Docket No. SA-89 File No. 523-44

C I V I L A E R O N A U T I C S B O A R D

ACCIDENT INVESTIGATION REPORT

Adopted: June 28, 1945 Released: June 29, 1945

AMERICAN AIRLINES ACCIDENT - MEMPHIS - FEBRUARY 10, 1944

Summary

American Airlines Trip 2, on a regular transcontinental schedule from Los Angeles to New York City, while en route from Little Rock to Memphis, crashed in the Mississippi River 18 miles southwest of Memphis Airport about 11:36 p.m., CWT, on February 10, 1944. The 21 passengers and three crew members were fatally injured and the airplane, a DC3, was totally destroyed.

The flight was observed to be at a normal altitude approximately 30 miles west of the scene of the crash. At a point 2½ miles west of the scene, the plane was observed flying very low. How long it had been flying low between these two points could not be ascertained as there were no known witnesses to this portion of the flight. It approached and struck the river in an angle of descent of about 20° with the right wing slightly low. Impact with the water, submersion and the extremely difficult salvage operation caused an unusual degree of damage to the plane. Only 75% of the wreckage is estimated to have been recovered. These conditions materially limited the efforts of the Board's investigators.

Although a considerable period of time was devoted to the investigation in order to gather all possible evidence, the Board is unable to determine the probable cause of this accident.

This report was prepared from the Board's investigation and the hearing held at Memphis, Tennessee, February 22 and 23, 1944.

NARRATIVE DESCRIPTION OF FLIGHT AND ACCIDENT

American Airlines Trip 2, on a regularly scheduled transcontinental flight from Los Angeles to New York, arrived at Fort Worth at 7:18 p.m., CWT, February 10, 1944, where a routine change of crew was made. Due to the inoperative condition of the propeller de-icing equipment on the plane used between Los Angeles and Fort Worth, another DC3, NC 21767, was placed in service to continue the flight, which departed from Fort Worth at 8:20 p.m., one hour and 15 minutes behind the scheduled departure time. It departed from Little Rock at 10:56 p.m., cleared to the Memphis Airport to cruise at 5000 feet, and estimated arrival at Memphis as 11:40 p.m.

Two persons observed the airplane at a point 30 miles west of the Mississippi River, at which time the plane was on course and at a normal flight altitude. At 11:25 p.m., American's radio operator at Memphis contacted Trip 2 and requested that preparations be made to remove at Memphis one Class 4 priority passenger bound for Nashville. At 11:31 p.m., Trip 2 advised Memphis by radio the weight of the passenger and baggage to be removed. This was the last radio contact with the flight and the crew at that time gave no indication that they were encountering any difficulty. The next known point from which the aircraft was observed was $2\frac{1}{2}$ miles west of the river. This observer's attention was drawn to the airplane because of the low altitude at which it was flying. The engines sounded normal at this time. Although a careful search was made for other witnesses between the 30-mile and $2\frac{1}{2}$-mile points, none could be found. It was therefore impossible to determine at what point the airplane began to lose altitude. One mile farther on five persons heard and saw the airplane and believed, either because of its very low altitude or an unusual noise from its engines, that it was in trouble. The attention of a United States shipkeeper, on duty on a barge in the river, was attracted to the plane when it was at an altitude of approximately 200 feet and approaching the west bank of the river in a descent of approximately 20°, with its right wing slightly down. Its landing lights were off, flaps and gear retracted. The moonlight was reflected from the river which made objects clearly visible to this observer. The airplane appeared to him to come down with an "awful lot" of speed and he was certain that both engines were running at the time the airplane plunged into the river. It struck the water at a point approximately 300 yards beyond the west bank of the river and sank almost immediately. This occurred about 11:36 p.m. CWT, approximately 18 miles southwest of the Memphis Airport. The 21 passengers and three crew members were fatally injured and the aircraft was totally destroyed.

The shipkeeper on board the barge reported the accident to his chief, who notified the United States Army Engineers' Office at West Memphis, Tennessee. This office in turn notified the airport officials.

