File No. 722-42

Docket No. SA-59

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REPORT OF THE CIVIL AERONAUTICS BOARD

On the investigation of an accident involving aircraft of United States registry NC 21788 which occurred at Detroit City Airport, Detroit, Michigan, on March 2, 1942.

CONDUCT OF INVESTIGATION

A landing accident involving aircraft NC 21788 occurred at the Detroit City Airport, Detroit, Michigan, on March 2, 1942, about 7:28 p.m. (EWT),[1] while the aircraft was operating in scheduled air carrier service between Washington, D. C. and Detroit, Michigan, as Trip 17 of the Pennsylvania-Central Airlines Corporation.[2] The accident resulted in major damage to the aircraft; however, none of the 14 passengers or 3 members of the crew was injured.

The Wayne, Michigan, office of the Civil Aeronautics Board[3] was notified of the accident about 8:15 p.m. the same evening. Immediately after receiving this notification the Board initiated an investigation of the accident in accordance with the provisions of section 702(a)(2) of the Civil Aeronautics Act of 1938, as amended.[4] An investigator for the Board was sent to the scene of the accident and arrived there about 9:25 p.m. that evening.

The wreckage was guarded by Detroit police and PCA employees until the arrival of the investigator for the Board. The investigator made an examination of the aircraft at the scene of the accident and then authorized its removal to the PCA hangar at the airport where a more complete examination was made. The aircraft was released to PCA on March 4, 1942.

1/ All times hereinafter mentioned are Eastern War Time.
2/ Hereinafter referred to as "PCA".
3/ Hereinafter referred to as "the Board".
4/ Hereinafter referred to as "the Act".

In connection with the investigation of the accident the Board ordered a public hearing, which was held at Detroit, Michigan, on March 17, 1942. Donald W. Markham, an attorney for the Board, acted as Presiding Examiner and the following personnel of the Board participated in the hearing: Robert D. Hoyt, Assistant Director of the Safety Bureau; Charles Z. German, Assistant General Counsel; James N. Peyton, Senior Air Safety Investigator; Ervin N. Townsend, Air Safety Investigator; and Paul A. Gareau, Air Safety Specialist.

Upon the basis of the evidence accumulated during the investigation and at the hearing the Board now makes its report in accordance with the provisions of the Act.

SUMMARY AND ANALYSIS OF EVIDENCE

Air Carrier

PCA, a Delaware corporation, was at the time of the accident an air carrier operating under certificates of public convenience and necessity and an air carrier operating certificate issued pursuant to the Act. These certificates authorized it to engage in air transportation between various points, including Washington, D. C.; Pittsburgh, Pennsylvania; Cleveland, Ohio; and Detroit, Michigan.

Flight Personnel

On the flight in question the crew consisted of Captain Ralph N. Read, First Officer Albert R. Ricks and Stewardess Louise Taylor.

Captain Read, age 32, was the holder of an airline transport pilot certificate and had logged 5287 hours 34 minutes of flight time, of which approximately 1430 hours had been in Douglas DC-3 equipment. He had first been employed as a co-pilot in 1935 by the Pennsylvania Airlines, predecessor of PCA, and was promoted to Captain in May 1940. When he was last examined by a medical examiner of the Civil Aeronautics Administration on January 14, 1942, he was found to be in satisfactory physical condition. At the time of the accident he was certified as competent to fly the route from Washington to Detroit.

First Officer Ricks, age 32, was the holder of a commercial pilot certificate with an instrument rating and had logged 1565 hours 12 minutes of flying time, of which approximately 500 hours had been in Douglas DC-3 equipment. When last examined by a medical examiner of the Civil Aeronautics Administration on January 8, 1942, Ricks was found to be in satisfactory physical condition.

It appears from the evidence that Captain Read and First Officer Ricks held the proper certificates of competency and were physically qualified for the flight involved.

Airplane and Equipment

Airplane NC 21788, a Douglas model DC-3, had been manufactured by the Douglas Aircraft Co., Inc., in 1940 and had been purchased by PCA on May 22, 1940. It was equipped with two Wright model G102A engines, and with Hamilton Standard constant speed,

hydromatic, full-feathering propellers. The aircraft was currently certificated as airworthy to carry 21 passengers and 4 crew members at a standard weight of 24,546 pounds and a provisional weight of 25,346 pounds with de-icing equipment. 1/

The aircraft had been operated a total of 3,834 hours 22 minutes. Major overhauls were required by the air carrier operating certificate after every 650 hours of operation, but the airplane had been flown only 424 hours since its last major overhaul. The engines and propell had likewise been operated considerably less than the specified overha periods. PCA records indicate that the airplane had been properly mai tained. It thus appears from the evidence that the aircraft was in an airworthy condition when it was dispatched on March 2, 1942, for the flight to Detroit.

