

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: May 6, 1948

Released: May 7, 1948

AMERICAN AIRLINES, INC.—LAGUARDIA FIELD, NEW YORK—AUGUST 8, 1947

The Accident

An American Airlines' DC-3C,¹ aircraft NX-88787, crashed into Bowery Bay, approximately 1,350 feet off the approach end of runway 13 of LaGuardia Airport at 1849,² August 8, 1947, while attempting a single engine landing. Both of the pilots, and one of the 3 mechanics aboard lost their lives. No passengers were carried. The aircraft was substantially damaged.

History of the Flight

NX-88787, also known by the name Alpha, a C-47 converted to a research aircraft, took off on runway 13 of LaGuardia Airport at 1843, having been cleared on an instrument flight plan to Rochester, New York, with Toronto, Ontario, as an alternate. Approximately 2 minutes after take-off the flight called LaGuardia Tower and reported that it was in the vicinity of the south end of Whitestone Bridge, approximately 2 1/2 miles northeast of LaGuardia Airport. The flight advised that the oil pressure was low on one engine, and requested clearance to land on runway 22. The request was approved, and the tower informed the crew that the wind was calm. When asked if emergency equipment was desired to stand by, the flight replied in the negative. Shortly thereafter, NX-88787 reported that it was on the final approach, and that it was over the sand barges, located approximately one-half mile off the approach end of runway 22. In reply the flight was again given clearance to land.

The aircraft was first seen at an altitude of approximately 800 feet, and about 1,300 feet off the approach end of runway 22 with the landing gear extended. The flaps were lowered, and the aircraft

started a steep descent to runway 22, but it passed over the approach end of the runway at an altitude of approximately 300 feet. The flight then requested and was granted permission by the tower to make a right turn, however, the aircraft continued straight ahead over the runway, gradually losing altitude.

When one-third of the way down the runway, the right propeller was feathered. When over the intersection of runways 22 and 18 and at an altitude of 200 feet the flaps were raised, which resulted in an additional loss of altitude. During or directly after raising the flaps, a right turn was initiated, and the landing gear was observed to retract slowly. Competent witnesses stated that the right turn was made at a very slow speed, at a high angle of attack, and at an altitude appearing never to have exceeded 200 feet.

Over Bowery Bay the aircraft on two occasions almost settled into the water. When in a flat right turn toward runway 13 it lost altitude to about 50 feet. Approximately 2,000 feet from the end of the runway, the landing gear started to extend, and became fully extended when the aircraft was aligned with runway 13. At this time the airplane attitude appeared to be that of a steep climb. The wings were seen to wobble slightly, then the left wing and nose dropped, and the airplane struck the water at an angle of approximately 20 degrees. The forward movement of the aircraft continued on the surface of the water for 40 to 50 feet, throwing up a great spray as the tail rose to a vertical position, after which the aircraft continued over on its back and sank in about 5 minutes.

Investigation

Salvage was conducted by the U. S. Navy. The aircraft was recovered on the evening of August 10, and the major portions of the aircraft were accounted for. Both cockpit seats and the bulkhead

¹C-47 airplane converted from military to civilian use, and identical to a DC-3A except for stronger landing gear

²The times noted in this report are Eastern Standard and based on the 24-hour clock.

immediately behind had been forced aft approximately 3 feet by impact forces. The area forward of the seats was a mass of tangled wreckage. Eight feet of the cockpit had been telescoped into a space only 2 feet thick.

Inspection of the wreckage after salvage indicated that the flaps were up, that the hydraulic selector valve handle was in the "up" position, that the landing gear was down and locked, and that all the flight control cables were intact. There was no evidence of malfunctioning of the flight controls prior to impact. Since the cockpit structure was badly crushed by impact and salvage, it is improbable that the positions of the cockpit controls observed immediately after salvage were the same as they were before the airplane struck the water.

The left propeller was in a low pitch position, the right was feathered. Except for corrosion caused by salt water immersion, and the damage incurred in salvage the engines were undamaged. Inspection and a test stand run of the left engine gave no indication that this engine would not have developed full take-off power before the accident.

The spring loaded oil strainer cover plate was removed from the right engine. Although it is normally necessary to tap this cover plate with a mallet in order to break it loose from its seat, when the nuts were removed in this case the cover plate and cover plate gasket dropped from the engine. Inspection of the gasket disclosed a fracture across one of the attaching stud holes, and an impression had been left on the gasket next to the break by the oil strainer cover plate. This impression was not parallel to the edge of the gasket, but was angular with the widest part of the angle at the position of the break. Corrosion was evident on the cover plate flange, and the engine mounting flange at the position of the gasket break.

