

*Hughes* B 83

REPORT OF THE CIVIL AERONAUTICS BOARD

Of the investigation of an accident involving civil aircraft of the United States NC 17315 which occurred near Robertson, Missouri, on January 23, 1944.

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CONDUCT OF INVESTIGATION

An accident involving aircraft NC 17315, while operating in scheduled air carrier service between Los Angeles, California, and New York, New York, as Trip 6 of Transcontinental and Western Air, Inc., (hereinafter referred to as "TWA") occurred in the vicinity of Robertson, Missouri, on January 23, 1941, about 4:13 a.m. (CST). The accident resulted in the destruction of the airplane, fatal injuries to one passenger and one member of the crew, serious injuries to four passengers and one member of the crew, and minor injuries to six passengers and one member of the crew. The accident was reported to the Kansas City, Missouri, office of the Civil Aeronautics Board (hereinafter referred to as the "Board") about 4:45 a.m., January 23, by a representative of TWA.

Inspection and Preservation of Wreckage

Immediately after receiving this notification the Board initiated an investigation of the accident in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. An accident investigator of the Board arrived at the Lambert-St. Louis Airport early on the morning of January 23, 1941, and immediately proceeded to the scene of the accident. In accordance with the instructions of the Board, the damaged airplane had been placed under guard and the airplane had not been disturbed except for the damage necessarily incurred in removing some of the passengers from the cabin. Additional investigators of the Board

arrived that afternoon and a thorough examination of the wreckage was started.

The engines, propellers, radio equipment and certain other accessories of the airplane were removed from the scene of the accident to the TWA maintenance shop at Kansas City, Missouri, in order that a more adequate inspection might be made. During the transportation of this equipment it was constantly in the custody of an investigator of the Board. The disassembly and inspection of the engines and other equipment were made under the direct supervision of the Board's power plant engineer.

The inspection of all parts of the aircraft was completed by the Board on February 1, 1941, and aircraft NC 17315 was accordingly released to TWA.

#### Public Hearing

In connection with the investigation of the accident, a public hearing was held at St. Louis, Missouri, beginning on January 30, and continuing through February 1, 1941. G. Grant Mason, Jr., one of the five Members of the Board, was designated by the Board to preside at the hearing. He was assisted by Robert W. Chrisp, Attorney of the Board, who acted as Associate Examiner; Jerome Lederer, Director of the Safety Bureau of the Board; Frank E. Caldwell, Chief, Investigation Division of the Safety Bureau; and Paul A. Gareau, Air Safety Specialist in Meteorology of the Safety Bureau.

At the hearing all the evidence then available to the Board was presented, 72 exhibits were introduced, and 39 witnesses testified

including witnesses from the vicinity of the accident and experts in various technical subjects involved in the investigation. Depositions of five passengers on board the airplane at the time of the accident and the two surviving members of the crew were read into the record at the hearing.

While the Examiners and the representatives of the Safety Bureau were the only ones designated to ask questions directly of any witness, the Presiding Examiner, acting under instruction of the Board, announced at the opening of the hearing that any person who had any evidence, questions, or suggestions to present for consideration in the proceeding, might submit them to the Examiners. Forty-seven questions were submitted and at the close of the hearing the Presiding Examiner announced that every question submitted had been asked unless the subject matter of the question had previously been covered by the testimony.

Upon the basis of all the evidence accumulated in the investigation and hearing, the Board now makes its report in accordance with the provisions of the Civil Aeronautics Act of 1938, as amended.

## II.

### SUMMARY AND ANALYSIS OF EVIDENCE

#### Air Carrier

Transcontinental and Western Air, Inc., a Delaware corporation, was operating at the time of the accident 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. These certificates authorized it to engage in air transportation with respect to persons, property and mail between various points, including Los Angeles, California, and New York, New York, via Winslow, Arizona; Albuquerque, New Mexico; Kansas City, Missouri; St. Louis, Missouri; Indianapolis, Indiana; and Pittsburgh, Pennsylvania. The company is also authorized to operate over an alternate route when weather conditions prevent safe operation over the regular route.

