged. The fabric of the left aileron was completely burned off, the right aileron was undamaged. The integral wing gas tanks were ruptured at a point adjacent to the main landing gear fittings.

The extreme forward portion of the nose section of the fuselage escaped damage, the pilots' cockpit was almost completely destroyed. All instruments in the cockpit were damaged and rendered unreadable. The emergency air brake bottle had been discharged. Both CO<sub>2</sub> fire extinguisher bottles used to extinguish fires in the baggage compartment or engine nacelles were fully charged. The selector valves and cylinder valves used in discharging these bottles had not been pulled.

The fuselage from the cockpit rearward to the bulkhead behind the lavatory was almost completely consumed.

The tail section of the aircraft was undamaged

All four engines were badly damaged. The nacelle and a propeller blade of the No. 1 engine propeller were damaged by contact with the floodlight. The blades of all propellers were bent rearward, and it was determined that little or no power was being developed at the time of impact. There was no evidence of mechanical malfunctioning of either the aircraft or engines prior to the accident.

Wheel marks showed that initial contact was made by the aircraft's main landing gear wheels 3,140 feet down the runway and that the nose wheel touched down 528 feet farther on. The remaining distances of surfaced runway from these observed touchdown points are 2,140 and 1,612 feet, respectively. For the remainder of the runway, marks made by the main tires were not continuous. Wheel marks also appeared on the turf from the end of the runway to the ditch. There was evidence that the tires had slid in several places.

Information in the company's required Operations Manual for DC-4's, a copy of which was on board the aircraft, indicated that the landing distance required to come to a full stop from a 50-foot height on a dry runway is 2,550 feet. Also, that under unsuitable runway conditions (wet or icy, etc.), or with malfunctioning brakes, a total runway length of 4,250 feet is required. These distances are predicated on flight tests under conditions similar to those encountered by the subject aircraft. Captain Barwick testified that only 1,550 feet were required to stop the DC-4 on a dry runway.

Following tests, the Douglas Aircraft Company published, on November 4, 1946, as part of the DC-4 Manual, information that a distance of 1,936 feet is required to bring this type aircraft to a full stop from point of touchdown, providing there is normal braking action and a dry paved surface is used. In the event of wet or slippery runways the distance required is increased, and will vary from 3,650 to 5,283 feet.

Runway 9/27 is 5,280 feet long and is the ILS runway. It was surfaced with a black tar-like composition, and a large portion of the east end was covered with fine gravel. At the time of the accident the runway was also covered with approximately 3/4 inch of

wet snow. Adjacent to the runway, on both sides and extending throughout its entire length, were two rows of high-intensity runway (Bartow) lights, spaced 200 feet apart. These are standard white lights except that the final 1,500 feet are amber. The tower controller on duty stated that the runway lights were lighted and that the selector switch was at the position of highest intensity. The day of the accident, portable green threshold lights with yellow cone-like bases divided the main 5,280-foot runway from the 2,000-foot extension under construction at the approach end.

A row of red neon approach lights, located to the left of the runway extension, extended in a westerly direction a distance of 1,500 feet from the west end of the threshold of Runway 9/27. These approach lights are actuated by an automatic device situated near the west end of the runway and controlled by a photoelectric cell. This cell is pointed in a northerly direction and depressed at an approximate angle of 25 degrees, actuating the lights when illumination equals 30-foot candles, and turning them off when this value increases to 50-foot candles. Snow coverage does not appreciably affect its operation. The tower operator stated that he presumed the approach lights were on. Under conditions of restricted visibility the lights cannot be seen from the tower because a reflector attached to each light concentrates the light beam toward approaching aircraft. If the photoelectric cell is operating properly, the lights cannot be manually turned on or off from the tower, this can be done only if the system fails. Subsequent to the accident the approach light mechanism was tested and found normal. The flight crew stated that they did not see the approach lights.

The work on the 2,000-foot extension to the west end of the runway was nearing completion the day of the accident. No construction work was being performed that day, and there were no obstructions to aircraft landing on Runway 9/27.

