

REPORT OF THE CIVIL AERONAUTICS BOARD  
on the  
Investigation of an Accident Involving Aircraft  
In Scheduled Air Carrier Operation

An accident involving an aircraft of United States registry, NC 16028, a Douglas DC3, which was being operated by American Airlines, Inc., occurred near Centerville, Tennessee (approximately 42 miles southwest of Berry Field, Nashville, Tennessee), about 11:17 p.m. (CWT) on October 15, 1943. The flight was identified by the air carrier as Flight 63 and was being operated in scheduled air carrier service between Cleveland, Ohio and Memphis, Tennessee, with intermediate stops at Columbus, Dayton, Cincinnati, Louisville, and Nashville. The three members of the crew; one airline captain, a non-revenue passenger to Memphis; and all of the six revenue passengers were fatally injured. The aircraft struck the ground nose-first in a vertical attitude and was completely demolished by impact.

CONDUCT OF INVESTIGATION

The Washington Office of the Civil Aeronautics Board (hereinafter referred to as the Board) received notification in the early morning of October 16, 1943, and immediately initiated an investigation in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. 1/ Fred G. Powell, Senior Air Safety Investigator in charge of the Atlanta, Georgia Office of the Board, proceeded to the scene of the accident, arriving there at approximately 3:30 p.m. on October 16, 1943. The wreckage of the airliner had been placed under civil police guard and was so kept until a complete examination had been made by investigators of the Board.

Hearing

In connection with the investigation, the Board ordered a public hearing in which Allen P. Bourdon, Chief, Investigation Division, Safety Bureau of the Board, was designated as presiding officer.

The hearing was held in two sessions, November 5 and 6, 1943, in which the following personnel of the Bureau staff participated: John M. Chamberlain, Assistant Director; Fred G. Powell, Senior Air Safety Investigator; George H. French, Meteorological Specialist; and Victor M. Clark, Senior Reports Editor.

On the basis of all evidence accumulated during the investigation, the Board now make its report in accordance with the provisions of the Civil Aeronautics Act of 1938, as amended.

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1/ Section 702 (a) (2) provides that it shall be the duty of the Board to "Investigate such accidents and report to the Authority the facts, conditions, and circumstances relating to each accident and the probable cause thereof."

SUMMARY AND ANALYSIS OF EVIDENCEAir Carrier

At the time of the accident American Airlines, Inc. (hereinafter referred to as American), a Delaware corporation, was operating as an air carrier under a certificate of public convenience and necessity and an air carrier operating certificate, both issued pursuant to the Civil Aeronautics Act of 1938, as amended. These certificates authorized the corporation to engage in air transportation with respect to persons, property and mail between various points in the United States, including Cleveland, Columbus, Dayton, Cincinnati, Louisville, Nashville and Memphis.

Flight Personnel

The crew of flight 63 consisted of Dale F. Dryer, captain; William J. Brand, first officer; and Margaret A. Jewell, stewardess. Captain Robert Alden Gay, employed by American, was riding in the jump seat as a non-revenue passenger on the subject flight.

Captain Dryer, age 37, was employed by American as an airplane mechanic May 27, 1931. He was assigned as first officer July 9, 1934, and as captain April 1, 1938. He held an airline transport pilot certificate with multi-engine land, 900-2700 h.p. ratings. He had accumulated approximately 7928 flying hours, 6728 of which were while in the employ of American, and about 3000 on DC3 and DST equipment. He had flown approximately 250 hours in the three months preceding the accident. His last physical examination required by Civil Air Regulations was accomplished April 7, 1943. The date of his last flight over the subject route was October 9, 1943. He had his last instrument check and his last monthly route qualification report on October 3, 1943.

First Officer Brand, age 29, held a commercial pilot certificate with single-engine land, 0-330 h.p., flight instructor and instrument ratings. He was employed by American as a student pilot on September 15, 1942, and was assigned as first officer December 21, 1942. He had accumulated approximately 1470 hours of flight time, about 776 of which were while in the employ of American. His total flying time on DC3 equipment was 700 hours. His last physical examination required by Civil Air Regulations was accomplished August 19, 1943.

