

CIVIL AERONAUTICS BOARD  
ACCIDENT INVESTIGATION REPORT

Adopted: December 23, 1953

Released: December 31, 1953

ASSOCIATED AIR TRANSPORT, INC., NEAR FISH HAVEN,  
IDAHO, JANUARY 7, 1953The Accident

At approximately 0412 MST,<sup>1/</sup> January 7, 1953, an Associated Air Transport Curtiss C-46F aircraft, N 1648M, being operated as Trip 1-6-6A, CAM, No. 4355J,<sup>2/</sup> between Seattle, Washington, and Fort Jackson, South Carolina, crashed approximately eight miles west of Fish Haven, Idaho. All 40 persons aboard, consisting of 37 passengers, all military personnel, and a crew of three lost their lives, and the aircraft was completely demolished.

History of the Flight

Trip 1-6-6A originated at Boeing Field, Seattle, Washington, with the first stop scheduled at Cheyenne, Wyoming. The crew consisted of Captain Lawrence B. Crawford, First Officer Maxwell F. Perkins and Stewardess Marie Davis. Prior to departure the aircraft was serviced with 738 gallons of fuel and 20 gallons of oil, bringing the total on board to 1,020 gallons of fuel and 60 gallons of oil. Pre-flight inspection was performed by the crew. The gross weight of the aircraft at departure was 45,401 pounds or 401 pounds over the maximum allowable gross weight of 45,000 pounds authorized for passenger operations;<sup>3/</sup> the distribution of the load on board, however, was within the prescribed center of gravity limitations.

Weather briefing of the crew by the United States Weather Bureau at Boeing Field indicated en route weather to be scattered to broken clouds to overcast with the tops estimated at 12,000 feet and a Cheyenne Terminal Forecast of scattered clouds at 15,000 feet, visibility of more than 15 miles. The weather briefing included a forecast of icing conditions in clouds and precipitation above 6,000 feet along the route, with cloud tops ranging from 10,000 to 14,000 feet MSL.

An IFR (Instrument Flight Rules) flight plan, filed by Captain Crawford and approved by the Civil Aeronautics Administration Air Route Traffic Control, Seattle, requested a cruising altitude of 13,000 feet to Cheyenne via Airways Green 2, Blue 12, Blue 32, Red 1, and Green 3, with a proposed true air speed of 200 m.p.h., estimated elapsed time five hours, with six hours and forty minutes of fuel aboard, alternate airport, Denver, Colorado.

The flight departed Boeing Field at 0050 and made the required position

1/ All times herein are Mountain Standard Time based on the 24-hour clock.

2/ CAM is the designation of Commercial Air Movement flights which are arranged by contract between the military and air-carrier operators.

3/ See C.A.B. Special Regulation No. SF-379, adopted January 31, 1952.

reports along the route, with no mention of any irregularities, reporting over Malad City at 13,000 feet, time 0358, and estimating Rock Springs at 0445.

There were no further radio contacts with the aircraft. All attempts to contact the flight by CAA radio stations and by other aircraft along and bordering the proposed route were unsuccessful. A widespread search for the missing aircraft was subsequently conducted under the supervision of Air Search and Rescue units of the United States Air Force.

### Investigation

Five days later, on January 12, 1953, at 1320 hours, the wreckage was sighted from the air by a Civil Air Patrol pilot. Two Air Force paramedics parachuted to the scene and immediately confirmed the aircraft's identity and determined that there were no survivors.

During their observation of the wreckage area, a strip of hard ice was noticed on the leading edge of the deicer boot of a partially exposed wing. This piece of ice was adhering to the boot, parallel to the leading edge and was about three feet long and uniformly about 1-1/2 inches thick and about 3/4 inches wide. Both ends of this strip appeared to be blunt. No other ice was seen on the aircraft wreckage.

On January 13 and 14, a military search party and Board investigators reached the crash site. It was agreed to by all concerned that it was impossible to find and identify the bodies or to conduct a detailed examination of the wreckage because of extremely deep and heavily drifted snow.