#### Flight Personnel

On the flight in question the crew consisted of Captain P. T. W. Scott, First Officer O. J. DiGuardi, and Air Hostess Mary T. Eshbach.

Captain Scott, aged 36, had accumulated a total of 9,711 hours flying time, of which approximately 2,338 hours were in Douglas DC-3 type airplanes. His last physical examination required by the Civil Air Regulations was taken on January 8, 1941, and showed him to be in satisfactory physical condition. Captain Scott, in accordance with company policy, had been given refresher flight checks from time to time which included the operation of DC-3 airplanes and instrument procedures over the Kansas City-St. Louis-Indianapolis-Pittsburgh-New York route. The results of these tests as shown by company records indicated that he was a well qualified and proficient pilot. The records also showed that Captain Scott had been employed by TWA and its predecessors since December 1, 1932, and with the exception of occasional co-pilot trips over

other routes, he had operated over the route involved since the date of his employment.

First Officer C. J. DioGuardi, aged 28, had accumulated at the time of the accident approximately 1,505 hours of flying time, of which 129 hours had been as co-pilot in Douglas DC-3 type airplanes. His last physical examination required by the Civil Air Regulations was taken in September, 1940, and showed him to be in a satisfactory physical condition. He had been employed by TWA since August 1, 1940.

Both pilots had just completed a 24-hour rest period prior to going on duty on January 23, 1941. Thus, it appears from the evidence that both Captain Scott and First Officer DioGuardi were physically qualified, held the proper certificates of competency, and by reason of their training and experience, were qualified for the flight and equipment involved.

Miss Mary T. Eshbach, R.N., aged 24, of Jackson Heights, New York, has been employed by TWA since February 23, 1939. She graduated from St. Mary's Hospital, St. Louis, Missouri, in June, 1937, and after satisfactorily completing the company hostess training course, was placed on duty as an air hostess on February 23, 1939.

#### Airplane and Equipment

Airplane NC 17315 was a Douglas model DC-3-B, manufactured by the Douglas Aircraft Corporation of Santa Monica, California, and was purchased by TWA on May 28, 1937. It was powered with two Wright

Cyclone-60102 engines, each rated at 1100 horsepower for take-off, and was equipped with Hamilton Standard constant speed, hydromatic, full feathering propellers, Hub Models left propeller 23 E 50-47, and right propeller 23 E 50-35. The blade design for both propellers was No. 6153A-18. This model aircraft and its equipment had been approved by the Civil Aeronautics Authority for air carrier operation over routes flown by TWA for 23 passengers and a crew of three. This particular airplane, however, was one of a group designed as a combination club seat and sky sleeper with berth sections in the forward part of the cabin and seats to the rear. At night when the berths are used, the airplane carries a normal complement of 15 passengers, accommodating 8 passengers in the berth sections and 7 passengers in the club seats. The airplane had been certificated for operation with a standard gross weight of 24,400 pounds and a provisional gross weight of 24,800 pounds. At the time of departure of Trip 6 from Kansas City, the gross weight of the airplane was approximately 24,475 pounds, including mail, cargo, 611 gallons of fuel, 53 gallons of oil, 11 passengers, and a crew of three. The record shows that the airplane was loaded in accordance with the current approved loading schedule prescribed by the Civil Aeronautics Administration and which was attached to the airworthiness certificate of the airplane.

The airplane and its equipment had received the overhauls, periodic inspections, and checks which are provided for in company practice and approved by the Civil Aeronautics Administration.

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1/ See footnote 12 on page 23.



History of the Flight

Trip 6 originated at Los Angeles, California, and departed the Union Air Terminal on January 22 about 1:10 p.m. (PST). Due to weather conditions prevailing, the flight was dispatched over an alternate route to Kansas City via Phoenix, Arizona; El Paso, Texas; Albuquerque, New Mexico; and Amarillo, Texas. Since this alternate route required considerably more time to traverse than the regular route, the flight arrived in Kansas City at 2:08 a.m., January 23, which was approximately two hours and 16 minutes behind schedule. In accordance with the usual procedure, a different crew, consisting of Captain Scott, First Officer DioGuardi, and Air Hostess Eshbach, took charge of the airplane for the remainder of the flight to New York, City.