It became apparent to American Airlines personnel at Memphis that Trip 2 might have experienced some difficulty, when at 11:44 p.m. the flight then slightly overdue, did not acknowledge a special weather report which was broadcast. Trip 3, a westbound plane flying in the same area, acknowledged receipt of this weather broadcast. The weather as given in this special report for Memphis was: "Ceiling measured 3100 feet, high thin broken clouds, lower broken clouds, visibility 8 miles, light rain showers, temperature 56°, dew point 53°, surface winds south-southwest 12 m.p.h., barometer 29.82."

The United States Army Engineers, upon being notified of the accident, immediately started movement of the necessary equipment from their West Memphis Base to begin salvage operations. The first piece of wreckage recovered from the aircraft, the door to the rear cargo compartment, was found about 10:00 a.m. on February 11, and definitely established the identity of the aircraft. Salvage operations began with a United States Army Engineers' barge, using drag equipment. They were joined later by another crew, employing a steam-powered "clam shell." Assisting also in the work was a United States Coast Guard unit, employing two watercraft equippped for grappling. They searched as far as two miles down stream from the scene of the accident. The Coast Guard also made a detailed search of the river banks and recovered some of the lost baggage and equipment. After it became apparent that further search was futile, salvage operations were abandoned on the afternoon of February 21, 1944. An estimated 75% of the airplane was retrieved. The salvaged parts were in a badly mutilated condition. The work of the United States Army Engineers and Coast Guard was highly commendable in that a large amount of the wreckage was salvaged under extremely difficult conditions.

In a further effort to locate any parts of the aircraft which might have become detached in flight, an exhaustive search was conducted on February 26 over an area 1/2 mile wide by 2-1/2 miles long, immediately west of the river, over which Trip 2 had passed before it crashed into the water. This search was conducted by a large group of Boy Scouts and personnel from American and the Board. However, no parts of the airplane were found in the area.

THE BOARD'S INVESTIGATION

The Fort Worth Office of the Civil Aeronautics Board received notification at 12:30 a.m., CWT, February 11, 1944, and immediately initiated an investigation in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. (Hereinafter referred to as the Act.) Perry Hodgden, Senior Air Safety Investigator in charge of the Fort Worth Branch Office, Safety Bureau of the Board, proceeded to the scene of the accident, arriving there at 1:00 p.m., February 11, 1944. Salvage operations were already under way by the United States Army Engineers. Parts of the badly disintegrated aircraft and its equipment were under guard by the Army Engineers and were so kept until a complete examination of all wreckage recovered from the river had been made by investigators of the Board. It was estimated that about 75% of the wreckage was recovered by Monday, February 21, 1944, after which further search in the river was abandoned.

Hearing

In connection with the investigation, the Board ordered a public hearing in which W. K. Andrews, Chief, Investigation Section, Safety Bureau of the Board, served as presiding officer. This hearing was held at Memphis, Tennessee on February 22 and 23, 1944 and the following personnel of the Safety Bureau staff participated: John M. Chamberlain, Assistant

Director; Jesse K. Fenno, Chief, Investigation Division; Ralph A. Reed and Perry Hodgden, Senior Air Safety Investigators; Henry G. Boonstra, Air Safety Investigator; W. E. Koneczny, Aircraft Specialist; George M. French, Meteorological Specialist; Kenneth C. Sonner, Powerplant Specialist; and Victor M. Clark, Senior Reports Editor.

A SUMMARY AND ANALYSIS OF EVIDENCE

Air Carrier Certification Status

At the time of the accident, American Airlines, Inc., a Delaware corporation, was operating as an air carrier under proper certification. The corporation was authorized to engage in air transportation with respect to persons, property and mail between various points in the United States from Los Angeles to New York City, including Little Rock and Memphis.

Flight Personnel Employment and Experience Record

The crew of Trip 2 consisted of Dale B. Francis, captain; Raymond R. Majors, first officer; and Dovie M. Holybee, stewardess.

