SA-192 File No. 1-0069

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: February 9, 1950 Released February 10, 1950

STRATO-FREIGHT, INC, SAN JUAN, PUERTO RICO, JUNE 7, 1949

The Accident

At 0025,[1] June 7, 1949, a C-46A aircraft, NC-92857, owned and operated by Strato-Freight, Inc., a large irregular carrier, crash landed in the Atlantic Ocean, 6.4 statute miles west of Isla Grande Airport, San Juan, Puerto Rico. Of the 75 passengers and crew of six on board, 52 passengers and one crew member lost their lives. The aircraft sank.

History of the Flight

The aircraft had been flown from Newark, N. J., to San Juan, June 4, 1949, with a crew consisting of Captain Lee Howard Wakefield, and Copilots John Connell and George Cary, and Stewardess Judith Hale. No difficulties were experienced in the operation of the aircraft except that during the approach for the landing at San Juan, the flaps extended to the full down position when the cockpit control was placed in the 1/4 down position. Captain Wakefield had been previously advised at Newark that the follow-up cable, which controls the extension of the flaps, was frayed.

During the time that the aircraft was on the ground at San Juan, the flap follow-up cable was replaced, and both engines were checked. Since the right engine misfired during the check, 13 new AC-LS-87 spark plugs were installed. After the completion of this work the aircraft was declared to be airworthy for the return trip to Newark by a certificated mechanic employed by the aircraft repair agency in San Juan which accomplished turnaround maintenance for Strato-Freight, Inc.

Shortly before midnight, June 6, seventy-five passengers, including five infants in arms and 14 children between the ages of two and 12, boarded the aircraft. There was also placed on board 1,116 pounds of baggage, and according to the Weight and Balance Manifest there was 7,125 pounds of fuel and oil on board. With the addition of a third pilot, Alfred Cockrill, and a Steward, Ismael Gonzalez, the crew for the northbound flight was the same as that of the flight of June 4 and 5 to San Juan.

According to the crew, all occupants in the cabin were seated at the time of takeoff and had available safety belts. However, there were only 65 seats in the cabin which necessitated seating some of the passengers double in one seat. Although the Weight and Balance Manifest for the flight indicated a total weight of 44,500 pounds, the aircraft actually weighed 48,709 pounds, which was 3,709 pounds in excess of the 45,000 pounds certificated aircraft weight.[2]

At approximately 0010 with Alfred Cockrill acting as pilot, and John Connell as copilot, the aircraft taxied to Runway 27 where the "pre-takeoff check" was accomplished at which time engines and flight controls operated normally. Takeoff was accomplished at 0021 after the San Juan Tower had transmitted an instrument clearance to the flight authorizing it to cruise at 8,500 feet to Miami. The ceiling at San Juan was reported to be 2,500 feet, visibility, 12 miles, and the wind, calm. One minute after the aircraft left the ground, and at an indicated air speed of approximately 115 miles per hour and at an indicated altitude of 250 feet, the right engine began to backfire severely and lose power. No attempt was made to feather the propeller of the right engine. An emergency was declared, and the tower cleared the flight to land on Runway 9. But, since air speed was low and altitude could not be maintained, the aircraft was flown straight ahead for a crash landing 200 yards off the shore at Punta Salinas.

[1] All times referred to herein are Atlantic Standard Time and based on the 24-hour clock.

[2] See Appendices I and II

Immediately before impact with the water the landing lights were extended.

During a six minute period that the aircraft remained afloat the crew pushed two uninflated life rafts into the water and furnished several passengers with life preservers. Considerable confusion existed during the ditching operation since none of the passengers had received any instruction in the location or use of emergency equipment. Of the 81 occupants, only 23 passengers and five crew members survived.

