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File

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted. November 24, 1948

Released: November 26, 1948

SLICK AIRWAYS, INC.—NEAR PORT COLUMBUS AIRPORT, COLUMBUS, OHIO—
MAY 16, 1948

The Accident

At approximately 2042, May 16, 1948, a Curtiss-Wright C46-E, aircraft NC-59489, owned and operated by Slick Airways, Inc., an air freight carrier, crashed near the Port Columbus Airport, Columbus, Ohio. The only occupants, a crew of two, were fatally injured. The aircraft was destroyed.

History of the Flight

The flight departed from Newark, New Jersey, at 1733 May 16, 1948, for Chicago, Illinois, Denver, Colorado, Burbank, and San Francisco, California. In addition to a crew consisting of Captain William R. McCauley and Copilot Jack R. Foote, the flight carried 5,280 pounds of fuel, and 10,263 pounds of cargo. According to the hourly weather reports available to the crew in Newark prior to departure, thunderstorm activity which existed over the vicinity of Goshen and Fort Wayne, Indiana, was moving eastward. Chicago Municipal Airport was reported to have a ceiling of 2,000 feet. The flight plan specified a cruising altitude of 4,000 feet to Chicago, the first intended point of landing. South Bend, Indiana, was designated as the alternate airport.

No unusual incident was reported for approximately the first two hours of the trip, then, at 1931 the flight reported over Cleveland, Ohio, at 4,000 feet, stating that there was extreme turbulence approximately five miles east of the Cleveland Airport. At this time the flight acknowledged receipt of a weather report from Toledo, Ohio, to the effect that light thunderstorms with cloud to cloud lightning were moving northeasterly from Toledo.

At 2013 the flight reported at 4,000 feet over Mansfield, Ohio, 58 miles south

southwest of Cleveland. The crew stated that they had changed course to the south to avoid thunderstorms, and intended to proceed to Columbus, Ohio, in accordance with visual flight rules. A special weather observation taken at Cleveland at 2003 which reported a ceiling of 2,000 feet, visibility 10 miles, light rain, wind from the northwest at 30 miles per hour with strong gusts, and cloud to cloud and cloud to ground lightning was transmitted to the flight. Cleveland Radio also transmitted a weather observation taken at Columbus at 1930 which reported an unlimited ceiling, visibility of 15 miles, and wind from the south at 14 miles per hour. After acknowledging receipt of this weather information, the flight stated "For your information advise no one to go through the turbulence we just went through."

The next position report was received at 2032 at which time the flight reported being five miles north of Columbus. Following this report it was cleared by Columbus Tower for landing. In reply the flight stated to the tower, "We are declaring an emergency. Our rudder is locked, and I don't think we will have any directional control on the ground." A landing approach was made for runway twenty-three, 4,490 feet long. Information concerning wind direction and velocity was transmitted repeatedly by the tower to the flight throughout the course of the approach.

Although the first touchdown on runway 23 appeared normal, power was immediately applied and the aircraft took off. The crew then informed the tower that they wished to land directly into the wind, which at that time was from the south at five to ten miles per hour. They were accordingly cleared to land on runway eighteen, 3,580 feet long. The second approach appeared normal, and a touchdown was made on the runway without

*All times referred to herein are Eastern Standard and based on the 24-hour clock.

any apparent difficulty, but power was again applied and the flight took off again. When the flight reached a point $2\frac{1}{2}$ miles east of the field in its left circle of the field, it was observed to spin to the ground. Flames were observed immediately after the crash.

Investigation

No evidence was found of the aircraft striking the tops of any trees, except those in the immediate area of the crash. The limbs and bark of trees where the airplane crashed were broken straight downward which indicated that, although the horizontal axis of the airplane may have approximated level flight, it still descended almost vertically. Fire which occurred in the left wing immediately after impact, due to a ruptured fuel tank, did considerable damage to the left wing and the left side of the fuselage.

The fuselage was broken into three sections aft of the trailing edge of the wing and forward of the rear cargo bulkhead with an approximate six-foot separation at each break. The nose and cockpit portions of the fuselage were completely crushed by impact and forward movement of cargo.

The wings and horizontal tail members were still attached to their fuselage sections. The leading edge of the left wing and the trailing edge of the right wing were damaged by contact with the trees, which indicated that the aircraft had a clockwise spinning motion at the time of impact. The right horizontal stabilizer had tears from the trailing edge forward due to damage from trees which also indicated a clockwise movement.

The fin and rudder, attached to each other, were free of the fuselage and lying a few feet to the rear on their right sides. The rudder was torn in two from the trailing edge forward, and the tear extended approximately 18 inches into the vertical fin. This tear had been made by a large tree, and was perpendicular to the sides of the fin and rudder, indicating that these surfaces were leaning over to the right side approximately parallel to the right horizontal stabilizer at impact. An examination of the fuselage structure beneath the fin showed that the fuselage skin had separated on the left side just beneath the fuselage attachment angle, and the fuselage skin on the right side had separated at approximately the midpoint of the fuselage height.

Both engines were broken from their mounts and partially buried in the ground. The propellers were damaged in such a manner as to indicate that power was not being applied at impact. The ignition master switch was in the "off" position. Although the landing gears were found in a semiretracted position, it could not be determined whether they were being extended or retracted at the time of impact. The trim tab indicators were found with settings, ailerons one degree right wing down, elevators two degrees nose down, and rudder 15 degrees right.