Captain Francis, age 39, was employed by American on March 9, 1936, was assigned as first officer on March 28, 1936, as a first officer and reserve captain on August 17, 1939, and as a captain on October 13, 1942. He held an airline transport pilot certificate with a multi-engine land, 900-2700 h.p. rating, and had accumulated about 13,050 flying hours, 7374 of which were while in the employ of American. Approximately 4798 hours of this time were on DC3 equipment. He had flown approximately 152 hours in the two months preceding the accident, and his last flight over the subject route was February 8, 1944. He had his last instrument check on December 7, 1943, and his last monthly qualification report was completed on February 1, 1944. His last physical examination, required by the Civil Air Regulations, was passed on October 12, 1943.

First Officer Majors, age 25, held a commercial pilot certificate with a single-engine land, 90-270 h.p. rating. He was employed by American on October 15, 1942, and was assigned as a first officer on February 27, 1943. He had accumulated approximately 1911 hours of flight time, about 812 of which were in DC3 equipment while in the employ of American. His last physical examination, required by the Civil Air Regulations, was passed on June 18, 1943.

Stewardess Holybee, age 25, had been in the employ of American since February 19, 1942.

The Aircraft Record

NC 21767, a Douglas DC3 twin-engined passenger plane was manufactured by the Douglas Aircraft Company in 1939 and was owned by American at the time of the accident. The last major overhaul was completed on August 17, 1943, following the aircraft's conversion from an Army cargo plane to a standard DC3. This overhaul was performed in accordance with the standards set by American and approved by the Civil Aeronautics Administration. The airplane had been flown about 10,664 hours at the time of its last overhaul and approximately 1792 hours since overhaul, for a total of 12,446 hours.

The left engine was last overhauled on December 23, 1943, and had been flown approximately 427 hours since then for a total of 10,029 hours. The right engine was last overhauled on December 24, 1943, and had been flown about 427 hours since then for a total of 9,252 hours. These overhauls were completed in accordance with standards established by American and approved by the Civil Aeronautics Administration.

The left propeller was purchased from Hamilton Standard on September 23, 1942, and was assembled, inspected, and installed by American. It had not been through overhaul since it had logged only 490 hours and 30 minutes at the time of the accident. The right propeller was purchased from Hamilton Standard on December 31, 1941. It was last overhauled on December 21, 1943, in accordance with American standards which have been approved by the Civil Aeronautics Administration, and has since logged approximately 427 hours, for a total time of 4871 hours.

Examination of the Company records revealed that the maintenance of this aircraft was satisfactory.

Weather

A very careful aftercast was made of the weather, [illegible] by pilots who flew between Memphis and Little Rock near the time of the accident. In taking into account all available information, it was concluded that icing could not have been encountered; that the only front traversed was mild; and that there were no severe local thunderstorms, only mild turbulence. It is believed that no other weather conditions existed which could have contributed to the accident. The flight was dispatched on the forecast issued by American, after having considered the forecast by the United States Weather Bureau. The Weather Bureau and Company forecasts did not differ greatly, both anticipating worse weather than that which actually existed.

Examination of the Wreckage

Aircraft and Powerplant specialists of the Board, assisted by a CAA Air Carrier Maintenance inspector and engineers of American Airlines, Wright Aeronautical Corporation and Hamilton Standard Propeller Company made detailed examinations of all the recovered parts of the aircraft, its engines and accessories. None of these examinations revealed any indication of mechanical failure.

As previously stated, extensive mangling and mutilating of the airplane occurred upon impact with the water and during the salvage process. Most of the wreckage was retrieved from the water in small pieces. The largest portion of the airplane salvaged in one piece was the tail which was attached to eight or ten feet of the fuselage. Even this was badly damaged. Undoubtedly the speed with which the airplane struck the water caused a shattering effect, which, together with the damage caused by salvage operations and the submersion, resulted in a nearly total disintegration of the plane.