Investigation

The wreckage was located on the ocean floor the morning of June 7, 1949, and salvage operations were begun. Ocean tides, currents, salt water corrosion, and salvage operations resulted in extensive damage to the aircraft. The engines, propellers and lower front fuselage structure were torn loose at the time of impact with the water. The center section was recovered with landing gear and wing panels attached. The entire forward section of the fuselage, which included the cockpit, was found intact However, the floor of the fuselage had been broken badly which resulted in the center row of seats becoming detached. The tail section was also recovered intact.

Although the crew stated that the aircraft performed as if the right flap were extended, examination of the wreckage showed definitely that all the flaps were retracted at the time of impact. In addition to this, the actuating mechanism itself was found to be retracted. Furthermore, the flap indices in the cockpit were found in the "flaps up" position, and the hydraulic control mechanism when bench checked operated normally. Both landing gears were also found retracted. The landing lights were found in extended position.

Both engines with propellers attached had been torn loose from their mounts at the time of impact. Damage to the left engine was confined to salt water corrosion and external scuffing. All parts in this engine showed that they had been in good operating condition prior to impact, with the exception of too much clearance in some of the spark plug electrodes. Of the 36 spark plugs installed in this engine 18 were type AC-LS-87. No evidence was found which could have resulted in a power failure, and this fact supported the crew's statement that the left engine had developed substantial power during the short period of flight.

The right engine and propeller had been damaged by salt water and external scuffing similar to the left. However, the disassembly of this engine disclosed First, that the neoprene adapter sleeve for the carburetor and the carburetor air intake screen were covered with a heavy carbon deposit, and second, that 30 of the 36 spark plugs were type AC-LS-87 spark plugs which were not approved by the manufacturer of the spark plugs, the manufacturer of the engines, or by the U. S. Air Forces[3] for use in the engines which were installed in this aircraft. Furthermore, the spark plug terminals for this engine were found to be oily and dirty and spark plug electrodes were found to have too much clearance.

Of particular significance was the fact that the center electrodes in both spark plugs from the No 4 cylinder of the right engine were found badly burned. The center electrode of the rear plug had fused with the outer electrode, and the center electrode of the front plug had burned out flush with the porcelain. In addition, the porcelain in six of the other plugs was found chipped or cracked.

The ignition switch for the right engine was found set on the left magneto position which would have permitted if so set during flight, only the rear spark plugs to fire. A further examination of all spark plugs in the right engine showed that the rear plugs sustained excessive heat damage while all front plugs, excepting the one in the No. 4 cylinder, showed no evidence of heat

On April 11, 1949, the aircraft was inspected by the Civil Aeronautics Administration and the following emergency equipment was on board the aircraft at that time Six 10-man and one 15-man life rafts and 80 life jackets. Strato-Freight, Inc., stated that at the time of takeoff from San Juan there were ten 6-man life rafts and three 7-man rafts and 81 life jackets.

Analysis

AC-LS-87 type spark plugs are not approved by the manufacturer of the spark

[3] A U S. Air Forces Technical Order in effect at the time of the accident prohibited the use of the AC-LS-87 spark plug in Pratt and Whitney R-2800 engines

plugs, the manufacturer of the engines, or by the U. S. Air Forces for the type of engines which were installed in this aircraft because the combustion chamber temperatures and pressures in such engines are too high for the satisfactory operation of this plug. In this instance, the rear spark plug in the No. 4 cylinder of the right engine operated at such a high temperature that the center electrode fused with the outer electrode. A contributing cause to this plug attaining such a high temperature may have been the operation of the engine on only the rear set of spark plugs. As previously stated, this was indicated by the position of the magneto switch which was found in the "Left" position, and by the fact that the front set of plugs showed no evidence of heat, while all the rear showed signs of excessive heat.

The operation of a spark plug at a temperature high enough to fuse its electrodes would result in preignition. Preignition in turn would cause backfiring through the induction system. That severe backfiring occurred in this instance is evidenced not only by the observations of the crew, but also by the carbon deposits found on the neoprene adapter sleeve and the carburetor air intake screen. Since severe backfiring destroys a proper fuel-air mixture, it would result in complete loss of power if sustained. All evidence found in the disassembly of the right engine indicates that this happened during this flight.

