

CIVIL AERONAUTICS BOARD  
ACCIDENT INVESTIGATION REPORTAdopted: June 25, 1951Released: June 27, 1951NATIONAL AIRLINES, INC., WASHINGTON NATIONAL AIRPORT, WASHINGTON, D. C.,  
OCTOBER 2, 1950The Accident

A National Airlines' cargo flight, a C-46 aircraft, N-1661M, landed with landing gear retracted on Runway 15 at the Washington National Airport, Washington, D. C., at 2353<sup>1/</sup>, October 2, 1950. Neither of the two crew members, the only occupants on board, was injured; but the aircraft was substantially damaged.

History of the Flight

The flight departed the Newark Airport, Newark, New Jersey, at 2240, October 2, 1950, VFR (Visual Flight Rules) for Washington, D. C. Thomas Sutor, the captain, was seated on the right or copilot's side of the cockpit; and Robert Denton, the copilot, was seated on the left or captain's side. On board were 14,892 pounds of cargo, 2,780 pounds of fuel, and 260 pounds of oil, which, in addition to the weight of the crew and their baggage of 390 pounds, resulted in a gross aircraft weight at the time of take-off of 47,190 pounds. All cargo was properly loaded and stowed so that the center of gravity of the aircraft was within the certificated limits, and the gross weight was well within the allowable limit of 48,000 pounds.

In accordance with the flight plan, the flight proceeded to Washington at an altitude of 6,000 feet, experiencing no difficulty en route. Over

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

Relay, which is a radio range intersection 31 miles northeast of the Washington National Airport, the flight was cleared by the control tower to enter the traffic pattern for landing on Runway 36. The wind was reported to be calm; visibility was 3 miles; and the sky was clear. A left traffic pattern was entered approximately  $1\frac{1}{2}$  miles northeast of the field at an altitude of 1,200 feet. From there the flight proceeded westerly so as to circle the Washington National Airport to the left for an approach to Runway 36. Just before passing over Hains Point,<sup>2/</sup> the BEFORE LANDING check was accomplished.<sup>2/</sup> The landing gear was extended; flaps were lowered one quarter; and air speed was reduced to between 130 and 135 miles per hour.

Immediately after the aircraft passed over Hains Point, at a point about one mile northeast of the approach end of Runway 18, the crew stated that fuel pressure for the right engine dropped to zero and the right engine lost power. Power settings for the left engine were immediately increased to the maximum for continuous operation, and the landing gear and flaps were retracted. Copilot Denton continued to fly the aircraft from the left side while Captain Sutor examined the cockpit with a flashlight to determine why the right engine had failed. His check included the fuel quantity and the position of the selector valve, and he testified that he found the booster pump in the high position, and the mixture control in full rich position.

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2/ See the attached chart, showing flight path.

3/ National Airlines check list contains under separate headings an IN RANGE check which is normally accomplished just before traffic is entered, and a BEFORE LANDING check which is normally accomplished before entering final approach for landing. Both of these checks were completed on this flight just before passing over Hains Point, according to the crew, to permit them to give full attention to Washington traffic.

However, no reason could be found in the cockpit for the engine failure and since the right engine did not restart, Captain Sutor feathered its propeller. By this time the aircraft had been flown beyond Runway 18, and since it seemed that altitude could not be maintained, a left turn was made for landing on Runway 15.

Contact with Runway 15 was made at its intersection with Runway 18. The aircraft slid on the bottom surfaces of the fuselage, engine nacelles, and landing gear doors, for a distance of 1,750 feet, then came to rest on the runway 660 feet from the end. There was no fire nor personal injuries, the only damage being that which resulted from the aircraft's sliding on the surface of the runway.

#### Investigation

An examination of the cockpit was made shortly after the accident. It was found that the wing flaps and landing gear controls were in the full "down" position. Throttles were retarded. Propeller pitch controls were full forward in the high RPM position. Both fuel valve selectors were in the "front" tank position. Ignition switches were on. Both fuel boost pump switches were off. The fuel mixture controls were forward in the "full rich" position.