A sufficient number of pieces of the right outer wing panel were recovered to account reasonably for that component. However, only a few pieces of the left outer wing could be definitely identified. The condition of the flap retracting system was conclusive evidence that the flaps were in the retracted position at the time of impact. Very little of either of the aileron structures was recovered. The aircraft was not equipped with an automatic pilot.

Most of the center section could be accounted for. The fuel tanks, although badly crumpled and broken, could be identified. The dump valve was broken and therefore its position prior to impact could not be determined. Fuel records revealed that Trip 2 had taken aboard 120 gallons of gasoline at Little Rock. This provided a total of 410 gallons and reasonably precludes the possibility that the plane could have run out of fuel. The possibility of exhausting the fuel supply in one tank before switching to another was considered. Experimental flight tests have indicated that in such an event no serious loss of altitude would be likely to occur during the interval between the time of switching to another tank and the restoration of power. However, the possibility of fuel exhaustion cannot be positively excluded.

Almost all of the tail surface parts were recovered. These had sustained appreciable damage during salvage operations. Particularly the elevators were found broken up. A detailed examination of all surfaces revealed nothing which would indicate failure or jamming in the air. All of the main surface control systems were accounted for, together with all cables, except two aileron cables which were broken at the vicinity of the center bell-crank of the right wing. The portions of cable located outboard of the center bell-crank were missing. The breaks in these cables, as well as single breaks in the rudder and elevator cables, are believed to have been caused by impact. As might be expected in a crash, some cables had jumped their pulleys. One rudder cable was found jammed between the side of the micarta pulley and its housing. It was established in collaboration with the National Bureau of Standards that in this case the jamming of the cable was either the result of impact or salvage operations. From an examination of the parts recovered, there was no evidence of malfunctioning of any part of the flight controls prior to the crash.

Both the right and left sides of the landing gear were recovered and evidence revealed that the gear was in the retracted position. Much of the instrument panel and many of the cockpit controls were not recovered. Neither of the altimeters was found. Except for the elevator tab indicator, which was found set to $1\frac{1}{2}$ degrees down, there were no significant indications from the recovered instruments.

The carbon dioxide cylinder (CO_2 bottle used for fire extinguishing) was not recovered. Although there was no evidence that the bottle had failed while in the airplane, tests made to determine the effects of the gas indicated that had the cylinder broken or been opened, no more serious effect than that of bringing tears to the eyes and a tendency toward suffocation would have occurred. This condition could readily have been discerned by the pilots and remedied promptly. This gas is non-toxic.

The oxygen bottle was recovered intact and although the valve connections had parted, allowing the oxygen to escape, there was nothing to indicate any heat or fire.

Both engines were broken free from the nacelles by the impact. The right engine was more severely damaged than the left, indicating that it had absorbed more of the initial shock of striking the water. This fact would also indicate that the plane struck the water with the right wing low, verifying witness statements that one wing was low. The right engine was recovered in three major sections. The nose section, with the propeller attached; the center or power section, with several of the cylinder heads knocked off; and the diffuser or rear section which was still attached to the motor mount. The left engine received much exterior damage but was recovered in one piece. Neither of the carburetors nor their air scoops was recovered.

The propeller blades were all separated from the hub of the left engine. Only two of these blades were recovered; however, it was definitely established through the markings and deformations that all of the blades were intact at the time of impact. The blades of the right propeller remained attached to the nose section. Following a preliminary examination at the scene of the accident, the propellers were sent to New York where the Board's Powerplant Specialist, assisted by representatives of American Hamilton Standard Propeller Company and the Civil Aeronautics Administration, determined that the pitch settings were approximately 36°. The pitch setting for normal cruising in level flight is approximately 29°. Two flight tests were made to determine the flight conditions under which a pitch angle of 36° might be obtained. Not knowing the amount of horse power being developed at the time of the accident, it is not possible to make a conclusive statement; however, it was found that the plane would necessarily have had to be traveling at cruising or higher speed, estimated to have been 165 m.p.h. at 1000 r.p.m. and in a nose-down attitude under partial power. The angles of the propeller blades and the abrasions, nicks and scratches, when compared to corresponding marks on the rocker boxes and cylinders, definitely indicate that some degree of power was being developed by both engines or that at least a high degree of rotational momentum existed at the time of impact.