Stewardess Margaret A. Jewell had been in the employ of American since March 15, 1943, and was assigned as stewardess on May 18, 1943.

The Aircraft

The aircraft, NC 16008, was a Douglas DC3-G102, twin-engine passenger plane, serial No. 1588, and had been flown a total of 17,774 hours. The time flown since its last major overhaul was 6895 hours. Its manufacture was completed by the Douglas Aircraft Company, Inc., on

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October 31, 1936, and American, the registered owner at the time of the accident, accepted delivery of the airplane November 10, 1936. The airplane was equipped with two Wright G-102 engines and two Hamilton Standard hydromatic 3-bladed propellers. The engines and the propellers had been operated approximately 615 hours since their last major overhaul.

#### History of the Flight

Flight 63 originated at Cleveland at 5:56 p.m. EWT, 17 minutes later than the scheduled departure because of the late arrival of air cargo and the handling of priority passengers and express. Intermediate stops were made at Columbus, Dayton, Cincinnati, and at Louisville where there was a delay due to unreported Army traffic in the Nashville area. The flight departed Louisville at 9:11 p.m. CWT 2/ and arrived at Nashville at 10:25 p.m. Here it was refueled to 375 gallons of gasoline which was more than ample to negotiate the flight, and took off at 10:48 p.m., cleared to Memphis with Little Rock, Arkansas as an alternate destination. Accumulated delays at the time of departure from Nashville amounted to one hour and 38 minutes. The total gross weight of the aircraft when it took off from Nashville was 21,509 pounds, which was well within the allowable weight of 25,200 pounds. Flight 63 was originally cleared to cruise at 6000 feet from Cleveland to Memphis, with intermediate stops. While on the ground at Nashville, American's meteorologist advised Captain Dryer that he would have a better wind at 4000 feet in proceeding to Memphis. It was presumed therefore that the captain would change his flight plan to 4000 feet. At 10:52 p.m., approximately four minutes after take-off, the flight contacted Nashville and reported passing through the 3000-foot altitude level, and about 10:59 p.m., it reported cruising at 6000 feet. When this report was received it became evident that there had been some misunderstanding, whereupon Atlanta ATC approved the 6000-foot level and such approval was transmitted to the flight by Nashville at 11:03 p.m. At 11:06 p.m. the flight called Nashville and requested a change in flight plan, to cruise at 8000 feet. At 11:08 p.m., Nashville contacted the flight as follows: "Atlanta ATC approves 8000 feet to Nashville boundary." Memphis also transmitted to the flight the following message: "Memphis ATC clears 63 from Atlanta boundary to Memphis tower at 8000 feet." Nothing further was heard from the flight until about 11:17 p.m. when the radio operators of American's stations at Memphis, Nashville and Johnson City, Tennessee heard a voice, which was recognized as that of Captain Dryer, call Memphis, identify the flight and continue shouting into the microphone, talking so loud and so fast that none of the short message was intelligible. Flight 63 was then asked by Johnson City to "repeat transmission, repeat more slowly," and Memphis recorded the message as, "Incomplete contact, unable to distinguish remarks." Nothing further was heard and all subsequent efforts by Memphis, Fort Worth and Nashville to contact Flight 63 were unsuccessful.

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2/ All times referred to hereinafter are Central War, unless specified otherwise.

Weather was broadcast to the flight in the clear by Memphis, Nashville, Fort Worth, Little Rock, Johnson City and New York from 11:44 a.m., October 15 to 3:43 a.m., October 16.

Although an organized search was inaugurated and continued throughout the night, the wreckage was discovered accidentally about 8:00 a.m., October 16 by a farmer engaged in a routine chore, and who lived approximately three-fourths of a mile from the scene. He had not heard the airplane the night before nor was he aware that there had been an accident. He drove to the town of Wrigley, about three miles distant, where a storekeeper notified officials in Nashville by telephone.