According to the captain the flight to Philadelphia was routine and he was cognizant of the lowering weather conditions. He said that even though he did not receive the last transmission from the tower (advising that the glide path was inoperative, etc.), it made but little difference as he was

advised of most of this information through published NCTAM's that he could see the lighted runway throughout its entire length. He stated that he purposely made a normal but slightly high approach to avoid possible landing hazards, that he intended to land within the first third of the runway and that there were no obstructions to his vision. The aircraft's windshield wipers were working properly. After touchdown he considered there was sufficient distance remaining within which to stop and therefore did not attempt to go around. As soon as the nose wheel made contact with the runway, he began applying brakes. Although there seemed to be adequate brake pressure, there was apparently no effective brake action, the aircraft continuing ahead with little deceleration. When approximately 1,000 feet from the end of the runway the emergency air brakes were applied with no apparent retardation.

The crew said that an external fire and another between the pilots' compartment and the main cabin door started immediately after impact. The engine switches and electrical system switches, etc., were not turned off and the intercommunication system between the pilots' compartment and the main cabin was not used.

One pilot escaped through the front cargo door, the other through the sliding cockpit window. Their attempts to assist the stewardess, still in the cabin, with the evacuation of the passengers were unsuccessful due to the intense heat already existing in the area of the main cabin exit which prevented them from getting close to it. The stewardess, who opened the main cabin door, advised everyone to remain calm and rendered the utmost assistance to all, was highly praised by the passengers who escaped, for her courageous efforts. The emergency rope ladder anchored near the main cabin door was not used, nor were any of the cabin emergency exits opened.

Captain Barwick stated that he qualified as captain on DC-4 aircraft on September 26, 1947, and that he had flown this equipment as captain approximately 22 hours. The greater part of this flying experience was in 1947, and he did not again fly DC-4's as captain until January 1951. In the interim he had flown either as copilot on DC-4's or as captain or copilot on Lockheed Lodestars. Early

in January 1951 he was sent to the company's base at Miami, Florida, for additional training on DC-4's, receiving 24 hours of ground school and six hours and thirty minutes of flight training. On January 13, 1951, the day before the accident, as part of his requalification he was given a company line check between Jacksonville, Florida, and Newark. This check consisted of flying the DC-4 as captain, under the supervision of a company check pilot, on National's scheduled Flight 50 over the route mentioned. Stops were made at Charleston, South Carolina, Wilmington, North Carolina, Richmond, Virginia, Washington, D. C., Baltimore, Maryland, and Newark. No stop was scheduled at Philadelphia. His last previous landing at the Philadelphia International Airport was made on April 30, 1950, with a Lodestar.

In accordance with the company's policy, Flight 83 which departed Newark was dispatched from the company's office at New York International Airport. This is accomplished by teletype and telephone through the New York dispatcher, who delegates the authority to a company agent. Weather information is available to crews at Newark, and NOTAM's are put on the bulletin board. Pertinent information necessary to the successful completion of the flight is attached to the flight clearance.

#### ANALYSIS

Captain Barwick stated that the flight was routine until the final approach was made to the Philadelphia International Airport. He also said that he did not receive the final radio transmission from the tower, which included the runway and braking conditions, the ILS localizer frequency, the fact that the glide path was inoperative, and the general field conditions. It is difficult to understand why this transmission was not received by the flight since it was established (by means of automatic recorder in the tower) that it was transmitted as stated, and since all other messages to the flight were received and acknowledged. It is probable, however, that had this information been given to the flight when it first contacted Approach Control over Northeast Philadelphia, the additional time allowed would have permitted the captain to make a better evaluation of the field conditions,

particularly since this was his first landing on the airport in several months. The fact that the ILS glide path was inoperative should not have had any bearing on the approach to the runway since this facility was not needed to effect a safe landing. Also, when the approach was made there were no hazardous obstructions to the approach end of the runway or anything to seriously hinder the pilot's vision. Therefore, if the approach had been properly planned, the aircraft could have been stopped by landing on the first third of the old runway. If we accept the captain's testimony that he became contact at an altitude of 500 feet in the vicinity of the middle marker and that as he approached the runway he could see the green threshold lights and all of the runway lights, there is even less excuse for his landing so far down the runway, particularly with a negligible wind. His decision to land at a point, which even under favorable conditions would be considered marginal to allow stopping, does not reflect the judgment and "highest degree of care" which the public is entitled to have exercised by the airline pilots in whose hands their safety rests.