The flight plan for Trip 6 from Kansas City to New York, which had been prepared by First Officer DioGuardi under the supervision of Captain Scott and approved by the TWA flight superintendent on duty at Kansas City, provided for intermediate stops at St. Louis, Missouri; Indianapolis, Indiana; and Pittsburgh, Pennsylvania. Prior to the filing of the flight plan, Captain Scott conferred with the company meteorologist and flight superintendent and after discussing weather conditions over the route to be flown, he prepared a weather analysis for the flight.

Trip 6 was rescheduled to leave the Kansas City Municipal Airport at 2:26 a.m. (CST) and in accordance with the regular company procedure was cleared by the company flight superintendent at Kansas City for an instrument flight to St. Louis. The clearance was

based on current United States Weather Bureau sequence weather reports, forecasts, and a trip forecast made by the company meteorologist. The pilot's flight plan called for a cruising altitude of 7,000 feet and the flight was cleared in accordance with that plan by Airway Traffic Control at Kansas City.<sup>2/</sup> The estimated total time from Kansas City to St. Louis, including taxiing, was 1 hour and 24 minutes, and Indianapolis, Indiana, was designated as the alternate airport.

Available weather reports showed that a general overcast condition prevailed over the entire route between Kansas City and St. Louis with precipitation in the form of snow over western Missouri changing to drizzle eastward. The ceiling at Kansas City was estimated to be 900 feet and visibility one and one-fourth miles with a moderate snow falling. Intermediate weather reports at Marshall, Columbia, and New Florence, Missouri, indicated average ceilings from 400 to 1200 feet and visibility ranged from one and one-half miles to five miles. The ceiling at St. Louis was estimated to be 800 feet, variable, overcast, lower broken, visibility 3 miles, light drizzle, light fog, scattered clouds at 500 feet. The weather at Indianapolis, the alternate airport for St. Louis, was overcast, ceiling 2000 feet, and visibility unlimited.

The trip departed from the ramp at the Kansas City Municipal Airport at 2:40 a.m., having been delayed by Captain Scott on account of last minute weather checks and in order that the ground crew might

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<sup>2/</sup> The Airway Traffic Control staff, a part of the Civil Aeronautics Administration, regulates the flow of traffic over the civil airways during instrument weather conditions in order to eliminate the possibility of collision between aircraft. Before flying on a civil airway under instrument weather conditions, approval must be secured from Airway Traffic Control for the flight, including the altitude at which it is to be flown.

C O R R E C T I O N

In Report of the Civil Aeronautics Board  
Of the investigation of an accident  
involving civil aircraft of the United  
States NC 17315 (Transcontinental &  
Western Air, Inc.) which occurred near  
Robertson, Missouri, on January 23, 1941.

In last line, middle paragraph, Page 8, there is a typographical  
error indicating that the ceiling at Indianapolis was 200 feet,  
and the ceiling was actually 2000 feet.

clean off snow which had accumulated on the wings, tail, and control surfaces of the airplane while it was on the ground. After taxiing out for the take-off, the airplane was returned to the ramp to pick up a passenger who inadvertently had been left at the terminal. Actual take-off was then made at 2:44 a.m.