An examination of the airplane showed that the landing flaps were extended, but that the landing gear had been retracted when contact was made with the runway. Retraction of the gear at time of landing was indicated by the runway damage to the bottom of the landing gear doors.

Damage to the right tail-wheel door indicated that it had been opened after the aircraft was on the runway and stopped; for the skin was buckled from the door being forced opened by hydraulic pressure against the runway surface, whereas the forward and bottom edges of the door were not scuffed as they would have been had the door been in the open position as the aircraft skidded on the runway.

All three tips of the left propeller were broken off by contact with the runway; and two tips of the right propeller, which had been feathered, were worn from rubbing on the runway. The underside surface of both engine nacelles, the skin on the bottom surfaces of the landing gear doors, the oil coolers, and the middle section of the fuselage were scuffed and torn from skidding on the concrete runway. Oil was leaking from the right engine oil cooler drain plug as a result of rubbing action on the runway.

An examination of markings on the runway surface showed that the fuselage touched ground at the southeast side of the intersection of Runways 15 and 18, and that immediately following the fuselage the left propeller struck the runway. There were no tire marks from the aircraft that could be identified. The propeller marks on the runway which started just a few feet from the intersection of Runways 15 and 18, which was where the crew stated they landed, substantiated the conclusion made from aircraft damage that the landing gear was not extended at the time of landing.

The aircraft was lifted, placed on its gear, then towed to a side of the airport where further examination and tests were conducted. Engine cowling was removed for an examination of the fuel system. No irregularities

were found in the carburetors, fuel pumps, fuel selector valves, fuel screens or in the fuel tank boost pumps. No leakage, or indication of stoppage in any of the lines or operating parts of the fuel system was found. A retraction test was later made of the landing gear. It operated normally.

A test was made of the booster pumps in the right and left front tanks. With the booster pump switch turned to the "low" position the right front booster pump developed 7.5 pounds and the left front 8 pounds. When the switch was placed in the "high" position the right front developed 16 pounds and the left 16.3 pounds. These quantities were within normal limits.

The right engine was started with the fuel boost pump on. No difficulty was experienced in starting, but the engine was operated only about 3 minutes at idling speed because of oil leakage from the cooler which had been damaged in the landing. With the booster pump turned off, the engine driven fuel pump developed 16 pounds pressure. This quantity was normal. The left engine was also started. It was necessary to remove the generator because of a defective brush assembly, but otherwise the engine was capable of normal operation.

All fuel tanks were pumped and then drained until dry. The following quantities were taken from each: Left front, 120 gallons; left center, 9 gallons; left rear, 2 gallons; right front, 93 gallons; right center, 9 gallons; and right rear, 5 gallons. According to the crew, both engines were operated during the entire flight from the front tanks.

After necessary repairs were made the aircraft was test flown. Repairs so far as the powerplants were involved consisted of replacing the oil coolers which had been damaged, and replacing the left generator. Other

repairs included the replacement of propellers, cowl flaps, and landing gear doors. The purpose of the test flight was to determine how the right engine would respond to various settings of the fuel system controls. For the purpose of the tests, 185 gallons of fuel were placed in each of the front tanks, 15 in the right center tank, and nine in the right rear tank. Approximately 160 gallons remained in each of the front tanks after the engine run-up was completed.

During the tests the aircraft was skidded, dived, climbed, and steeply banked in an attempt to unport the front tanks, and thereby cause engine stoppage. This could not be done even though the last attempt was made when only sixty gallons of fuel remained in the front tanks. Engines operated normally throughout all the tests regardless of tank selection or whether the booster pump was used. In one test the right engine fuel valve was turned off. Throttles and propellers remained at a cruise setting, and mixture in the full rich position. The propeller was permitted to windmill for three minutes, then the fuel selector valve for the right engine was turned to the right front tank. The engine did not start until the booster pump was turned to the "low" position after which fuel pressure increased to 17 pounds in two seconds, and the engine returned to normal operation within ten seconds. Other tests involved timing the restart of the engine after the fuel had either been turned off or a tank had been allowed to run dry. The longest period, using different combinations of fuel system control settings, was 15 seconds. Even with the booster pump off, only seven seconds were required to restart the right engine after turning the fuel off, and then turning it back on immediately after the engine stopped.