#### Examination of the Wreckage

The aircraft fell on the thickly wooded southern slope of a hill which rose to a height of about 75 feet. Examination of the wreckage definitely indicated that the aircraft descended and struck the ground nose-first in a vertical attitude. As it fell the right wing crashed downward between two trees, which were approximately 45 feet in height, the upper surface of the wing scraping the bark from one of the trees for a distance of about 10 feet, measured upward from the base. Small upper branches and twigs were sheared from both trees. In relation to these trees the wing was found in such a position that clearance to each of the trees was less than one foot, which was positive indication that the aircraft descended in a practically vertical attitude. The right wing was collapsed from the leading edge to the front spar in accordion fashion, while the rear portion of the wing had disintegrated. The left wing tip was broken and bent back but remained attached. The center section had parted from both left and right wings and was found approximately 20 feet downhill from the wings. The fuselage was entirely collapsed and disintegrated from the nose section to, but not including, the tail surfaces. The tail surfaces were found lying on top of the center section. It was indicated by marks on the ground that when the airplane struck the earth both engines were in their respective locations. The left engine came to rest at a point approximately seven feet down the embankment from the point of first contact with the ground; the right engine was found at the point of impact. Both were badly broken and mutilated. There was no evidence of fire on, or in, any part of the aircraft before or after impact. The two parachute type A-8 flares were found detached from the aircraft structure and had not been released or discharged. The wrist watches of the captain and one of the passengers, as well as the clock from the instrument panel, indicated that they had stopped at 11:17 and this evidence, along with the last radio message, established the time of the accident.

All parts of the airframe, its instruments, engines and accessories were accounted for and were found at the scene of the accident and although they were severely damaged by impact, no evidence was found to establish failure of any part of the aircraft prior to impact. Subsequent investigation and exhaustive laboratory tests of the automatic

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pilot, were conducted by a committee of American engineers and during all of these tests at least one member of the Safety Bureau of the Board was present. None of these tests revealed failure of any part of the mechanism prior to impact. Investigation of known cases of malfunctioning of automatic pilots in civil and military aircraft over a period of years reveals no instance in which such malfunctioning was not overcome by the pilot by overpowering its operation or by the disengagement by the pilot of the automatic unit.

#### Weather

A relatively warm air mass existed in Tennessee during the forenoon of October 15, while much colder polar continental air prevailed farther to the northwest. This colder air was moving southeastward behind a cold front which extended from Arkansas through extreme northwestern Tennessee and into western Kentucky. This cold front continued to move southeasterly and passed Centerville and Nashville about 4:30 p.m. Showers, turbulence and fresh northwesterly winds attended its passage. Following the cold front passage, fresh northwest wind continued, the temperature fell quite rapidly, and the area remained cloudy with light showers occasionally mixed with snow or sleet. Before the front passed, the freezing level over Nashville was at 11,000 feet and it had dropped to about 2200 feet above sea level at the time of the accident. Very little turbulence was indicated aloft in the area after 10:00 p.m., except that caused by the surface winds which were confined to a shallow layer near the ground. Information now available indicates that at the time Flight 63 left Nashville light icing in local areas extended from the freezing level at 2200 feet upward to an elevation of at least 6000 feet and along the airway from Nashville to approximately Jacks Creek, Tennessee, which is about 120 miles southwest of Nashville.

Forecasts were issued by American's meteorologist for Flight 63 at 4:03 p.m., 7:34 p.m. and 10:25 p.m. These were issued with the knowledge of the forecasts made by the U. S. Weather Bureau and both forecasts were in close agreement. The latest one furnished to the pilot was the company forecast at 10:25 p.m.

#### Forecast

The following forecast was issued by the company and was the latest one available to the flight.

#### Terminals

Nashville. Overcast, ceiling 3000 to 5000 feet with occasional lower scattered clouds, 1000 to 2000 feet, visibility 4 to 6 miles, light smoke and fog.