The turbulence encountered by the flight east and south of Cleveland, was caused by a squall line that had formed in northern Ohio and lower Michigan and had moved southeastward. The Chicago weather forecast for northern Indiana, lower Michigan, and northern Ohio, issued at 1630, May 16, 1948, and available for transmission at 1638, indicated cumulonimbus clouds and thunder-squalls with moderate to heavy turbulence in the thunderstorms throughout the area. Other flights in this area between 1800 and 1900 reported severe turbulence. One scheduled flight made the following report to its company radio at 1853: "We advise to use extreme caution at the squall line around Sandusky (53 miles west of Cleveland). It is so bad it looks like it might be a tornado. Turbulence terrific." Although this report was acknowledged by the company radio at Chicago, Detroit, and Cleveland, there was no evidence that this information was forwarded either to Air Route Traffic Control or to the Weather Bureau.

When the aircraft departed from Newark, it was loaded 3 4 inches aft of the rearward certificated limit. However, this loading aft of the rearward certificated value was not enough to affect the design loads on the vertical tail surfaces.

On June 18, 1943, the C46 airplane vertical tail structure was static-tested by Curtiss-Wright for designed ultimate loads resulting from 30 feet per second gusts at air speeds of 240 miles per hour, and satisfactorily withstood a load which was 100 percent of the designed ultimate.

Discussion

The vertical fin of the C46-E airplane is attached to the fuselage by bolting the fin attachment angles to the fuselage attachment angles. In the fuselage

structure beneath the fin are 10 semi-bulkhead frames which preserve the shape of the fuselage and aid in the support of the vertical fin. These frames are circular in shape except that immediately under the fin there is a reverse curve where the frames extend upward to a short vertical section. Across the top of the frames a flat sheet is riveted to maintain their positions and rigidity.

In this case it was found that rivets connecting the skin of the fuselage to the vertical portion of the frames had failed due to an upward shearing force. Below, on the reverse curve portion of the frames, the rivets had failed due to an outward pulling force of the fuselage skin. The frames lost their rigidity when the fuselage skin separated from them, and were thus unable to aid in any support of the fin. Since the fin was then attached only to the skin of the fuselage, it was free to rock from right to left across the longitudinal axis of the airplane. As was evidenced by the marks and abrasions on the top of the tail cone and the bottom surfaces of the fin and rudder, the fin continued to rock from right to left until the rudder became jammed against the top of the tail cone portion of the fuselage. As a result, use of the rudder was lost. The rocking motion of the fin together with the air load thus imposed on the structure resulted in the fuselage skin breaking, as previously described, below the attachment angle. During the third attempted approach for landing the failure of the fuselage structure beneath the fin had progressed to the point where control of the airplane was no longer possible.

In the light of the flight's report to Cleveland Radio, that "For your information, advise no one to go through the turbulence we just went through," there can be little doubt that the aircraft had been flown through an area of extreme turbulence. Loads imposed upon the structure at that time may well have been in excess of its designed ultimate strength, thus causing the failure of rivets. This

failure permitted the skin to separate from the fuselage frames, and the progressive failure occurred as described.

The Bureau of Safety Investigation has no record of other instances of failure of the tail structure of the C46 airplane. However, the manufacturer has recommended reinforcement of the skin and fuselage semi-bulkhead frames beneath the vertical fin. Slick Airways, one of the principal operators of this type of aircraft, has complied with this recommendation.

Findings

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

- 1 The aircraft, crew, and carrier were properly certificated.
- 2 There was no mechanical malfunctioning of the engines or structural failure of the aircraft, except as described below.
- 3 The aircraft was flown through severe turbulence approximately one-half hour before the accident.
- 4 The rivets and fuselage skin immediately beneath the vertical fin failed during flight.
- 5 The separation of the fuselage skin allowed the vertical fin to rock across its longitudinal axis until the fuselage carry-in structure beneath the fin failed completely.
- 6 The failure of the vertical fin caused loss of control of the aircraft, and it crashed.

Probable Cause

The Board determines that the probable cause of this accident was the in-flight failure of the fuselage carry-in structure beneath the fin, due to extreme turbulence.

BY THE CIVIL AERONAUTICS BOARD

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

Supplemental Data

Investigation and Hearing

The Civil Aeronautics Board received notification of the accident through the Civil Aeronautics Administration Communication Station at Romulus, Michigan, at 2220 on May 16, 1948. Investigation was begun immediately in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. As a part of the investigation a hearing was held June 16, 1948, at Chicago, Illinois.

Air Carrier

Slick Airways, Inc, was incorporated under the laws of the State of Delaware. The company is a non-certificated cargo carrier operating under a temporary letter of registration from the Civil Aeronautics Board.

Flight Personnel

Captain William R. McCauley, age 31,

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was employed by Slick Airways June 10, 1948. He held a valid airline transport rating. He had a total of 2,580 hours, of which 600 were in the C46 airplane. Copilot Jack R. Foote was employed by Slick Airways August 19, 1946. He had logged approximately 4,675 hours, of which 1,354 were in C46 aircraft. He held a valid airline transport rating.

Aircraft

NC-59489 was a C46-E Curtiss-Wright aircraft. It was manufactured July 14, 1945, and had been flown a total of 5,641 hours. The left engine had a total of 516 hours since the last overhaul, and the right engine 597 hours. All records pertaining to the maintenance of the aircraft were examined and found to be complete and indicated that the aircraft was airworthy.

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