The evidence indicates that the aircraft and all its equipment functioned properly throughout the flight, and that it was loaded belo the standard weight and within the prescribed center-of-gravity limits at the time of the accident.

1/ The "standard weight" of an airplane is the maximum allowable weight for landing, while the "provisional weight" is the maximum allowable weight for take-off. When an airplane takes off with a weight in excess of the designated standard weight, the weight of the airplane must be reduced by gasoline consumption prior to arrival at its next scheduled stop, to the extent necessary to bring it within the standard weight for landing. If sufficient gasoline has not been consumed between time of take-off and any landing, the gasoline can be dumped by the use of tested and approved dump valves in order to reduce the total weight to the approved weight for landing.

History of the Flight

PCA Trip 17 was scheduled to operate from Washington, D. C. to Detroit, Michigan, with an intermediate stop at Pittsburgh, Pennsylvania. After receiving clearance from the company dispatcher for an instrument flight to Pittsburgh and Detroit and after receiving approval by Airways Traffic Control of his flight plan, Captain Read took off from Washington at 3:50 p.m. The flight landed at Pittsburgh at 4:53 p.m. and took off from there at 5:15 p.m. At 5:55 p.m. Trip 17 received a special weather report indicating that the weather at Detroit was below the minimums for landing at that point. 1/ Captain Read promptly contacted PCA personnel at Cleveland and was advised to land at Cleveland. The landing was effected there at 6:11 p.m.

A special weather report for Detroit made at 6:10 p.m. indicated that the ceiling had risen to an estimated 1200 feet and that visibility had improved to 1 mile. This report also indicated an overcast, lower broken clouds, light snow, light fog, temperature 32, dew point 31, and wind northeast 7 m.p.h. When this information was received, Trip 17 was cleared at 6:15 p.m. by the PCA dispatcher to proceed to Detroit. After receiving clearance from Airways Traffic

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1/ The minimums prescribed by the Civil Aeronautics Administration in the PCA air carrier operating certificate for landing at Detroit were: ceiling 700 feet and 1 mile visibility, or ceiling 1000 feet and 3/4 mile visibility if no precipitation was occurring. The special weather report gave the ceiling as 1000 feet and the visibility as 3/4 mile with light snow.

Control, the flight departed from Cleveland at 6:34 p.m. The flight then proceeded toward Leamington, Ontario, where Captain Read elected to hold in contact flight, awaiting an approach clearance to Detroit. Upon receiving such a clearance at 7:18 p.m., the flight proceeded toward the Windsor, Ontario, radio range station. It reported over Windsor at 7:23 p.m., contact at an altitude of 1625 feet above sea level, and continued contact to the Detroit City Airport, 8.8 miles from the range station. A weather report made at Detroit at 7:20 p.m. indicated: ceiling estimated as 1200 feet, overcast, lower broken clouds, visibility 1 mile, light snow, light fog, temperature 32, dew point 30, wind northeast 6 m.p.h., altimeter setting 29.76.

The control tower operator at Detroit contacted Trip 17 at 7:24 p. and advised that the wind was northeast 6 m.p.h. with light snow. The operator testified that he also advised Trip 17 that previous flights had been landing on the east-northeast--west-southwest runway. 1/ Captain Read, however, stated that the control tower operator did not suggest the use of that runway. First Officer Ricks testified that he could not recall whether the control tower operator made such a suggestion. Although Captain Read did not request it, the control tower operator turned on the floodlights at the east-northeast end of the runway.

1/ The Detroit City Airport is an L-shaped field. The only runways suitable for air carrier operation are the east-northeast--west-southwest runway and the northwest-southeast runway. There are a number of high obstructions in the vicinity of the airport and along its approaches. See map opposite p.

Captain Read stated that he first observed the airport on his left when he was at an altitude of approximately 1400 feet above sea level, 775 feet above the airport. After passing along the northeast side of the field, he circled the airport to the left and descended to approximately 600 feet above the ground.