Memphis. Clear ceiling, unlimited visibility 4 to 6 miles, light smoke and fog.

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General

Nashville to Memphis. Overcast to broken clouds, ceiling 1000 to 2000 near Nashville with intermittent light rain westward to Jacks Creek. Cloudiness will clear rapidly Jack's Creek to Memphis. Cloud tops near 7000.

Upper Winds and Temperature

Nashville to Memphis. 2000 to 4000 feet - north-northwest 25 to 30 m.p.h., temperature 55 to 45 degrees, 6000 to 8000 feet - wind northwest 30 to 35 m.p.h., temperature 40 to 35 degrees, 10,000 feet - west-northwest 35 m.p.h., temperature 30 degrees.

Sequence Weather Reports

The nearest airways weather reporting stations to the scene of the crash were Nashville and Jacks Creek, Tennessee. The reports made by those stations were as follows:

10:30 P.M. Nashville. Instrument. Measured 900, overcast, visibility 8 miles, light rain, sea level pressure 1013.5, temperature 40, dew point 38, wind WNW 18, light gusts, altimeter setting 29.92.

10:30 P.M. Jacks Creek. Unlimited, scattered clouds at 7000, visibility 8 miles, sea level pressure 1016.6, temperature 37, dew point 35, wind NW 9, altimeter setting 30.01.

11:00 P.M. Nashville. Instrument. Measured 800, overcast, visibility 8 miles, light rain, temperature 40, dew point 38, wind WNW 16, light gusts, altimeter setting 29.90.

11:30 P.M. Nashville. Instrument. Indefinite ceiling 900, overcast, visibility 7 miles, light rain, sea level pressure 1012.9, temperature 40, dew point 37, wind WNW 18, light gusts, altimeter setting 29.90.

11:30 P.M. Jacks Creek. Unlimited, scattered clouds at 5000, visibility 8 miles, sea level pressure 1016.3, temperature 37, dew point 35, wind WNW 9, altimeter setting 30.00.

Witnesses

Signed statements were taken from 20 residents of the vicinity, who heard the airplane in flight. Only five of them actually saw the flight at some time during the approximate three to four-minute period prior to the crash. From the statements of these witnesses the course of the flight can be estimated with a fair degree of reliability. It is apparent that the airplane had been on course and when heard was flying at altitudes variously estimated by different witnesses as "about 500 feet," "very low," "just above the house tops," and "so close it shook the roof." A large majority of the witnesses seemed to

believe that the airplane was circling, as they heard the engine noise intermittently. It is apparent that the weather on the subject evening from 11:00 p.m. to 11:30 p.m. was unusually and extremely spotty in this particular area. All but one of the witnesses agreed that it was either raining, sleeting or snowing, or a combination of two of the three conditions, in the neighborhood of their homes. Two of the witnesses believed that the pilot might have been experiencing some engine trouble.