According to the testimony of First Officer DiGuardi, the flight proceeded normally, making a radio position report over Higginsville (47 miles from Kansas City) at 7,000 feet on instruments at 3:01 a.m. As the flight progressed toward St. Louis a radio position report was made over Columbia Missouri, (118 miles from Kansas City) at 3:25 a.m., while flying between layers of clouds, and the flight remained between layers of clouds until it passed over New Florence, Missouri, (49 miles from St. Louis) at 3:42 a.m. When Trip 6 reported over New Florence, the TWA operator at St. Louis transmitted to the flight the following 3:35 a.m. Weather Bureau observation: "St. Louis 600 feet, variable, overcast, lower broken clouds, visibility two miles, light drizzle, light fog, temperature 32, dew point 31, wind northwest 4, barometer 30.20, scattered clouds at 300 feet." Captain Scott started his descent at this point and passed over Weldon Springs, Missouri (20 miles from St. Louis) at 3:55 a.m. on instruments at 3,000 feet. Airway Traffic Control through the TWA radio operator then gave Trip 6 a traffic clearance to the St. Louis control tower.<sup>3/</sup>

The flight continued to descend and at 4:04 a.m. passed over the St. Louis radio range station on the initial approach, flying in an easterly direction at an altitude of 1,700 feet above sea level.

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<sup>3/</sup> The basic responsibility of Airway Traffic Control is to prevent collisions between aircraft operating under instrument conditions. They have no further responsibility for the safety of the flight. Decisions on whether a flight is advisable or may be made with safety under existing weather conditions are the responsibility of the pilot and the air carrier dispatcher.

on instruments. At this time a special United States Weather Bureau observation taken at St. Louis at 3:55 a.m. was transmitted to the flight by the TWA radio operator on duty at St. Louis and an acknowledgment was received from First Officer DioGuardi.

The weather as broadcast was as follows: "Special - sky overcast, lower broken, ceiling 500 feet, variable, visibility one and one-half miles, light drizzle, light fog, 1023.7 millibars, temperature 32 degrees, dew point 31, wind NNE 5 m.p.h., barometer 30.20, scattered clouds at 200 feet." Immediately afterwards the St. Louis TWA altimeter setting of 30.20 was given to the flight and was acknowledged by DioGuardi. Upon receipt of this information, he advised Captain Scott accordingly and they set the barometric scales on both of the altimeters to read 30.20.

After passing over the range station on the initial approach, Captain Scott executed a standard instrument let-down-through procedure. The final approach to the airport was made in a westerly direction with the intention of landing on the east-west No. 1 runway. At 4:10 a.m. while Captain Scott was making his final approach and was still on instruments, the Civil Aeronautics Communication operator on duty at St. Louis broadcast over the simultaneous St. Louis radio range a 4:09 a.m. special weather report as reported by the United States Weather Bureau at that station. This report indicated a ceiling

of 400 feet, variable, visibility two miles, light drizzle, light fog, temperature 32 degrees, dew point 31, wind ~~NNE~~ 5 m.p.h., barometer 30.20, scattered clouds at 200 feet. <sup>4/</sup> First Officer DioGuardi stated that he had his receiver tuned to the company frequency and did not receive this report; however, Captain Scott had both of his receivers tuned to the St. Louis radio range. The evidence indicates that he was listening to the simultaneous range and voice broadcast and therefore it is presumed that he received this report.

The final stages of the flight are described in detail in the testimony of First Officer DioGuardi and of witnesses on the ground. The First Officer said, "We hit the range station at 3:04 <sup>5/</sup> 4:04 a.m. CST and Captain Scott ordered the gear down. He made the procedure turn and came over the cone again and the approach was one of the best I have ever seen with any Captain. We descended with reduced power to the airport from the range station and suddenly, of course, the neon approach lights started to show out as we descended from the overcast." <sup>6/</sup> He estimated, but could not state definitely, that the altitude of the plane was approximately 300 feet above the ground when it broke out of the overcast. At this time he saw the neon lights. The flight broke out of the overcast at 4:12 a.m.

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<sup>4/</sup> In accordance with standards set forth in the Civil Air Regulations, specific weather minimums for each airport are prescribed by the Civil Aeronautics Administration in weather letters of competency. The weather minimums for TWA at Lambert-St. Louis Airport were on the date of the accident a 400-foot ceiling and one mile visibility.

<sup>5/</sup> The cockpit clock was not changed from Mountain Time by the new crew that took over at Kansas City.