The military established and maintained a guard of the crash area until June 20, 1953, when recovery operations were completed and the last of the bodies had been removed.

The investigation at the scene of the accident revealed that the initial impact occurred when the aircraft, traveling on a heading of about 340 degrees and nearly level longitudinally, struck a small pine tree at an altitude of approximately 8,545 feet, 45 feet south of an 8,500-foot east-west ridge, and continued 377 feet in a nearly level attitude where contact was made with two large pine trees. At this point several small bits of wreckage, including chips of propeller blades, were recovered. The aircraft continued on the same heading (340 degrees), striking another large pine tree 242 feet beyond and approximately 75 feet lower. From this point, the aircraft began to disintegrate as it continued down the slope at an approximate 50-degree angle shearing numerous trees. Contact with the ground was made at the base of the hill at the north end of a 93-foot ravine where the aircraft gouged three large holes in the ground.

The aircraft then continued up a 32-degree rise approximately 200 feet where the tail section came to rest. Several components of the wreckage continued over this hill approximately 350 feet. The wreckage was distributed over an area approximately 400 feet wide and 1,540 feet north from the point of initial impact.

Time of the crash was determined by impact-stopped watches as close to 0412. The location was 42° 04' North latitude 111° 32' West longitude.

Two oxygen bottles were found at the scene of the accident. Although the main valve on each cylinder was closed, both pressure gauges and output control valves were broken off. One bottle was completely charged, while the other, which was badly damaged, was partially discharged. Thus, it is evident that there was no shortage of oxygen supply.

Examination of the widespread and scattered wreckage yielded no clue or even suggestion that there had been structural or mechanical difficulty of any nature before impact. Further, the relatively flat angle of impact is indicative of partial control at the time the aircraft struck. There was no evidence of any fire or explosion before the crash.

Examination showed that both engines were rotating at the time of impact and that the propellers were in the cruising r.p.m. range which definitely indicated that power was being developed at impact. Damage was so extensive that it was impossible to follow through on the continuity of all control systems; however, those portions of control systems that could be examined were found to be properly fastened and safetied.

The aircraft was equipped with wing deicer boots but the cockpit unit controlling their use was not recovered. However, investigation disclosed that the deicer boots were operative when checked at Boston on January 4, 1953, three days prior to the accident. Due to the forecasted icing conditions en route to Cheyenne, it is probable that the pilot checked the aircraft's deicer equipment prior to departure from Seattle in accordance with standard operating procedure. Also, the propellers were equipped for deicing, and the 20 gallon anti-icer tank, supplying the propellers, the carburetor and the windshields, was full of alcohol when the aircraft left Cheyenne for Seattle on January 5, 1953.

The Board's investigation also disclosed that all the required items of navigation equipment were aboard the aircraft, and that the flight log found at the scene had been maintained with the last position entry over Malad City at 0358. It revealed no discrepancies. The indicated times over stations along the route coincided with reported times as recorded by the CAA radio stations.

According to company records, Captain Crawford and First Officer Perkins were both well qualified on C-46 aircraft, and were thoroughly familiar with the deicing equipment and its use. A company official testified that both had flown the route involved about 12 times during the year preceding the accident and were therefore familiar with terrain elevations. Investigation disclosed that both Captain Crawford and First Officer Perkins had received their required rest periods prior to departure from Seattle.

### Analysis

Had the flight continued on from Malad City at 13,000 feet, it would likely have entered the tops of the clouds over the mountains between Malad City and Bear Lake. During this short period that the flight would have been in the clouds, light rime ice and light to possibly moderate turbulence would have occurred. It is probable that the top portion of these clouds were predominately ice crystals, and that therefore sufficient water in the liquid state would not have been present to produce more than a light coating of ice. It seems likely

that even this condition could have been flown over by an increase of altitude of not more than 500 feet. These conditions were verified by another flight that preceded N 1648M by only a few minutes without any difficulty. There was no request received from the flight for a higher altitude. (Any change of altitude would require clearance from Air Route Traffic Control.)