An examination of the flight records for Captain Sutor and Copilot

Denton <sup>4/</sup> showed that neither of them had flown the C-46 during the nine months preceding the accident. Neither had experienced single-engine operation in C-46 loaded to its limit of 48,000 pounds. However, the flight records showed that they had been requalified in the C-46 aircraft just before their departure from Miami to Newark, which was the flight they were returning from at the time of this accident. Their requalification consisted of three landings and takeoffs and a demonstration of their knowledge of emergency procedures, including single-engine operation.

#### Analysis

Certain portions of the crews' testimony appear to be inconsistent with the facts found during this investigation. Copilot Denton stated that the fuel pressure warning light came on at about the same time that the right engine lost power, and that the light remained on even after the booster pump switch was placed in the "high" position. The booster pumps in the front tanks when tested after the accident operated normally, developing 16 pounds pressure with the booster pump switch in the "high" position. Only 14 pounds pressure was required to turn the pressure warning light off. Therefore, if the booster pump switch had been in the "high" position, and if the fuel tank selectors had been turned to front tanks, all as stated by the crew, then the fuel pressure warning light would not have remained on. This would have been true even though the right engine may have lost power, and even if the right propeller had been feathered.

Secondly, the pilot stated that the landing gear control was placed in the down position during the final approach to landing, in which case the tail wheel would have had time to extend before the main gear. The normal sequence of retraction and extension of the landing gear system of the C-46

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<sup>4/</sup> For their complete flight history, see supplemental data.

type aircraft is for the tail gear to extend or retract ahead of the main gear. Therefore, when the aircraft in landing settled on its fuselage sliding along the runway, the tail gear would have been extended and would have contacted the runway with enough force to do damage to the tail wheel struts and retracting mechanism. Investigation at the scene proved that the tail gear was not extended and locked and there was no damage to the tail wheel retraction mechanism and struts; and later retraction tests proved that the entire landing gear system operated normally. The investigation also showed that the main landing gear doors had no damage to the forward edges when in the open position. The damage to these doors started 24 to 30 inches aft of the leading edges and 12 to 14 inches on either side indicating the doors were retracted. This damage consisting of dents and scraping of the metal was only in the direct line of flight. Since the forward and bottom edges of the main landing gear doors were not damaged by contact with the runway and the tail wheel mechanism was intact, it is concluded that the doors were closed, and the landing gear retracted when the aircraft first touched down on the runway, even though the landing gear control was found in the down position.

Thirdly, both crew members stated that neither altitude nor air speed could be maintained after they lost the power of the right engine. Their testimony continued to the effect that altitude and air speed were lost even though maximum continuous power was developed by the left engine, and even though the right propeller was feathered, and the landing gear and flaps retracted. At 46,170 pounds, a conservative estimate for the weight of the aircraft at the time of the accident, taking into account fuel consumed en route, the aircraft under the conditions existing at the time of the accident should have been able to climb at the rate of 240 feet a minute.



at an air speed of 130 miles per hour. This is based on the test data which is published in the CAA-approved Airplane Flight Manual for the C-46 type aircraft. In light of such test data, it is difficult to understand why neither altitude nor air speed could be maintained.

Giving credence to the crews' testimony where it is not in conflict with the physical facts found during the investigation, it appears that the following events occurred: One of the pilots inadvertently turned the fuel for the right engine off at the time that the IN RANGE and BEFORE LANDING checks were accomplished. This conclusion rests upon the fact that only this action would result in the nearly simultaneous loss of fuel pressure and power from the right engine. The conclusion is supported by the facts that a detailed examination of the engine and its fuel system disclosed no unsatisfactory condition, and that the engine was started and operated without difficulty after the accident and before any maintenance work was performed.

Then, after losing power from the right engine the crew retracted the landing gear and flaps. The flaps were extended for a second time during the final approach, but no attempt to extend the landing gear was made until after the aircraft was on the runway. This conclusion follows from the facts that the flaps were found extended, and that the bottom and forward edges of the landing gear doors, as explained above, showed that they were not open when the aircraft landed.