<sup>6/</sup> The red neon approach lights extend in a straight line approximately 1,500 feet east of the eastern boundary of the airport. These lights assist the pilot in lining up for a landing on No. 1 runway.

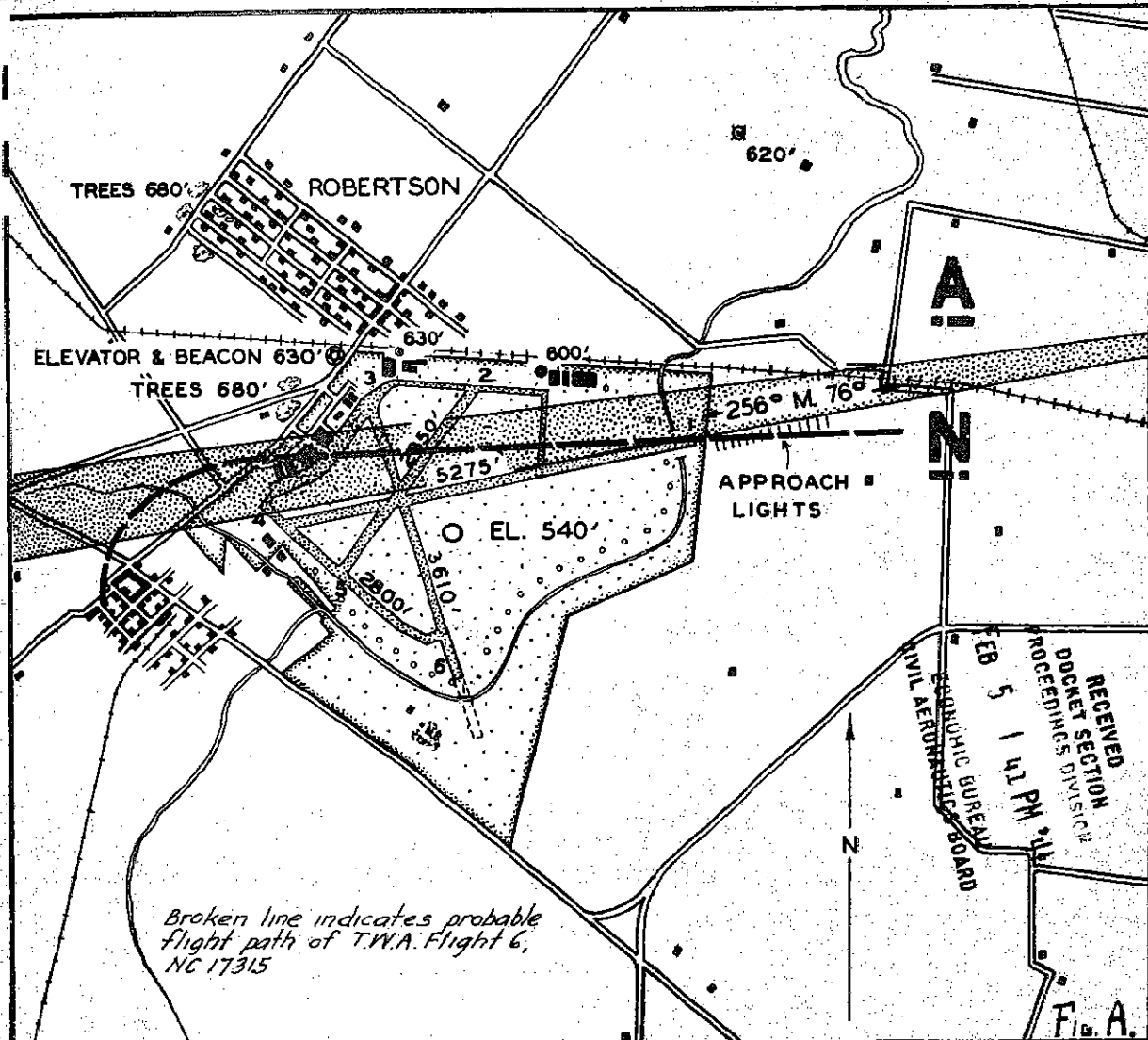
According to the testimony of DioGuardi, immediately after breaking out of the overcast, Captain Scott gave the command, "Flaps down"; however before DioGuardi could execute this order, the Captain ordered, "Flaps up." When DioGuardi was questioned concerning this sudden change in the Captain's decision, he stated, "I believe he was sure he was a little bit too high for a ship landing on No. 1 runway." This was substantiated by the fact that the Captain immediately after ordering flaps up, applied sufficient power to the engines to maintain level flight. The airplane crossed the east end of runway No. 1 <sup>1</sup> diagonally from the south side to the north side of the runway and continued in a straight flight path across the airport. DioGuardi stated that he could see the Administration Building on his right as the airplane passed over the airport.

