FOR IMMEDIATE USE

DEPARTMENT OF COMMERCE
WASHINGTON

May 5, 1937.

Secretary Roper today made public the report of the Accident Board of the Bureau of Air Commerce in connection with the fatal air line accident near Clifton, Pennsylvania, on March 25, 1937. The report is as follows:

REPORT OF THE ACCIDENT BOARD

Statement of probable cause concerning an accident which occurred to an aircraft of Transcontinental and Western Air, Incorporated, near Clifton, Pennsylvania, on March 25, 1937

To the Secretary of Commerce:

On March 25, 1937, at about 6:40 p.m., at a point near Clifton, Pennsylvania, approximately seven miles west-southwest of the Allegheny County Municipal Airport, Pittsburgh, an airplane of United States registry, while being operated in scheduled interstate operation carrying mail, passengers and express, met with an accident which resulted in death to all persons on board and the complete destruction of the aircraft.

The pilot, F. L. Bohnet, held a Federal transport pilot's license and a scheduled air transport rating. His latest physical examination, taken on September 25, 1936, showed him to be in good physical condition. His license and rating were renewed on September 30, 1936. The co-pilot, H. E. Warwick, held a Federal transport pilot's license and a scheduled air transport rating. His latest physical examination, taken on October 5, 1936, showed him to be in good physical condition and his license and rating were renewed on October 16, 1936. The third member of the crew was Stewardess Doris Hammons. Passengers on board were as follows:

E. J. Fleming Kansas City, Missouri	Miss Mary Black New York, N. Y.
C. R. Lewers Kansas City, Missouri	Miss Frances Reed New York, N. Y.
H. Herman Elmhurst, Illinois	H. Haxli Chicago, Illinois

E. Brazelton,
Elmhurst, Illinois

Frederick Lehman
Harrisburg, Pa.

E. G. Neill
Minneapolis, Minn.

Miss Pauline Trask
Germantown, Pa.

The airplane, a Douglas, model DC-2, was inspected and approved for renewal of license by the Bureau of Air Commerce on September 14, 1936, and bore Federal license number NC-13730. It was owned by Transcontinental and Western Air, Incorporated, of New York City, and at the time of the accident was being operated as Flight 15-A between Newark, New Jersey, and Chicago, Illinois, by this corporation with scheduled intermediate stops at Camden and Pittsburgh.

Flight 15-A, scheduled to leave at 3:25 p.m., actually departed from Newark, New Jersey, at 3:31 p.m. A stop was made at Camden and the flight departed from this point on schedule at 4:15 p.m. Four hundred ninety gallons of fuel and 30 gallons of oil were carried. The company ground station radio transmitter at Camden was not functioning at the time. However, the company ground stations at Newark, Harrisburg and Pittsburgh were functioning and no difficulty was experienced in maintaining proper radio contact with the flight. The ceiling and visibility at Pittsburgh remained above the minimum requirements for an instrument approach throughout the period of the flight, the lowest being 600 feet and 2½ miles. The United States Weather Bureau terminal forecast, available at the time of departure from Camden, indicated icing conditions in the clouds and frequent snow squalls. Another TWA airplane, Flight 2, eastbound for Camden and Newark, left Pittsburgh at 4:08 p.m. and at 4:37 p.m., while flying at an altitude of 5,000 feet and having passed the north leg of the Buckstown radio range, approximately 70 miles east of Pittsburgh, reported an air temperature of 25 degrees and "No ice". However, an airplane of another company, arriving at Pittsburgh from Washington at 5:53 p.m., accumulated a considerable amount of ice in descending through the clouds for a landing.

This information was not reported to the Airway Control office at Pittsburgh or to other operators until after the accident had occurred.

The first position report from Flight 15-A after departure from Camden at 4:15 p.m., stated that the flight had passed Harrisburg at 5:06 p.m. at an altitude of 4,000 feet and was flying with the ground in view. The next position report placed the flight over the south leg of the Bellefonte range at 5:35 p.m. at an altitude of 4,000 feet, flying by instruments part of the time and making a ground speed of 110 miles per hour. The flight reported its position as over the north leg of the Buckstown radio range at 5:51 p.m., still flying at an altitude of 4,000 feet and on "Instruments, moderate ice". Other evidence indicates that the flight was in turbulent air at this time. In this communication the pilot estimated his arrival time over Pittsburgh as 6:25 p.m. He was then advised by the company ground station at Pittsburgh to climb to an altitude of 5,000 feet and maintain that altitude until further advice, due to the presence in the vicinity of a westbound airplane from Washington. The next message received from the pilot stated that he was over the cone of silence (Pittsburgh) at 6:33 p.m. and was heading out the west leg of the range. At this time the company ground station (Pittsburgh) instructed the pilot to make a normal approach for landing and advised him that the westbound airplane from Washington had landed and that TWA Flight 6, eastbound, had crossed Wellsburg (approximately 38 miles west-southwest of the airport) at 6:30½ p.m. at 3,000 feet and would approach the airport at 2,500 feet, maintaining visual contact with the ground. Weather information for landing was also given Flight 15-A. In acknowledgment, the flight stated, "Will go out on west leg Pittsburgh beam and come in for a landing". This was the last communication with the flight.

The next definite record of the flight is over a point approximately eight miles west-southwest of Pittsburgh. The airplane had made a turn, descended through the overcast and was returning toward the airport beneath the overcast.