The parts of both propellers were then submitted to the National Bureau of Standards to determine if there were any indications of mechanical fatigue, failure or defective workmanship. No evidence was found in these tests which would in any way indicate failure prior to impact.

The engines immediately upon being salvaged were taken by the Board's Powerplant Specialist to the Shelby County School of Aeronautics, Whitehaven, Tennessee, where they were partially dismantled and given a preliminary

examination. Later they were taken to the American Airlines shop in New York where they were given exhaustive tests, including a complete teardown inspection, under supervision of the Board's Powerplant Specialist. These tests revealed no indication of powerplant failure.

Clinging to personal luggage were two bits of feathers. According to the report of government agencies which studied the feathers, one was identified as coming from a "Lesser Scaup Duck", another from a "Snowy Owl." Neither of these types of feathers was used in the passenger pillows carried as part of the plane's equipment. It is possible that the feathers became attached to the luggage while in the water. Although these bits of feathers are not considered sufficient evidence in themselves that the airplane collided with birds, such a possibility cannot be entirely discounted.

Seventeen specimens from the airplane which warranted further study were submitted to the Federal Bureau of Investigation for analysis, but these tests also revealed no clues as to the possible cause of the accident.

Witness Statements

Eight known witnesses who observed the flight just prior to the accident, including one who saw the aircraft crash into the river, gave testimony at the hearing. All of the witnesses stated that the visibility was good, with intermittent clouds, and that the moon was visible except at short intervals. All were questioned as to whether or not they had seen or heard any mass flocks of migratory birds, or had observed other aircraft, including balloons of any sort, in the vicinity, at or near the time of the accident. All answered in the negative. From their testimony it was evident that the landing lights of the aircraft had not been turned on, that no parts were seen to fall from the airplane, and that no flames or smoke were visible to any of the witnesses, except as described by the one known witness to the actual impact with the water.

In tracing the flight along its course it was found that two witnesses observed it about 30 miles west of the river, apparently on course and at what appeared to them to be a normal altitude. Both stated that it was sometime after 11:00 p.m. The next known witness observed the flight about 2½ miles west of the scene of the accident. He stated that his attention was attracted to the airplane only on account of its unusually low altitude. He estimated the time as slightly after 11:30 p.m., adding that the airplane was headed east and that he could see the navigation lights blinking. He stated that he heard the engines and that they sounded "like it always had sounded." After the flight had proceeded approximately one mile beyond this witness, five other persons in very rapid succession heard and saw the flight, and revealed by their testimony that they thought the plane was in trouble.

Two boys, who were walking on a road, estimated the plane's altitude as 500 feet when they first observed it, and both agreed that the engines seemed to be running normally. They testified that they could not see the body of the plane but that after it had passed overhead they had remarked about the beauty of the "blinking" lights, which they described as red, green and white. Their attention was again directed to what they described

as the engines "backfiring", and that when they looked up again it "was falling . . . it went on across the levee." Both boys said it appeared to them that the plane "was going down spinning." However, after their further testimony that they had not seen the body or wings of the airplane and that all they had actually seen was the blinking lights, it seems apparent that their thought that the plane was "spinning" was an illusion. This "spinning" was not substantiated by the testimony of any other witnesses who observed the airplane at about the same time.

The next witness stated that his attention was drawn to the aircraft because "it was very low", and that when he first observed the plane the engines seemed to be operating normally. He said that suddenly "the motor cut off", and when asked if he meant both engines, he answered, "I couldn't hear anything else." The engines, he stated, then "picked back up" for "just a few seconds, and immediately after it picked back up there was loud noise . . . . roaring, bzzz and a pop off, bang, bang, right behind the noise. After it popped off the plane was headed over the levee then, and I couldn't see no more of it."