The flight was first observed approaching the vicinity from the northeast and continuing southwest at an altitude of approximately 500 feet, by a witness who resided just south of Highway No. 100, 44-4/10 road miles southwest of Nashville and approximately 8 miles northeast of the scene of the accident. The flight was then heard or observed in rapid succession over a period approximated at four to six minutes by the 19 other witnesses living in a rectangular area, the long axis of which is approximately 12 miles, running northeast-southwest and with a shorter axis of approximately  $4\frac{1}{2}$  miles. There were no known eye-witnesses to the actual descent of the aircraft to the ground; however, several witnesses stated that they distinctly heard the impact. Their statements are believed very probable as these witnesses lived within a radius of three-quarters of a mile from the scene of the accident. One witness, a caretaker who resided on the Graham Airport, Graham, Tennessee, stated that he returned home about 9:30 on the evening of the accident. He stated in part that, "shortly after I came in the house I was conscious of heavy rain outside . . . I estimate that it was a few minutes after eleven o'clock when I got to bed. Shortly thereafter, I cannot say exactly how long, I heard the sound of airplane engines. The sound came and went and gave me the impression that the airplane was circling somewhere in the distance. I lay in bed and listened to the sound for four or five minutes. The sound would fade and then return and then fade again . . . I had made up my mind to go look as soon as I heard it again, but I did not hear the sound of the motors again. I regularly hear the sound of transport planes crossing my home and the sound of the motors usually remains within the range of my hearing about two minutes. The fading and returning sound which I have described above was so different from the usual sound of an airplane crossing overhead that I paid more attention to it than usual. It was my belief that the airplane might be in trouble and was searching for Graham Field. (Graham Airport is an emergency landing field directly on the course being flown by Flight 63.) I am sure that I heard the sound of its motors for a longer time than I would have if it had been merely passing overhead . . . Ships flying over my house usually pass it within a half mile. The airplane I heard Friday evening was not, in my opinion, that close to the house. My estimate is that it was five or six miles away." He stated that all of the airport lights were burning when he came home and that when he rose the following morning, shortly after five o'clock, the airport lights were still burning. Subsequent conversation between the witness and investigators of the Board revealed that in his opinion the flight never did get as far west as Graham. (The scene of the accident is approximately  $4\frac{1}{2}$  miles due east of Graham.)

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Another witness, who lived about three-quarters of a mile from the scene of the accident, stated, "I hear airplanes pass every day . . . . I heard plane northwest of the house circling . . . . and it circled in same place. I went back to bed and just then the plane passed north of my house going east. I saw big lights on, shining bright. It was just above the timber. We live in the hollow . . . . When I saw it first it was coming down and was coming fast. He was coming down like he was landing just before he pulled up . . . . After passing the house I saw the plane pull up fast. It sounded like it turned to southeast . . . . about 200 or 300 yards from my house. Couldn't tell any difference in motors when plane pulled up. I ran out on front porch when plane pulled up and in about  $\frac{1}{2}$  minute the noise of the motors stopped. When noise of motors stopped I thought plane had crashed. I went to back of house and looked toward east to see if I could see any plane, but could see none. I thought plane was on ground but my wife said she sometimes heard them go over and noise stop when plane passed over the hill."

Careful consideration was given to reports that a free barrage balloon or a cable-controlled balloon of some type was observed near Grant, Tennessee, on October 13, and also one that was reported seen on the morning of October 16, about two miles south of Berry Field, Nashville. Such derelict balloons could constitute a serious hazard to an aircraft, especially at night or during instrument weather. The history of the time and place of the escape of these two balloons, their probable course and the time and place of their recovery was thoroughly investigated and there were no indications that either of them could have been in the vicinity of the accident.

American's Assistant Director of Maintenance and Overhaul testified that NC 16008 was not equipped with either wing de-icer equipment or propeller de-icer fluid, and added that this equipment is removed from their airplanes for operations during the summer months. While the program of re-installing the de-icer equipment for the fall and winter had started, the work had not been accomplished on the subject airplane. He added, however, that the carburetor de-icing equipment was installed and operative as this equipment remains installed the year round.

Statements from five American pilots and three Army pilots, who had been flying on or near the route at various times from approximately an hour before to two hours after the accident, indicated that they encountered icing conditions at altitudes under 8000 feet in various forms and degrees. None, however, considered it serious enough to cause trouble. Some reported rain, snow or sleet with the temperatures as low as 25°. One Army officer, flying a B-24, reported that icing was first noticed on his windshield and that it continued to form, with the accretion becoming greatest somewhat west of Nashville. He was proceeding at an altitude of 6000 feet and reported that about 40 miles west of Nashville the condition seemed to diminish somewhat. He reported, however, that up to this point sufficient ice had accumulated to cut his airspeed down 10 to 15 m.p.h. and to cause some vibration of the plane. He reported that he also had propeller ice but that it



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vibrated loose when he increased his r.p.m. All but one of the other flights referred to reported light rime ice, some experiencing it on the airplane and windshield.