The two control tower operators on duty in the tower at the airport and four TWA employees who were standing on the ramp in front of the Administration Building stated that the airplane became visible to them a short distance east of the field and in the vicinity of the neon approach lights. The airport boundary lights and the obstruction lights were on and the visibility light located two miles south of the airport was observed by the control tower operators. As the airplane continued across the airport at an estimated speed of 110 to 120 m.p.h. in level flight, it was observed that the landing gear was down and the flaps were in the "up" position.

The red (left wing), green (right wing) and white (tail) navigation lights were clearly visible but the airplane's landing

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7/ See sketch of Lambert-St. Louis Airport on opposite page showing the probable flight path of the airplane. (Figure A)



### INSTRUMENT APPROACH PROCEDURE SUMMARY

1. Initial approach will be made at 1600'.
2. On arrival over LS cone proceed out East leg (069°) for 4 minutes and/or 10 miles. Maintaining 1600' make procedure turn on south side of east leg.
3. On final approach East leg (249°) establish compass heading descending to min. ind. alt. of 1100' until cone is passed.
4. After passing cone change course 7° right and proceed out West leg (256°) descending to 940 feet.
5. Plane should be over field approximately 1 minute 20 seconds after passing cone.
6. If unable obtain ground contact at 940' within 1 min. 30 sec. after passing cone, climb to 1600' and head back toward station on West leg of radio range (076°).

AIRPORT TRAFFIC CONTROL BOARD

**CAUTION**

DOCKET No. 30-32 EXHIBIT No. 70

WITNESS: Collins

DATE: 2-1-41

LAMBERT-ST. LOUIS AIRPORT

SCALE 1" = 2000'

ALL ELEVATIONS ABOVE SEA LEVEL

LAT. 38 - 45 N. LONG. 90 - 25 W.

DRAWN BY R.L.S. CHECKED BY [Signature]

APPROVED [Signature] REV. DATE JAN. 25, 1940



lights were off. They further stated that the engines appeared to be operating normally. The witnesses said the plane did not fly through or above any lower scattered clouds after it became visible to them. The estimates made by these six witnesses of the altitude of the plane as it crossed the airport ranged from 300 to 350 feet. However, from the reactions of five of these witnesses who observed simulated flights made four days after the accident, it appears that the altitude of Trip 6 as it crossed the airport was no more than 200 feet.<sup>8/</sup> Although the TWA personnel on the ramp lost sight of the airplane as it passed beyond the Robertson Hangar on the west side of the airport, the navigation lights were still clearly visible to the operators in the control tower.