Since the above conditions did exist at the time the flight was in the area, it is likely that an involuntary descent was made into an area of increasing ice and turbulence which extended two or three thousand feet above the mountains. The mountains between Malad City and Bear Lake range from 8,000 feet to in excess of 9,000 feet. The westerly winds were lifting the moist unstable air over those mountains, producing zero ceilings, moderate to severe turbulence, moderate to heavy icing and snow, with updrafts on the windward side of the slopes and downdrafts on the leeward sides. Ground observers in that area, none of whom saw any aircraft, described conditions as a blizzard. This was a local condition resulting from the air flow over this mountain range.

The general weather conditions at 13,000 feet in the area were not conducive to carburetor ice. However, had any icing occurred, the prompt application of alcohol or heat should have eliminated this condition. Since icing became progressively worse at lower altitudes, there is a possibility that any appreciable delay in taking corrective action could have caused a forced descent into worsening conditions. There was an ample supply of alcohol for both the carburetors and propellers.

As mentioned previously, a strip of hard ice was found on the leading edge of the deicer boot, parallel to the exposed upper surface of a wing. Although this ice was observed five days following the accident, there were strong indications that it had accumulated on the wing during descent. No ice was seen on the other exposed parts of the airplane and the absence of glazed ice or icicles on the boughs of trees is indicative that the wing ice had not formed following the accident. The configuration of the ice precludes the possibility of it having formed as a result of rain droplets after the crash. Furthermore, the blunt condition of both ends of the ice strip strongly suggests that it was the remaining portion of a larger ice layer on the leading edge which could well have been broken off during the crash. Since this ice was on the deicer boot, it shows that ice was forming on the boots so rapidly during descent that action of the boots themselves was not sufficient to break off and remove the ice completely.

Investigation disclosed that the aircraft struck on a heading almost 100 degrees from its intended course. This gives rise to the belief that during the descent a rapid accumulation of ice on the top surfaces of the wings would have seriously impaired the lift of the aircraft and probably adversely affected controllability despite the fact that the deicer boots could have been operating at the time. The airplane could not have maintained proper altitude much less climb had these conditions existed, even though maximum continuous power was being used.

It is well known that the rate of ice accretion and its quantity vary greatly under different conditions of temperature, moisture content, etc.<sup>4/</sup>

4/ Ice on aircraft and its harmful effects has been the subject of much research by the National Advisory Committee for Aeronautics and others. This subject was recently referred to in the Board's Accident Report SA-274.

About 42 miles back from the crash site, over Malad City, the flight reported as being at 13,000 feet. The elapsed time from the Malad City report to the time of crash was about 14 minutes. Thus the ground speed over these 42 miles was about 180 miles per hour. Previous legs of the flight had been logged at ground speeds of 220 - 230 miles per hour. But the distance of the final segment, from Malad City, is short and the time determinations are subject to some error. Therefore, it may be presumed that the flight lost altitude while continuing straight ahead and on course at a somewhat reduced speed until shortly before the accident when a left turn was made. (The crash site was only about two miles from the center of the airway.) This somewhat reduced speed can be accounted for by the fact that light to moderate turbulence existed at the cruising level and became worse at the lower altitudes. (The company's Operation Manual specifies a speed reduction to 140 m.p.h. through turbulence.)

The flight previously mentioned, also eastbound, and only a few minutes earlier, did encounter some turbulence in the area and this pilot avoided it by increasing his altitude from 13,000 feet to 13,500 feet.

The crash site was several hundred miles from Cheyenne, the point of next intended landing, far too distant to start a letdown.

The fact that the aircraft was overweight by 401 pounds when it left Boeing Field cannot be considered as pertinent because the aircraft's weight at the time it crashed was some 3,000 pounds less than the weight at take-off due to fuel consumption.