On Saturday, March 18, 1944, the public hearing on the subject accident was reopened at New York, N. Y. in order to take the testimony of American's radio operators who were on duty at Nashville, Tri-City, Fort Worth and Memphis at the time of the accident, and from whom depositions had already been taken. All of the operators were positive that the radio message they heard about 11:17 p.m. was coming from Flight 63 but only one was well enough acquainted with the voice of Captain Dryer to be positive that he had done the transmitting. The other three operators could not identify the voice. Two of the operators could not recall any words of the message other than the identification. One had the impression that the word "ice" was included in the message, while one believed he remembered some part of the message which included the word "control" or "controls."

From the testimony of the radio operators, it was apparent that all of them heard the message being broadcast from Flight 63 in a very rapid and garbled fashion and in a high excited pitch. The radio logs of all the four stations were in order.

#### Findings

1. The accident occurred near Centerville, Tennessee, about 11:17 p.m. on October 15, 1943, and resulted in fatal injuries to six revenue passengers, three members of the crew, and one airline captain who was riding as a non-revenue passenger.
2. American's Flight 63 originated in Cleveland, Ohio, with Memphis, Tennessee, as its final destination. It departed from Nashville at 10:48 p.m., having been cleared to Memphis, with Little Rock, Arkansas, as an alternate destination, in accordance with company procedure.
3. At the time of the accident, American held certificates of public convenience and necessity and an air carrier operating certificate authorizing it to conduct the flight. Both certificates were currently effective.
4. Captain Dryer and First Officer Brand held proper certificates to perform their duties on the subject flight.
5. There was no evidence of mechanical failure of any part of the airframe, its engines, propellers, or accessories.
6. The operation of Flight 63 was apparently normal until about 11:06 p.m. when the flight requested a change in flight plan from 6000 feet to 8000 feet.

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7. Two-way radio communication had apparently been satisfactory until about 11:17 p.m. when the flight initiated a radio contact to Memphis, which was, except for its identification, unintelligible.

8. The weather forecast by the United States Weather Bureau indicated that icing conditions could be expected over the route above the 8000-foot level but such conditions were not anticipated by the Weather Bureau below 8000 feet. American's forecast indicated freezing temperatures above 9000 feet.

9. From the radiosonde observation made at Nashville at 11:00 p.m. the freezing temperatures actually extended upward from about 2200 feet.

10. The aircraft, although in an airworthy condition prior to the accident, was not equipped with wing or propeller de-icers.

#### METEOROLOGICAL ASPECTS OF THIS FLIGHT

Lowest freezing temperature was forecast for the subject flight at 8000 feet by the Weather Bureau and at 9000 feet by the company meteorologist. Icing was forecast by the Weather Bureau above 8000 feet. The invasion of a cold air mass usually starts as a shallow layer on the ground followed by slowly increasing depth. If, for example, the temperature at the ground in a cold air mass is above freezing and the freezing level in the cold air is at 2500 feet, then no freezing temperatures would be expected aloft in the cold air until the depth of the cold air had exceeded 2500 feet. As the top of the cold air mass continues to rise all temperatures between the 2500-foot level and the top would ordinarily be freezing or lower.

In the case of the subject flight the Company and Weather Bureau meteorologists evidently believed the cold air had not yet reached a depth that included freezing temperature in the upper portion. Furthermore, if the cold air was advancing according to usual pattern, as presumably they believed it was, it should have taken considerable time for the top of the air mass to build upward to the 8000-foot level. During this period, temperatures were expected to remain above freezing between the top of the cold air and 8000 feet.

A sounding was made at Nashville at 11:30 p.m. which showed that the cold replaced the warmer air to a high altitude within an extremely short time resulting in below freezing temperatures at all altitudes upward from 2200 feet. This information was not available in time to be used for the subject flight. Subsequent study of these conditions, while showing probability of icing in some form, did not reveal conditions thought at that time to be necessary for severe icing. More recently there came to our attention the results of a governmental icing research program in which the Weather Bureau collaborated and the validity of present day icing forecast theories were more thoroughly

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tested than heretofore. As a result it was found that severe icing is not only possible but probable in a meteorological situation such as existed in the Nashville area at the time of the subject flight. However, due to extreme variability of icing, both as to area and to time, no two flights are likely to encounter it in the same degree and in the same location.