Following the failure of the right engine, the aircraft failed to remain airborne despite the fact that the left engine was apparently developing full power, because the aircraft did not have single engine climb speed and its gross load was 3,709 pounds more than the certificated weight. Other factors contributed to this lack of single engine performance the right propeller was not feathered, and the right cowl flaps were fully opened and the landing lights were extended, all of which would materially increase the parasitic and interference drag, further reducing the possibility of the aircraft remaining airborne under these conditions.

As a result of this accident, and because of previous violations, the Civil Aeronautics Board by an initial decision issued October 27, 1949, Docket No. SR-2073, which became effective November 8, 1949, revoked the air carrier operating certificate of Strato-Freight, Inc. Also as a result of this accident and previous violations, the Civil Aeronautics Board by order issued January 26, 1950, Docket No. SR-2074, revoked the pilot certificate of Lee Howard Wakefield, effective February 5, 1950, for a period of six months.

Captain Wakefield was designated as captain in command of the flight of June 7, 1949, and signed all the aircraft papers for the flight, however, he was riding in the passenger cabin and entered the cockpit when the right engine began to backfire on the takeoff. During the course of the hearing held in San Juan, June 21, 1949, in connection with the investigation of the accident, Captain Wakefield stated under oath that he was in command of the flight (Transcript p. 90, SA-192), however, during the course of the hearing held September 12, 1949, on the complaint seeking the suspension or revocation of his pilot certificate, while again under oath he denied that he was the pilot in command (Transcript p. 441, SR-2074).

Findings

1. The aircraft, carrier and crew were properly certificated.

2. One minute following takeoff the right engine began to backfire and lose power.

3. The aircraft failed to maintain altitude and crash landed in the sea, 6 4 statute miles west of the Isla Grande Airport.

4. At the time of the crash landing the wheels and flaps were in the retracted position, however, the right cowl flaps were fully open, the landing lights were extended, and the right propeller was not feathered, all of which reduced the air speed.

5. At takeoff the gross weight of the aircraft exceeded by 3,709 pounds its certificated takeoff weight.

6. Thirty of the thirty-six spark plugs installed in the right engine were not approved by the manufacturer of the spark plug, by the manufacturer of the engines, or by the U. S. Air Forces.

7. The magneto switch for the right engine was found set to the "Left" position which fires the rear spark plugs only.

8. All of the rear row of spark plugs in the right engine showed evidence of excessive heat.

9. The center electrode of the rear spark plug of the No. 4 cylinder had fused with the outer electrode.

10 The front row of spark plugs showed no evidence of high temperatures with the exception of the one in the No. 4 cylinder which had burned out flush with the porcelain.

11. Heavy deposits of carbon were found on the neoprene adapter sleeve and the carburetor air intake screen of the right engine, an indication of severe backfiring.

Probable Cause

The Board determines that the probable cause of this accident was the loss of power of the right engine before the aircraft attained the optimum single engine climb speed which, together with the overloaded condition of the aircraft, resulted in it losing altitude and settling into the sea.

BY THE CIVIL AERONAUTICS BOARD

/s/ JOSEPH J. O'CONNELL, JR
/s/ OSWALD RYAN
/s/ JOSH LEE
/s/ RUSSELL B ADAMS

Harold A. Jones, Member of the Board, did not participate in the adoption of this report.

Supplemental Data

Investigation and Hearing

The Civil Aeronautics Board was notified of the accident at 0345 EST, June 7, 1949, at Atlanta, Ga. Personnel from the Miami office were dispatched immediately to the scene of the accident arriving at 1400 AST, June 7, 1949, and 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 was held in San Juan, Puerto Rico, June 21, 22, 23, 1949.