A failure of the oil strainer cover plate gasket would be very critical since the oil strainer is located between the oil pump and the engine bearings. Tests conducted after the accident disclosed that a gasket break similar to the one in this instance would result in a 20 pound drop in oil pressure. No other cause of low oil pressure was found.

Analysis of the gasket by the National Bureau of Standards showed that the

gasket conformed to the manufacturer's specifications,³ and a check of the cover plate for warping revealed that it was within allowed tolerances. The mechanic who installed the gasket at the 230-hour-check, immediately before the flight, stated that a new gasket had been used. According to the company maintenance records, and apart from the possibly defective gasket, the aircraft was in airworthy condition at the time of its departure from LaGuardia Airport.

The 1843 weather report for LaGuardia Field, issued as Special 23, reported a high overcast, scattered clouds at 4,500 feet, visibility 1 and 3/4 miles, smoke, wind south-southwest at 5 miles per hour. When the flight was in the vicinity of the south end of Whitestone Bridge, the flight advised the tower that the visibility was 3 miles. It is entirely possible that the flight had 3 miles visibility there, but the visibility in the immediate vicinity of the field was probably restricted, as stated in the 1843 weather report, to 1 and 3/4 miles.

NX-88787 was equipped with considerable radio and electronic equipment not normally installed on air carrier aircraft. Included in the electronic equipment was a radar system which necessitated the installation of an external radar dome for its operation. This dome was located on the bottom of the fuselage directly below the cockpit. The extra radio equipment required the installation of external antennas and antenna posts, and it is estimated that the drag introduced by all the additional exterior installations on Alpha amounted to a flat plate area of approximately 2 square feet.

The control of the radio and electronic equipment was from the cockpit, and it was the policy of the company to give a cockpit check to any pilot flying the aircraft for the first time. Since Captain W. A. Davidson and First Officer W. R. Zundel had never flown Alpha, they were given a thorough briefing concerning the use of this equipment. The attention of the pilots was also called to the dual manifold and tachometer gauges which replaced single instruments in order to make a place for the radar scope. These two dual instruments were

³At the present time a service test is being made for a new type of gasket for this installation

located on the instrument panel where the two single manifold pressure gauges were normally located. Other than the dual engine instruments, and the additional radio and electronic switches, the cockpit instruments and controls were the same as for a standard DC-3A.

During the course of the investigation a comparison between the air speed calibration of Alpha and a DC-3A was made. It was found that Alpha, in the speed range between 90 and 110 miles per hour, had a calibrated air speed identical to the indicated air speed, while a DC-3A in the same speed range had a calibrated air speed approximately 6 miles per hour higher than the indicated air speed.

According to the single engine climb data for Alpha the aircraft when loaded to 25,000 pounds,⁴ climbed, gear up, at the rate of 320 feet per minute when flown with an air speed of 110 miles per hour. At 90 miles per hour air speed it climbed at the rate of 265 feet per minute. Witness statements were to the effect that the right turn to the field was conducted at a high angle of attack, and at a very low air speed. At 95 miles per hour Alpha would have been only 7 miles per hour above minimum single engine control speed.

Flight tests conducted after the accident in an aircraft of the same weight and under similar conditions of flight showed that 40 to 50 feet of altitude would be lost in retracting the flaps when operating only one engine. The flight test further demonstrated that under the conditions of flight under which Alpha was flown a much longer radius of turn to runway 13 was required than which was actually flown in this case.⁵

Due to the "NX" certification⁶ of Alpha the aircraft was never used in scheduled operations. In this instance, the aircraft was being used to ferry an engine and an engine change crew to Buffalo, New York. An intermediate stop was to be made at Rochester, New York, to unload communication equipment.

Captain Davidson was qualified to operate DC-3A equipment, having accumulated approximately 2,000 hours in this type of aircraft of which 152 hours had

been accumulated in the past 60 days. Captain Davidson's total flying time amounted to 4,934 hours. First Officer Zundel was also qualified to operate DC-3A equipment, having accumulated approximately 1,500 hours in this type aircraft. His most recent flight time had been obtained in June when he made 3 take-offs and landings in order to retain his qualifications. His total flying time amounted to 4,760 hours. Both pilots possessed valid airline transport pilot ratings.

After the conclusion of the first hearing in this case evidence was presented in the form of a toxicologist's report following an incomplete autopsy by Queen County, New York, medical officials to the effect that three-plus ethyl alcohol⁷ content was found in Captain Davidson's liver, one-plus ethyl alcohol was in First Officer Zundel's brain, and one-plus ethyl alcohol was in the liver of Henry Hickey, one of the mechanics aboard the aircraft. Accordingly, further investigation was conducted to determine the applicability of the toxicologist's report, and a second hearing was held.