#### CONCLUSION

In the subject flight, the pilot was advised by the company meteorologist that the best winds would be found at 4000 feet. Captain Dryer did not choose to use that altitude and went on up to 6000 feet. While he did not give any reason therefor, the most logical reason appears to be that he was worried by below freezing temperatures and potential icing conditions, and believed he would be in above freezing temperature at 6000 feet. Wind conditions were expected to be less favorable above 4000 feet and could not account for the change to higher altitude. Soon thereafter Captain Dryer asked for a change of flight plan to 8000 feet without giving a reason. Again, there seems to be only one logical reason, namely, that he found temperature and potential icing conditions no better at 6000 feet and believed there still remained a layer of above-freezing air between the 6000 and 8000 foot levels. He probably felt he could avoid possible icing hazards by flying at around 8000 feet. As the aircraft was not equipped with a recording barograph, it could not be determined nor is it believed that the flight ever arrived at 8000 feet as the request was made only about 11 minutes prior to the accident. However, it appears probable that somewhere around the 6000-foot altitude, or somewhat above, considerable icing was encountered, and having no mechanical aids to dissipate wing or propeller ice, the pilot found it necessary to make a rapid descent to low altitudes where, as he probably realized by that time, the only above freezing temperatures existed. All evidence from the witnesses on the ground indicated that the flight circled and maneuvered at very low altitudes in the vicinity of the accident for some four to six minutes. Based on the approximate distance covered, this estimated time seems probable. This would indicate that the descent from an altitude estimated as 6000 feet or more feet was quite rapid and was made in some five to seven minutes.

Meteorological conditions favorable for carburetor icing existed throughout the flight. It does not appear reasonable that carburetor icing could have developed during the climb due to the additional engine heat available, but assuming that severe icing was encountered on the aircraft and propellers at the peak of the climb, it becomes entirely possible that only partial clearance of ice on propellers was effected, forcing reduction of power and rapid descent. This condition could account for the crew being too busy to report having taken on ice and the descent under partial power, and difficult control could have made it possible for carburetor ice to develop. After breaking out below the overcast and reaching a temperature slightly above freezing, some loss of aircraft or propeller ice, or both, may have taken place, as it appears

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from statements of witnesses that further loss of altitude was quite gradual during the time the plane was seen. During this time below the overcast, Captain Dryer had his landing lights on, which strongly suggests that he could not climb and possibly could not maintain altitude. It is logical to believe that he was using the lights to assist him in avoiding obstructions and to make a landing if forced to do so. Due to the indications that continued lack of power to maintain altitude existed, probably as a result of carburetor ice plus any remaining aircraft and propeller ice, he was forced to pull up or attempt to hold altitude as his only chance to escape immediate collision with trees on the hilly terrain. In so doing the airplane stalled, as definitely indicated by the vertical angle at which it dived to the ground. It is not conceivable that a pilot of Dryer's experience would stall the airplane, or allow it to stall, unless conditions and circumstances existed over which he had no control.

#### PROBABLE CAUSE

Inability of the aircraft to gain or maintain altitude due to carburetor ice or propeller ice or wing ice or some combination of these icing conditions while over terrain and in weather unsuitable for an emergency landing.

#### CONTRIBUTING FACTOR

Weather conditions which, had their nature been anticipated, should have precluded the dispatch of the flight in an aircraft not equipped with wing or propeller deicing equipment.

APPROVED:

/s/ L. Welch Pogue  
L. Welch Pogue

/s/ Edward Warner  
Edward Warner

/s/ Harllee Branch  
Harllee Branch

/s/ Oswald Ryan  
Oswald Ryan

/s/ Josh Lee  
Josh Lee