Air Carrier

Strato-Freight, Inc , was incorporated under the laws of the State of New Jersey, January 1947, with its principal place of business at Bradley Field, Windsor Locks, Conn. This company held a non-scheduled air carrier operating certificate No. 1-560, with Letter of Registration No. 91 as a Large Irregular Carrier, issued by the Civil Aeronautics Board, July 8, 1947

Flight Personnel

Captain Lee Howard Wakefield had been employed continuously by Strato-Freight, Inc , since March 1949. He held a valid airman certificate with an Airline Transport Pilot Rating. He had accumulated a total of 6,000 hours of which 5,000 hours were obtained in multi-engine equipment Captain Alfred Cockrill had been employed continuously by Strato-Freight, Inc , since January 1947, and at the time of the accident was chief pilot and vice-president of the company. He held a valid airman certificate with an Airline Transport Pilot Rating and had accumulated a total of 6,400 hours of which 3,200 hours were in multi-engine equipment including 1,400 in C-46 type aircraft. Copilot John Patrick Connell had been employed continuously by Strato-Freight, Inc., since April 1949. He held a valid airman certificate with a commercial and instrument rating He had accumulated a total of 3,860 hours of which 2,000 had been obtained in C-46 type aircraft Copilot George Stone Cary had been employed continuously by Strato-Freight, Inc., since April 1949. He held a valid airman certificate with a commercial and instrument rating He had accumulated a total of 4,850 hours, of which 500 had been in multi-engine equipment and 140 hours in C-46 type aircraft.

The Aircraft

NC-92857, a Curtiss Wright C-46A-50 Modified D aircraft, was purchased by Strato-Freight, Inc., from War Assets Administration, December 30, 1947. The original airworthiness certificate was issued April 12, 1948, and the last annual inspection was accomplished May 11, 1949. Total aircraft time on the date of the accident was 2,002 hours It was equipped with three crew and 65 passenger seats, all of which had safety belts An inspection report dated April 11, 1949, by CAA, showed that there were six 10-man and one 15-man life rafts aboard, and 80 life jackets. The engines were Pratt and Whitney R-2800-51 type engines equipped with Curtiss Electric Propellers, Hub Model C-5435-C2. The right engine was installed March 27, 1949, and had a total of 321 hours since overhaul, of which 49 hours had been acquired since the last 100-hour inspection The left engine was installed April 30, 1949, and had a total of 144 hours since overhaul, of which 49 hours had been acquired since the last 100-hour inspection.

APPENDIX I

Aircraft Weight as Computed by Strato-Freight, Inc.

	Pounds	
Basic weight	30,178	(includes 70 gallons oil, two crew and all emergency equipment)
Two crew	275	
1,050 gallons gasoline (1,100 less 50 for warm up)	6,300	
Operating weight	36,753	
Traffic weight	7,747	(includes passengers, baggage and two crew)
Total gross	44,500	
Allowable gross	45,000	

APPENDIX II

Aircraft Weight Computed by Civil Aeronautics Board

	Pounds
Basic weight	30,178
70 gallons oil	525
1,256 gallons gasoline	[1] 7,536
Six crew	950
Additional emergency equipment (not included in basic weight)	197
Operating weight	39,386
Traffic weight	[2] 9,323
Total gross	48,709
Allowable gross	45,000
Overload	3,709

---

[1] CAA Aircraft Specification A-772 for this aircraft lists the following fuel capacities

(1) 2 front tanks, 472 gallons usable fuel

(2) 2 center tanks, 584 gallons usable fuel

(3) 2 rear tanks 350 gallons usable fuel

Exhibit 56b, the statement of the aircraft fueler states that the two front and two center tanks were filled to the filler necks and 125 gallons each were placed in the two rear tanks Allowing 50 gallons for run-up, there were, therefore, 1,256 gallons or 7,536 pounds of gasoline aboard the aircraft at takeoff

[2] Includes passenger and baggage weight. Passenger weight estimated from statements of survivors and relatives of deceased Baggage weight (1,118) same as on original weight and balance as there was no reliable basis for estimating actual weight