Immediately after passing the west boundary of the airport, Captain Scott started a left turn, apparently for the purpose of making a landing from south to north on No. 6 runway. The sequence of events

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<sup>8/</sup> On January 27, 1941, four flights were made in a Douglas DC-3 similar to the airplane involved in the accident to simulate as closely as possible the flight path and flight altitude of Trip 6 as it crossed the airport. The first flight was made at an altitude of 350 feet, the second flight at 300 feet, and the third and fourth flights at 200 feet. These flights were observed by the two control tower operators from the control tower and were observed from the ramp by three of the four TWA employees who had seen Trip 6 pass across the airport on the morning of the accident. These five witnesses were not informed at any time before the hearing at what altitudes these four flights were flown. The control tower operators advised that the second flight was approximately the altitude being flown by Trip 6. The three TWA employees on the ramp selected the third and fourth flights as approximating the altitude of Trip 6; they observed that the fourth flight most nearly simulated the flight path of Trip 6 and the airplane while on this flight disappeared from view behind the hangar at the west end of the field as had trip 6, whereas the other three simulated flights did not. In view of this fact, it seems certain that Trip 6 was at an altitude of not more than 200 feet.

immediately following this left turn is best related by First Officer DiGuardi who was sitting on the right side of the pilots' cockpit. He said: "While in this bank we apparently brushed what I know now was trees. Captain Scott immediately before or just about the time we hit these trees, applied full power immediately. The airplane was then out of control and Captain Scott tried to bank the airplane back to level flight but it was impossible . . . . As a matter of fact I myself helped him on the controls in an effort to return . . . to level flight because the airplane was really out of control and the wheel was all the way to the right but was very hard to keep there."

Russell L. Biermann, one of the control tower operators on duty at the airport at the time of the accident, testified at the hearing that he was watching the lights on the airplane when it passed beyond the west boundary of the airport. He said, "About a quarter of a mile after he passed over the west edge of the field, he began to circle to the left to make an approach in on runway No. 6; of course, when I speak of the airplane, I am speaking of seeing his lights . . . shortly after the turn was begun I noticed the white light began to descend slightly to the left and the red navigation light became slightly visible. Then at almost the same instant the pilot applied what seemed to be full power with his engine . . . the noise was increased three or four times to what it was when he went over the field, and the white light and the red light descended quite a bit and then the red light went out and the

white light moved abruptly to the left and slightly up and then slightly to the right, and proceeded straight ahead as if the ship had been taken from the left bank into a right bank, and then leveled out and the light disappeared behind the trees."

The evidence shows that while in the left turn the airplane first made contact with a tree which is located 2,200 feet southwest of the end of runway No. 4. There were small branches broken from the top of this tree, which was 113 feet above the level of the airport.<sup>9/</sup> The airplane then careened through several other trees, tearing off a part of the left stabilizer and the elevators from the tail. Approximately 18 feet of the left wing was torn off and remained in a tree, the top of which was 104 feet above the level of the airport. The flight path as marked on the trees beyond the one in which the wing was found, and on the ground, indicates that the plane was in a vertical or beyond-vertical bank to the left and was traveling in a straight line. Just before the airplane came to rest it struck a high tension line and pole and the fuselage was broken in two near the center of the cabin. It is apparent from the manner in which the fuselage struck the high tension line pole and from the position in which the airplane came to rest on the ground that the plane was cartwheeling during the last portion of its travel before coming to rest. The distance from the point where the airplane struck the first tree to where it came to rest was 463 feet. The flight path was definitely indicated by markings on the ground and trees and

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<sup>9/</sup> The elevation of the Lambert-St. Louis Airport is 540 feet above sea level.