Alpha was equipped with alcohol deicer tanks with a total capacity of 20 gallons, and it was normal practice to keep these tanks full. The 4-gallon propeller deicing tank located behind the first pilot seat was punctured in the accident, and it contained no deicer fluid when removed from the aircraft after salvage. The 6-gallon windshield deicer tank located approximately two feet aft of the bulkhead immediately behind the second pilot seat was also punctured, and the attaching lines were torn loose. This tank also contained no deicer fluid when removed from the aircraft. The 10-gallon rubber carburetor deicing tank located approximately 3 feet aft of the windshield tank contained deicing fluid after salvage, but this fluid was drained out on the ground during dismantling operations, therefore, analysis of the fluid was not possible.

The aircraft was manufactured for the Army at Long Beach, California, on February 15, 1944, and records indicate that it was outside the continental limits of the United States from March 11, 1944, until after September 20, 1945. The aircraft was purchased by American Airlines from the U. S. Government on

⁴Weight of Alpha at the time of take-off was 24,824 pounds

⁵See attached chart of flight path

⁶Experimental aircraft

⁷Grain alcohol

December 7, 1945, and during the course of the next two months it was modified for experimental use. During this modification the alcohol system was not changed nor were the alcohol tanks drained. Subsequent to its modification it was used as an experimental aircraft, and most of the flying was done by three pilots assigned to the Engineering Department of American Airlines. These three pilots stated that the deicer tanks were operated only in very rare instances, and then only in small quantities. American Airlines' personnel who accompanied the aircraft on trips away from company bases stated that as far as they knew no alcohol had been added to the tanks.

A month and a half prior to the date of manufacture of the aircraft, an Army Technical Order was issued calling for the use of isopropyl alcohol instead of ethyl alcohol as a deicing agent. In March 1945, isopropyl, the type of deicing agent also desired to be used by the company became available, and the Engineering Department issued a Materiel Specification calling for its use. An amendment was issued to this specification in October 1945, due to the fact that the type of deicing agent previously used and containing ethyl alcohol was still found to be on hand. The amendment stated that this deicing fluid should be used prior to the replenishment of deicing systems with isopropyl.

It is, therefore, entirely possible that ethyl alcohol was carried as a deicing agent rather than isopropyl, and according to expert medical testimony and tests⁸ ethyl alcohol may be absorbed by one involuntarily if present in the water when one is drowned.

DISCUSSION

Since ethyl alcohol may have been carried as a deicing agent in the aircraft, and since ethyl alcohol found in the bodies of the two pilots and the mechanic during the autopsy may have been the result of involuntary intake when they were drowned in the aircraft, no conclusion as to intoxication can be based upon the evidence of the toxicologist's report. All other evidence concerning the habits and behavior of the two pilots and the

mechanic was to the effect that they reported for duty in a normal and sober condition, and that no use was made of intoxicating liquors any time during the day of this flight. It is, therefore, concluded that they were not under the effect of intoxicating liquors.

Conditions of limited visibility, and single engine operation undoubtedly contributed to the pilot's making too high an approach to runway 22 for his first attempted landing. The normal tendency of a pilot under such circumstances would have been to maintain a safe margin of altitude. It is probable that the airport became visible to Captain Davidson only after he had approached too close to make a normal descent and land. The fact that the right propeller was not feathered during the first approach did not contribute to his inability to make a normal landing, for the drag of the unfeathered propeller would have been about the same as it would have been during any normal power-off approach.

Captain Davidson's reluctance to abandon the landing until after he had progressed over two-thirds of the length of the runway exaggerated the critical single engine flight condition. Considerable air speed and altitude had been lost in the landing attempt, and the extended landing gear flaps increased drag, requiring additional power for the maintenance of single engine control speed. In addition to all these unfavorable circumstances the pilot was confronted with conditions of limited visibility and the necessity of executing a climbing turn without the benefit of a "run" over the field to accelerate to a higher air speed.

Once the wheels were retracted there was a chance of completing the "go around" for the second landing. But, the turn was too close to the field, and the angle of attack too high. As a result, no additional air speed was gained. When the gear was again lowered during the last turn on the landing approach, sufficient drag was induced to reduce the air speed below the minimum necessary for controlling the airplane, and it stalled, crashing into Bowery Bay. A factor which may have added to Captain Davidson's and First Officer Zundel's difficulty was that they were not informed that the calibrated air speed in this airplane was the same as the

⁸A test was conducted by making an analysis of the alcoholic content of the liver and brain of rats that had been drowned in a solution of ethyl alcohol and water

indicated air speed. Therefore, they may have believed that this airplane, as in other DC-3 aircraft, had a six miles per hour greater air speed than that which was indicated on the instrument. An additional factor may have been that the flat plate drag of Alpha, as explained above, was greater than that in other DC-3s.