One of the last persons to see or hear the flight before it crashed into the river stated that he and his wife heard the plane "awfully low", and discussed the possibility of it hitting their house. He added that he looked out of the bedroom window and remarked to his wife that the pilot must be "having a lot of trouble." He stated that the plane was making an unusual noise, "a rattling noise", which he described as a constant banging comparable to the noise he would expect in the burning out of a connecting rod bearing in an automobile engine. He further described it "like metal hitting, just a constant noise from the motors. The motors were making unusual noise." He stated that he only got a glimpse of the plane as it passed his bedroom window, and that he did not notice the attitude of the airplane as it passed. He explained how a few seconds after it passed over his house, he heard a "terrible noise" which he believed was the airplane crashing into the river.

A United States shipkeeper, on duty on a barge tied up on the Arkansas bank of the Mississippi River, was the only known witness to the actual plunge of the plane into the river, which, he stated, occurred about 300 yards east of where he was standing. His attention was directed to the airplane when it was approximately 200 feet high and about 100 feet west of the west bank. He added that "it was a little cloudy" but that "the moon was shining." He indicated by his testimony that the visibility was good; that the moonlight was reflecting off the river; that the airplane was "coming down with an awful lot of speed", and that "it had a whistling noise something like you would set a sky rocket off." He was definite in his belief that both engines were running, and that they continued to do so until the aircraft struck the water, at an angle of about 20° with the right wing slightly lower than the left. He explained that upon impact it "exploded", and described the explosion as though "a ball of fire shot out in front of it." He declared that the aircraft sank almost immediately, adding that he "had a good clear view of it . . . . nothing was in my way."

From the testimony of the witnesses it seems reasonable to assume that the flight was proceeding normally when observed by the first two witnesses. Even though the third witness estimated that the plane might have been low,

he believed the engines sounded as though they were functioning in a usual manner. It appears evident, however, that at about the same time the boys heard the engines "backfire" and saw the airplane "falling", it was observed by the next witness who stated that "the motors cut off . . . . picked back up and the airplane disappeared over the levee." This testimony, along with the statement of the last witness who heard and saw the approach to the river and the actual crash, indicates clearly that the airplane was losing altitude with considerable forward speed and with at least some power from one or both engines until it struck the water.

DISCUSSION AND FINDINGS

The report thus far has dealt with the elimination of several of the possible causes. Other possible causes also were considered by the Board, as follows:

Every available means was used by both the government and American Airlines to determined the possibility of sabotage. All persons who had any connection with Trip 2, or its personnel prior to the flight, were investigated, including those who supplied food for the flight. No evidence was found of any form of sabotage.

An investigation was made to determine if any barrage balloons might have been in the vicinity at the time of the accident, but no record was found of any such.

In the absence of sufficient evidence supporting any one cause consideration must be given to three possibilities, all of which were given comprehensive study and none of which is sufficiently supported to exclude the other two. These are malfunctioning of the engines, jamming of the controls, and collision with birds.

Engine Malfunctioning

Some of the witnesses stated that they heard unusual sounds coming from the engines. These sounds to which the witnesses referred could have been caused by intentional manipulation of the throttles by the pilot. Had the elevator control system jammed, as discussed in the next paragraph, the pilot might have been using the throttles to assist in getting longitudinal control. As previously discussed, an exhaustive examination of the engines and engine accessories revealed no evidence of structural or functional failure. Engine malfunctioning as a possible cause in which a forced landing might be [illegible] is further discredited by the facts that the landing lights were not on, the flaps were not extended and the descent was uniform and [illegible].

Jamming of the Controls

A detailed examination of all control systems revealed no signs of any failure in flight. However, since the uniform and unchecked descent of the airplane suggests the possibility of loss of control due to some

failure of the elevator system, an exhaustive study of the system was made.