Captain Read elected not to land on the 4135-foot east-northeast--west-southwest runway. He decided instead to land on the sod toward the northeast, directly into the wind and at approximately a 20-degree angle across the runway. He subsequently stated that he did so because such a landing would allow him to extend his landing roll by turning to the left into the northwest corner of the airport in the event the field proved to be slippery. After circling the airport to the left, he made his final turn at a point southwest of the field and lined up for his approach about a mile from the airport boundary. Both Captain Read and First Officer Ricks stated that they could see the floodlights at the east-northeast end of the runway at this time. Full flaps were applied and the First Officer began to call airspeeds when the aircraft was about three-quarters of a mile from the boundary and was traveling at an airspeed of 110 m.p.h. The approach was made with power off. Captain Read estimated that he crossed the boundary of the airport at an altitude of about 140 feet and at an airspeed of 85 m.p.h. He stated that, because of the obstructions in the vicinity of the airport, he ordinarily landed faster there than at other airports. First Officer Ricks testified that the airplane crossed the boundary at an altitude

of about 150 feet, but stated that the airspeed at this time was 110 m.p.h. Other evidence also indicated that the airplane was flying at a high rate of speed at this time.

The landing path selected by Captain Read was approximately 3350 feet long. According to Captain Read, he thought at the time that the airplane contacted the ground at an airspeed of approximately 75 m.p.h. after passing over about one-third of this landing path. Subsequent examination of the wheel tracks left in the snow revealed, however, that the aircraft passed over 1935 feet of the landing path before either wheel touched the ground. From the tracks in the snow it appeared that the left wheel first contacted the ground rather sharply for a distance of 57 feet. This wheel then left the ground for 45 feet. Both wheels then made contact almost simultaneously, th left one staying on the ground for a distance of 48 feet and the righ one for a distance of 60 feet. The wheels continued to leave the gro intermittently for a considerable distance before both of them made continuous contact. The brakes were applied but had little effect because the surface of the airport was wet and covered with snow.

It became apparent to Captain Read that if the airplane continu on its path, it would not stop before striking the fence along the northeast boundary of the airport. He tried to turn to the left int the northwest corner of the airport, and a partial left turn was effected so that the airplane was proceeding in a northerly direction However, because of the slippery condition of the field and the spee

of the aircraft, Captain Read was unable to turn sufficiently to avoid striking the fence. Wheel marks indicated that the left wheel had been continuously on the ground for only 820 feet, the right wheel for only 470 feet, and the tail wheel for only 408 feet, when the aircraft struck the fence. The airplane went through the fence at a speed of from 20 to 30 m.p.h., and continued for 237 feet across a street and into a yard before it finally came to rest. This occurred at approximately 7:28 p.m.

The 7:30 p.m. weather report for Detroit indicated instrument weather, ceiling estimated as 1200 feet, overcast, lower scattered clouds at 500 feet, visibility 1 mile, light snow, light fog, temperature 31, dew point 30, wind north 4 m.p.h., altimeter setting 29.75. Captain Read testified that he had 1 mile visibility at all times in the vicinity of the airport but did not encounter the scattered clouds reported at 500 feet.

There was no indication of ice on the aircraft. When the plane was being removed from the point at which it came to rest, the brakes were tested and were found to be in satisfactory operating condition. Subsequent examination and the testimony of Captain Read and First Officer Ricks indicated there had been no malfunctioning of the aircraft, its brakes, or its engines. All of the damage to the airplane had apparently resulted from striking the fence and other obstructions beyond the fence.

Conduct of the Flight

Trip 17 was properly dispatched at Washington and properly re-dispatched at Cleveland.

Under the circumstances Captain Read used poor judgment in electing to land at Detroit toward the northeast instead of using the east-northeast--west-southwest runway. His stated reason for doing so was that such a landing would make it possible for him to turn and extend the landing roll into the northwest corner of the airport in case the surface proved to be slippery. However, the landing path which he selected was only about 3350 feet long. He should have foreseen that he might be unable to make the left turn into the northwest corner of the field if he overshot and found the field to be slippery. The east-northeast--west-southwest runway was more clearly defined since the floodlights at the east-northeast end were lighted, and, although Captain Read thought that he would get better traction on the sod than on the paved runway, it is probable that the reverse was true under the conditions then existing.

It also appears from the evidence that Captain Read made his final glide at too great a speed and too high an altitude. Captain Read testified that he normally crossed the boundary of the airport in his final glide at Detroit at an airspeed of 85 m.p.h., and that he crossed the boundary on this occasion at approximately that speed. However, First Officer Ricks, who was calling the airspeeds, stated that the aircraft passed the boundary at an airspeed of 110 m.p.h. and other

evidence indicates that the final stage of the approach was made at a higher speed than usual. Both the Captain and First Officer testified that the First Officer was calling airspeeds during the final approach, but it could not be determined which officer was correct in his recollection regarding the speed at which the airplane crossed the boundary.