There is little question that full take-off power was available from the left engine. This engine was heard to be operating normally at the time the aircraft was over the field, and the engine when placed on a test stand indicated that it had been operating normally during the single engine flight.

The corrosion found at the position of the gasket break on the cover plate flange, and the engine mounting flange showed that the gasket was broken prior to the time the engine was submerged in the salt water. The fact that normal oil pressure in the engine was developed during the pre-flight check and during engine operation until the flight became airborne, would indicate that the gasket was intact at the time it was installed, and that it failed only after the aircraft had taken off. However, the impression left in the gasket by the edge of the cover plate, which was not parallel to the edge of the gasket, would indicate that it was broken at the time that the cover plate was bolted into position. Accordingly, no determination has been made as to when the gasket failed.

Findings

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

1. The crew was properly certificated and physically qualified and able to perform their duties in a normal manner.

2. At the time of take-off the airplane was properly certificated and in

an airworthy condition with the exception as hereinafter stated.

3. Total weight of the aircraft was less than the maximum allowable and the load was properly distributed with respect to the center of gravity.

4. The oil screen cover plate gasket on the right engine was either fractured when installed immediately prior to the flight of August 8, 1947, or failed during the initial part of that flight.

5. As a result of the fractured oil screen cover plate gasket, oil pressure for the right engine dropped below normal, and the crew feathered the right propeller.

6. Visibility in the immediate vicinity of LaGuardia Airport at the time of the accident was reduced to one and three-fourths miles.

7. The left engine operated normally during the entire course of the flight.

8. Insufficient air speed was maintained in a landing approach to runway 13 at the LaGuardia Airport, after an attempted landing and "go around" had been made on runway 22, and as a result the airplane stalled and crashed into Bowery Bay.

Probable Cause

The Board determines that the probable cause of this accident was that, following an attempted landing, a miss-approach procedure was attempted for a second landing without sufficient air speed for single engine operation.

BY THE CIVIL AERONAUTICS BOARD

/s/ JOSEPH J O'CONNELL, JR

/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 received notification of the accident at 1855, August 8, 1947, and immediately initiated an investigation in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. An Air Safety Investigator of the Board's New York Office arrived at the scene of the accident about 1/2 hour after the accident and was later assisted in the investigation by other members of the Safety Bureau's staff. A public hearing was ordered held in New York, New York, August 26 and 27, 1947. A subsequent hearing was ordered and held in New York, New York, September 30, October 1 and 2, 1947, in order to receive additional evidence.

Air Carrier

American Airlines, Incorporated, operates under the laws of the State of Delaware and maintains its general offices in New York. At the time of the accident American Airlines, Incorporated, was operating under a currently effective Certificate of Public Convenience and Necessity and an Air Carrier Operating Certificate, both issued pursuant to the Civil Aeronautics Act of 1938, as amended.

Flight Personnel

Captain William Alexander Davidson, age 32, of Wantagh, Long Island, New York, possessed a valid airline transport pilot rating and until the date of the

accident had accumulated a total of 4,934 hours flying time. He had accumulated approximately 2,000 hours flying time in a Model DC-3 aircraft of which 152 hours had been obtained in the last 60 days. First Officer Walter Richard Zundel, age 28, of Jackson Heights, New York, possessed a valid airline transport pilot rating and until the date of the accident had accumulated a total of 4,760 hours flying time. He had accumulated approximately 1,500 hours flying time in Model DC-3 aircraft, and his most recent time had been obtained in June, 1947, when three take-offs and landings had been made. Both pilots were properly certificated and qualified for their respective duties.

The Aircraft

The Douglas DC-3C, NX-88787, was operated and registered in the name of American Airlines, Incorporated. The aircraft had accumulated a total of 2,035 hours since its manufacture February 15, 1944. It was equipped with two Pratt and Whitney S1C3G engines on which Hamilton Standard propellers were installed. The left engine had been operated a total of 4,265 hours and had accumulated 185 hours since overhaul. The right engine had been operated a total of 4,747 hours and had accumulated 84 hours since overhaul. At the time of departure the aircraft weighed 376 pounds less than the maximum allowable gross weight of 25,200 pounds and the load was distributed with respect to the center of gravity within approved limits.