The Board concludes from the evidence available that the aircraft encountered severe turbulence and the formation of heavy icing of the aircraft which precipitated its descent and subsequent crash. The Board is unable to state why the flight did not request and proceed to a higher altitude to clear the tops of the clouds. The reason for the initial descent is not known.

#### Findings

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

1. The carrier, the crew and the aircraft were properly certificated.
2. Both the captain and copilot had received the required rest period at Seattle.
3. The flight was routine until passing Malad City, the last reporting point.
4. The flight reported being over Malad City at 13,000 feet, its assigned altitude.
5. Light to moderate turbulence and light rime ice prevailed in cloud tops at cruising altitude, while at lower altitudes moderate to severe turbulence and moderate to heavy icing existed.
6. Ice found on the wing had formed in flight.

7. The crew had been adequately briefed by the U. S. Weather Bureau as to weather over the route prior to departure from Seattle.

8. All major components of the aircraft were identified and examination of the wreckage disclosed no evidence of malfunction, failure or fire prior to impact.

9. Both engines were developing power at impact.

10. All navigation aids along the route were reported normal.

11. The accident occurred within the airway and slightly to the left of course.

Probable Cause

The Board determines that the probable cause of this accident was the inadvertent descent into an area of turbulence and icing which resulted in the flight's inability to regain a safe altitude.

BY THE CIVIL AERONAUTICS BOARD:

/s/ OSWALD RYAN

/s/ HARMAR D. DENNY

/s/ JOSH LEE

/s/ JOSEPH P. ADAMS

/s/ CHAN GURNEY

## S U P P L E M E N T A L   D A T A

### Investigation and Hearing

The Civil Aeronautics Board's office at Kansas City, Missouri, received notification of the accident through CAA Communications, at 0930, January 7, 1953. 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 held in connection with the investigation of this accident at San Antonio, Texas, February 20 and 21, 1953. Additional reports of the Board's final examination of the wreckage were entered in the record by deposition at Kansas City, Missouri, on August 14, 1953.

### Air Carrier

Associated Air Transport, Inc., an irregular air carrier, is a Texas Corporation, with its principal place of business at San Antonio, Texas. It is authorized to operate in the area of the Continental United States, Overseas and International, transporting passengers and cargo under the terms of Air Carrier Operating Certificate No. 1-740.

### Flight Personnel

Captain Lawrence B. Crawford, age 28, was employed by Associated Air Transport on August 1, 1951. He was the holder of a valid airman certificate with an airline transport and appropriate aircraft rating. Captain Crawford has a total of 4,960 flying hours of which 1,055 were in C-46 aircraft. His last instrument check was accomplished October 27, 1952. He possessed a first-class medical certificate dated August 22, 1952, listing no restrictions.\*

First Officer Maxwell F. Perkins, age 32, was employed by Associated Air Transport October 20, 1952. He held an airman certificate with a commercial pilot, multi-engine land and instrument ratings. He had a total of 3,584 flying hours, which included 1,445 hours on C-46 type aircraft. First Officer Perkins possessed a first-class medical certificate dated April 14, 1952, which contained a waiver for glasses.

Miss Dorothy Marie Davis was employed as a Stewardess by Associated Air Transport, on January 1, 1953. This was Miss Davis' first flight with the company.

### The Aircraft

N 1648M, a Curtiss-Wright Model C-46F, Serial No. 2504, was certificated under CAA Specification 3A2. It was equipped with two Pratt & Whitney R-2800 engines with a total time of 673:33 hours since overhaul. Total time on the aircraft as of December 31, 1952, was 1,941:37 hours. The aircraft possessed a current Airworthiness Certificate issued December 12, 1952.

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\*Note: Civil Air Regulations require the holder of an airman certificate with an airline transport rating to take a physical examination each six months by a Medical Examiner certificated by the Civil Aeronautics Administration.