The pilots of eastbound TWA Flight 6, directly on course, approaching Pittsburgh from the west and flying visual contact at an altitude of 2,000 feet, saw Flight 15-A flying directly ahead of them at an altitude of approximately 1,700 feet. A few seconds after sighting Flight 15-A, the pilots of Flight 6 noted that they were rapidly overtaking that airplane and reduced their speed in order to allow it to land first. At the same time the pilots of Flight 6 noted that the airplane ahead was in a slight nose-high attitude with the wings in a horizontal position. They next noted that the left wing of the airplane ahead dropped slightly and recovered, then the right wing dropped slightly and recovered. The left wing then dropped again, continuing to a vertical position or slightly beyond and the nose was seen to drop. At this time it was evident that the airplane was out of control and it fell to the ground in a spin to the left. This description of the final maneuvers of the airplane is corroborated by several witnesses on the ground. The airplane did not catch fire on impact.

An examination of the wreckage failed to indicate any structural failure in the air of the airplane, engines, propellers or controls. No reliable indications could be found in the pilot's compartment to establish the positions of the various controls. An examination of the components, however, indicated that the landing gear was in the down position, the landing flaps were in the up position and the elevator and rudder tabs were in their neutral positions. The evidence indicates that power was not applied to either engine during the descent or at the time of impact. Both propellers were found with the engines. The fact that the airplane did not strike high obstructions in the immediate vicinity of the accident indicates conclusively that the descent was practically vertical.

The examination disclosed a considerable amount of ice on various parts of the airplane. The top of the rudder and the tips of the stabilizer had deposits of about one inch. Fragments of ice were found on the de-icer which protects the leading edge of the vertical fin. The manner in which the airplane struck

made it impossible to determine how much ice had been deposited on the entering edges and tips of the wings. Heavy deposits of ice were found along the lower forward edges of both ailerons. The depth of this ice was irregular and varied from a maximum of 1½ inches.

An analysis of the evidence leads to the opinion that this flight was properly dispatched out of Newark and Camden. The United States Weather Bureau terminal forecast indicated icing conditions in the clouds but this did not appear hazardous as the top of the overcast was below 9,000 feet and the ceiling and visibility under the overcast at Pittsburgh were definitely above the minimums prescribed by the Department of Commerce for descending down through. In addition, TWA Flight 2, leaving Pittsburgh for Camden at 4:08 p.m., climbed to an altitude of 5,000 feet on leaving Pittsburgh and flew at that altitude and reported, "No ice".

There is nothing in the evidence to indicate that the pilot was apprehensive at the time he reported over the cone of silence at Pittsburgh at 5,000 feet, although he had encountered moderate icing and turbulent air in the vicinity of the north leg of the Buckstown radio range. No difficulty was reported with radio reception and transmission and had he been concerned at this point, he had sufficient fuel and oil and could have requested clearance, via radio, to Columbus, Indianapolis or Cleveland, all of which had higher ceilings and visibilities than Pittsburgh. Whether most of the ice found on the airplane was picked up enroute or whether the majority of it was deposited while the airplane was descending from 5,000 feet for the visual approach to the airport is not known. However, the temperatures at the time were such that any ice already accumulated on the airplane would not have melted during the descent. In the 45 minutes preceding the accident, two other airplanes descended through the same overcast and although they had accumulated considerable ice, effected their landings at Pittsburgh without undue difficulty.

The evidence, however, seems to definitely indicate that ice formation on the airplane was a predominant factor in this accident, although several supplemental factors were necessary to produce serious results.

The wings of the airplane were protected by modern de-icing equipment which extended along the entering edges to within approximately three feet of the tips. Some three years of successful service operation in connection with the particular type of aircraft involved indicated the adequacy of this equipment. In the flight in question it is, therefore, certain from the amount of ice found on other parts that a proportional amount was deposited on the wing tips. This alone was not serious. It meant that a faster than normal minimum air speed must be maintained. The ice on the entering edges of the ailerons was an unusual condition and it was not until after this accident that a few other such icing experiences came to light. It indicates that the airplane was flying through turbulent air at the same time icing conditions existed, as the entering edges of the ailerons are somewhat protected by the wing when at or near their neutral positions. It is also possible that differential wing tip icing made abnormal use of the ailerons necessary in maintaining lateral balance and for this reason they were held out of their neutral positions for protracted periods. The only way to reduce the magnitude of the aerodynamic overbalancing forces created by such aileron icing is to reduce the flying speed of the airplane. Since the aileron control system was such that air forces acting on the ailerons were transmitted through the control system to the control wheel, overbalancing from any cause could only be overcome by application of physical force to the control wheel by the pilot. With both wing tips and ailerons iced, the pilot was confronted with two conditions, one requiring an increase of speed for safety, the other requiring a decrease of speed to keep control forces within his own physical ability.

The pilot apparently found it difficult or impossible, however, to maintain a speed even as high as he would under normal conditions because of the heavy control forces. The nose-high attitude of the airplane, which was noticed by competent witnesses, definitely establishes an unusually slow speed. Under these conditions it would require only a relatively slight atmospheric disturbance to throw the airplane out of control and into the maneuver which it executed.

In arriving at a conclusion, after an analysis of the evidence available, it does not appear that the accident was due to mechanical failure or to a failure of the company or crew to operate or navigate the airplane in accordance with prevailing rules and practices.

It is the opinion of the Accident Board that the probable cause of this accident was a heavy accumulation of ice on the airplane wing tips and ailerons which rendered the airplane uncontrollable.

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