Had the pilot experienced any difficulty with longitudinal control, in all probability he would have endeavored to maintain flight altitude either by varying the power or by use of the elevator tab system. It was quite definitely established through examination of the wreckage that the elevator surfaces were working freely with respect to their hinges. Therefore, the only other possibility of failure would be in the elevator controls, such as the column, cables, pulleys, brackets, etc. If this had happened the inherent flexibility of the system probably would still allow a certain movement of the elevator surfaces by the normal use of the tabs. The actual position of the tabs could not be determined due to impact or salvage, or both. The tab indicator in the cockpit showed a $1\frac{1}{2}^{o}$ nose-down setting. In this instance the setting found corresponds to a setting which might be expected in a normal descent from cruising altitude, and therefore is considered significant. Had the pilot found it necessary to maintain altitude by means of the tabs the setting would have been nose-up. Furthermore, there was no evidence of more than normal power being applied during the period just preceding the crash.

Failure of the aileron or of the rudder systems would not render the airplane totally uncontrollable. Therefore, failure of either of these systems would not account for the actual flight path taken by the airplane prior to the crash. Simultaneous failure of the aileron and elevator systems by jamming at the control column is a reasonable possibility; moreover, any other combination of simultaneous failure would be improbable. Taking into consideration these facts, failure in any part of the flight control system appears improbable.

Collision with Birds

There is a possibility that the pilots, for some unexplained reason, became unexpectedly incapacitated. This is indicated by the fact that the pilot did not appear to attempt control of the flight path. The landing lights were not on, the flaps were retracted and flares were not being used, things which normally might be expected were the pilot attempting to land.

Consideration is therefore given to the possibility of a bird collision. There are cases on record where birds have actually penetrated the windshields of planes, as well as striking other parts of the plane, leaving dents in leading edges, nose section, and other parts of the aircraft. Pilots have been temporarily incapacitated by the impact or injured from flying glass as a result of this hazard. Up to the present time there is no record of airplanes actually crashing as a result of collision with birds. Pilots have, however, made precautionary landings after being struck by birds. Had the plane struck birds little remaining visible evidence could be expected due to the washing effect of the river. Only a very small piece from the windshield was recovered. Had several birds, such as ducks or geese, penetrated the windshield,

would have been possible for both pilots to have been temporarily incapacitated. While this general area was known to be frequented by migratory birds at that season of the year, no witnesses could be found who had observed birds flying or heard them at the time of the accident. It is not known whether both pilots were in the pilots' compartment at the time of the crash. Although collision with birds is a possibility, there is not sufficient evidence in the present record to raise such a possibility to the level of a probable cause.

The possible consequences of this type of hazard are readily understandable. The Technical Development Division of the Civil Aeronautics Administration is conducting an extensive project directed toward the development of an aircraft windshield which will withstand the impact of birds. The significance of this project increases as the speeds of aircraft increase.

With all the foregoing facts and considerations in mind the Board finds that:

1. An examination of such parts as were recovered gave no evidence of mechanical failure of the aircraft, the engines or the propellers.

2. The plane lost altitude with considerable forward speed and with at least some power from both engines until it struck the water at an angle of approximately 20°.

3. There was no fuel shortage.

4. The flight had proceeded normally up to the time of its last radio contact which was approximately 9 minutes prior to the crash.

5. When the airplane was at a point within 2½ miles of the scene of the accident it was observed flying at an altitude lower than normal for that point. There was no evidence to indicate how long the airplane had been flying at such an altitude or the reason for such low flight.

6. The weather in the area and at the time of the accident was satisfactory for contact flight.

7. The evidence indicated that no landing was being attempted at the time.

8. There was no evidence of sabotage.

9. There was no evidence of escaped barrage balloons or any other aircraft being in the vicinity at the time of the accident.

PROBABLE CAUSE

The Board is unable to determine the probable cause of this accident upon the available evidence which has been collected in the present investigation. Search for further information will continue and in the event that additional significant evidence is obtained a supplemental report will be issued.

BY THE CIVIL AERONAUTICS BOARD:

/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