Captain Read thought during the landing that the airplane contacted the ground after passing over only one-third of the selected landing path. Actually, of course, the aircraft passed over 1935 feet of the 3350-foot path selected before it made contact. This misjudgment by Captain Read apparently resulted from approaching at too great a speed and from the limited visibility then prevailing. When the airplane did make contact and it became apparent to Captain Read that he could not stop in the area ahead of him, he used good judgment in electing not to attempt a take-off. An attempted take-off would have been extremely hazardous because of the short take-off area and the obstructions in the flight path.

An investigation of all weather services disclosed that the forecasts and weather reports made available to Trip 17 were substantially accurate. However, the landing in question was made at dusk, with visibility at the minimum, a snow cover on the ground and a light snow in the air. Under such circumstances the pilot's judgment of distances could easily be affected by the deceptive light conditions.

At the time of the accident one mile visibility was measured at the Detroit City Airport by observation of the airport boundary lights

at the northwest and southwest ends of the field. It was brought out at the hearing that when such observations indicate one mile visibilit on the airport itself, it is possible, because of the industrial area in which the airport is located, to have less than one mile visibility in the immediate vicinity of the airport due to localized smoke condit Such conditions are, of course, a serious handicap to the pilot in avoiding the numerous obstructions in the vicinity of the airport and in attempting to line up for a landing.

As a result of the investigation of this accident the Board has called the attention of the Weather Bureau to the problem of measuring visibility in the vicinity of airports subject to localized smoke conditions, and the Weather Bureau has adopted a new means of making such measurements. Under the new procedure visibility markers are established at more frequent intervals around the airport. In additi if one of the markers at a given distance, 1 mile for example, cannot be distinguished, the visibility is reported as the given distance wi a notation that the visibility is less than that in the direction of indistinguishable marker. Such information is, of course, of conside help to a pilot in selecting a safe approach path and in making the actual approach.

CONCLUSION

Findings

Upon all of the evidence available to the Board at this time, we find that the facts relating to the accident involving aircraft NC 21

on March 2, 1942, at the Detroit City Airport, Detroit, Michigan, are as follows:

1. The accident occurred at approximately 7:28 p.m. to PCA Trip 17 and resulted in major damage to the aircraft, but none of the passengers or crew members was injured.

2. At the time of the accident PCA held a certificate of public convenience and necessity and an air carrier operating certificate authorizing it to conduct the flight.

3. Captain Read and First Officer Ricks were physically qualified and held proper certificates of competency and appropriate ratings to operate as air carrier pilots over the route between Washington, D.C., and Detroit, Michigan.

4. Aircraft NC 21788 was currently certificated as airworthy at the time of the accident, had been properly maintained, and was loaded within its approved loading limits.

5. Trip 17 was cleared, in accordance with proper procedure, for the flight in question.

6. The 7:20 weather report for Detroit indicated in part: ceiling estimated as 1200 feet, overcast, lower broken clouds, visibility 1 mile, light snow, light fog, and wind northeast 6 m.p.h.

7. Captain Read showed questionable judgment in electing to land at Detroit toward the northeast on a 3350-foot landing area rather than toward the east-northeast on the 4135-foot runway.

8. Captain Read made his final glide at too great a speed and too high an altitude.

9. The slippery condition of the field prevented effective braking action and a sufficient turn to avoid the boundary fence along the northeast side of the airport. The aircraft struck this fence at a speed of 20 to 30 m.p.h., went through the fence, and continued for a distance of 237 feet across a street and into a yard before coming to rest.

10. Aircraft NC 21788, its brakes, and engines were functioning normally until the aircraft struck the fence.

11. The Detroit City Airport has only two runways suitable for air carrier operation, and there are numerous high obstructions in the vicinity. In addition, it is located in an industrial area and is subject to localized smoke conditions.

Probable Cause

On the basis of the foregoing findings and all the evidence available to the Board at this time, the Board finds that the probable cause of the accident was the action of Captain Read in electing to land on the sod which afforded less traction than the runway; in landing in a direction which afforded less usable landing area than would otherwise have been available: and in misjudging speed and distance during the approach under conditions of restricted visibility.

APPROVED:

/s/ L. Welch Pogue
L. Welch Pogue

/s/ Harllee Branch
Harllee Branch

/s/ Oswald Ryan
Oswald Ryan

/s/ Edward Warner
Edward Warner