Finally, no attempt was made to fly the aircraft to a position where a normal approach and landing could be accomplished, for the test data in the CAA-approved Airplane Flight Manual shows that the aircraft could have

been safely flown on one engine under the conditions that existed at the time of this accident, and nothing was found wrong essential to the operation of either engine.

In conclusion, attention is directed to the fact that neither the pilot nor the copilot had recent experience in the aircraft except for the requalification flights and the trip which they made to Newark just before the accident. Undoubtedly, the crew's confusion, which is manifest in the events leading up to this accident, resulted in a large part from their lack of familiarity with the aircraft and their lack of knowledge of its performance.

#### Findings

1. The carrier, the aircraft, and the crew were all properly certificated.
2. At the time of the accident the aircraft, including all its components, was in an airworthy condition, and was operating normally.
3. Just before the flight entered Washington National Airport traffic, fuel for the right engine was probably inadvertently turned off by the crew.
4. The right engine lost power immediately after the aircraft had been flown into traffic after which the landing gear was retracted.
5. Poor judgment was manifested by the crew in that they made no attempt to fly the aircraft on one engine to a position where a normal approach and landing could be accomplished.
6. No attempt was made to extend the landing gear until after the aircraft was on the runway.
7. The physical facts of record indicate that no credence can be given the testimony of the crew with regard to the fuel pressure warning light and the position of the landing gear.

8. With the exception of a re-qualification flight and a flight to Newark made within four days before this accident, neither the pilot nor the copilot had flown the C-46 within the preceding nine months.

Probable Cause

The Board determines that the probable cause of this accident was the confusion of the crew because of lack of familiarity with the C-46 which resulted in a wheels-up landing half-way down the runway.

BY THE CIVIL AERONAUTICS BOARD:

/s/ OSWALD RYAN

/s/ JOSH LEE

/s/ JOSEPH P. ADAMS

/s/ CHAN GURNEY

Donald W. Nyrop, Chairman, did not participate in the adoption of this report.

## S U P P L E M E N T A L D A T A

### Investigation and Hearing

The Civil Aeronautics Board was notified of this accident at 1220, October 3, 1950, by CAA Communications. An investigation was immediately initiated 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 held at Coral Gables, Florida, November 7, 1950.

### Air Carrier

National Airlines, Inc., is a Florida corporation having its principal place of business at Miami, Florida. The company is engaged in the transportation by air of persons, property, and mail under certificates of public convenience and necessity issued by the Civil Aeronautics Board, and it operates in accordance with an air carrier operating certificate issued by the Civil Aeronautics Administration. The company also holds a non-scheduled air carrier operating certificate issued by the Civil Aeronautics Administration. The flight which was being made in this case from Newark to Miami was considered to be a non-scheduled flight and was provided for in the carrier's non-scheduled operating certificate.

### Flight Personnel

The pilot in command, Thomas M. Sutor, age 35, was employed by National Airlines on November 9, 1945. He was qualified as a captain in April of 1946. At the time of this accident he had a total of 4,820 hours of which 146 were in the C-46 type aircraft. Prior to the time of this accident, Captain Sutor had not flown the C-46 during the nine months preceding except for the re-qualification flights and the flight to Newark as described

above. He held a currently effective airman certificate with an airline transport pilot rating.

The copilot of this flight, Robert R. Denton, age 45, was employed by National Airlines, May 21, 1945. He was qualified as a captain by the company in October of 1946. Mr. Denton had a total of 7,817 flying hours of which 101 were in the C-46 type aircraft. Mr. Denton had not flown a C-46 for the nine months preceding the time of this accident except for the re-qualification flight and the flight to Newark as described in the body of the report. Mr. Denton held a currently effective airman certificate with an airline transport pilot rating.

#### The Aircraft

Aircraft N-1661M was a Curtiss Wright C-46 aircraft currently certificated by the Civil Aeronautics Administration. The aircraft had been leased by National Airlines from Air Forces. The Air Forces serial number was 45-22544. The aircraft was modified in July of 1950 so as to qualify for a gross weight limitation of 48,000 pounds. The historical records, maintenance records, and inspection forms for this aircraft were examined and no discrepancies material to this accident were found.