While we recognize that the pilot was required to make a quick decision as between landing and making an emergency "pull up", the correct decision could have been made more probable by additional training.

A review of the pilot training given Captain Barwick prior to the accident indicates that he received 24 hours of ground school training and passing grades on six hours and 30 minutes of DC-4 flight training. He also was given a company route check between Jacksonville and New York by the assistant chief pilot the day before the accident and rated as satisfactory. Although the training program complied with the minimums specifically set forth in Section 61.132 of the Civil Air Regulations, it is also the duty of the air carrier to provide sufficient training to insure that the pilot is competent in view of all the circumstances. No rule can be promulgated which will provide for all contingencies and it is in the area not specifically covered by the minimum standards that the training of pilots must be solely in the hands of the air carrier. We have on several occasions been called upon to question and to examine the training program of this carrier. Marked progress has already been made and the air carrier must be given full credit for this improvement. But the price of safety is "eternal vigilance," and despite the progress already attained in the training

program of this air carrier, there would still appear to have been room for further improvement at the time of this accident.

Subsequent to the accident, a committee comprising both company personnel and members of the Air Line Pilots Association was formed, and they recommended the following training for Captain Barwick which was adopted by National: a week's rest with pay, a short familiarization ride with a company check pilot, 30 days or 85 hours as copilot, this time to be divided equally between two captains, two round trips on the line with different check pilots, and a CAA physical examination. If the above was completed in a satisfactory manner, he was to be returned to the line as captain.

As a result, Captain Barwick received the following training: 98 hours and 43 minutes as copilot, of which 17 hours and 40 minutes were flown under instrument flight conditions, and 12 hours and 50 minutes of check time. Captain Barwick received passing grades and was then returned to the line as captain.

In addition to the above, the company reviewed its training program with particular emphasis to emergency "pull up" procedures.

The Board is of the opinion that Mary Frances Housley, the stewardess, acted in a most courageous manner, and that she lost her life because of her high sense of duty in attempting to evacuate the passengers.

#### FINDINGS

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

- 1 The carrier, the aircraft, and the crew were properly certificated.
- 2 The flight was properly dispatched.
- 3 The runway was covered with wet snow and braking conditions were poor-to-fair.
- 4 The landing was made too far down the slippery runway to permit stopping within its limits.

#### PROBABLE CAUSE

The Board determines that the probable cause of this accident was the captain's error in judgment in landing the aircraft too far down the slippery runway instead of executing a missed approach procedure.

BY THE CIVIL AERONAUTICS BOARD

/s/ Donald W. Nyrop  
 /s/ Oswald Ryan  
 /s/ Josh Lee  
 /s/ Joseph P. Adams  
 /s/ Chan Gurney

# Supplemental Data

## INVESTIGATION AND HEARING

The Civil Aeronautics Board was notified promptly after the accident by CAA Communications. An investigation was begun immediately 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 Philadelphia, Pennsylvania, January 31, February 1, and 2, 1951.

## AIR CARRIER

National Airlines, Inc., is a Florida corporation with general offices in Miami, Florida, and operates as an air carrier under currently effective certificates of public convenience and necessity issued by the Civil Aeronautics Board, and an air carrier operating certificate issued by the Civil Aeronautics Administration. These certificates authorize the company to transport by air, persons, property and mail over various routes within the continental limits of the United States and Havana, Cuba, including the route from Newark, New Jersey,

through Philadelphia, Pennsylvania, Baltimore, Maryland, Washington, D C., and Richmond, Virginia, to Norfolk, Virginia.

## FLIGHT PERSONNEL

Captain Barwick, age 37, held a currently effective airman certificate with airline transport and flight instructor ratings. He had accumulated a total of 6,723 flying hours, of which 191 hours were on DC-4 type equipment. His last CAA medical examination was October 26, 1950, and his last instrument check was January 10, 1951. Copilot Zatarain, age 30, also held a currently effective airman certificate with an airline transport rating. He had accumulated 4,214 flying hours, of which 158 were on DC-4 type equipment. His last CAA physical examination was May 5, 1950.

## THE AIRCRAFT

N-74685, a Douglas aircraft, model DC-4-1009, was manufactured January 22, 1947. It was equipped with four Pratt and Whitney model R-2000-D-3 engines and Hamilton Standard hydromatic propellers.