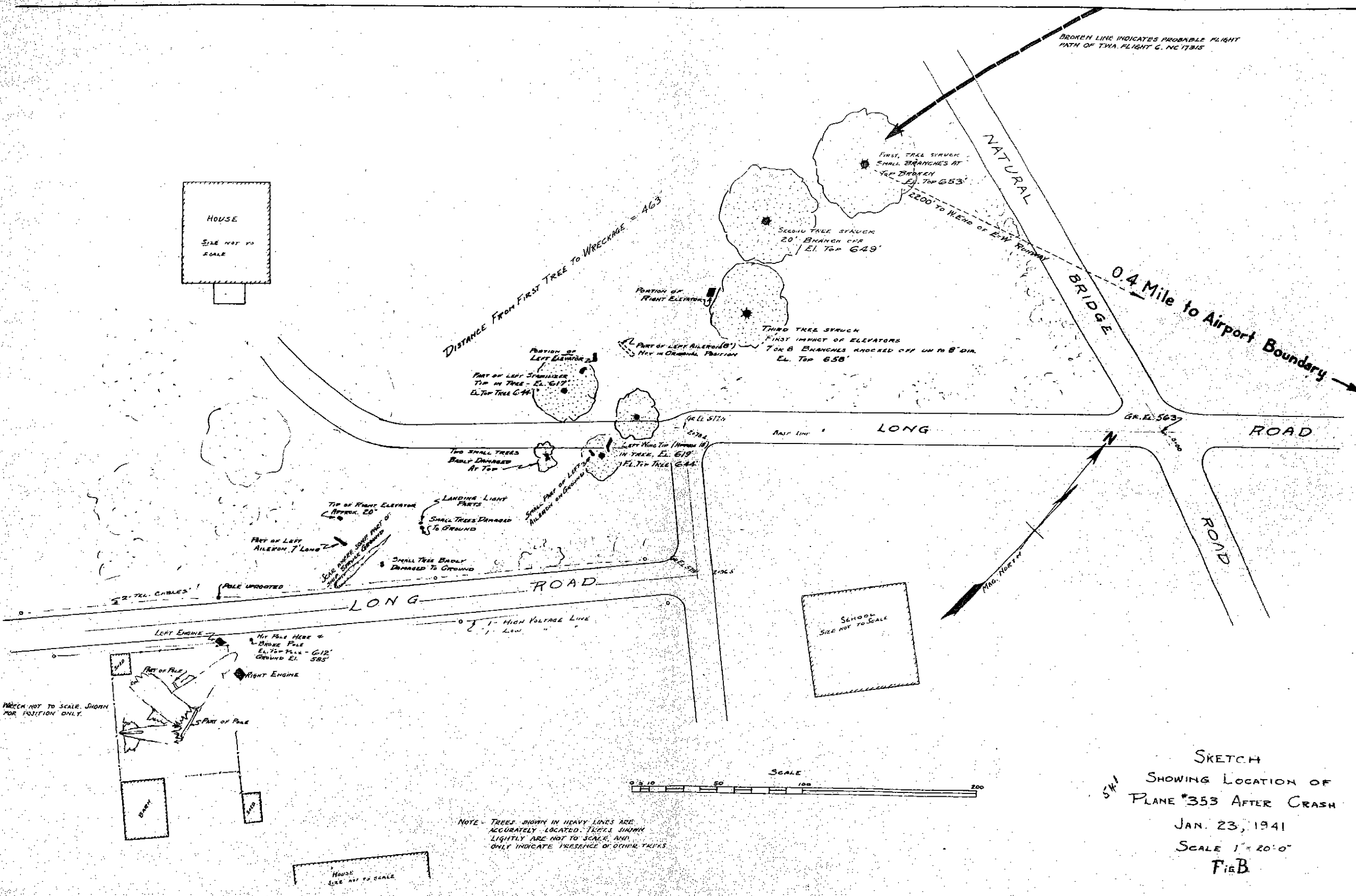
shows that the plane traveled in almost a straight line toward the south for this entire distance. <sup>10/</sup> Although small fires were started when the broken high tension line came in contact with one of the engines on the ground, they were quickly extinguished by ground crews from the airport who arrived at the scene a few minutes after the accident occurred.

Mr. Ralph W. Page, Manager of the Lambert-St. Louis Airport, and Mr. Charles Sessions, Station Manager for TWA at St. Louis, testified that they arrived at the scene within a few minutes after the accident occurred. They stated that they immediately inspected the airplane and control surfaces for indications of ice, but did not find any. Moreover, there was no ice on the ground and a drizzling rain was falling at the time. Several other witnesses who testified corroborated the testimony of Mr. Page and Mr. Sessions.

It was evident that no ice formed on the airplane during the flight from Kansas City. First Officer DioGuardi stated that he recorded outside air temperatures of 25 to 26 degrees at cruising levels and outside temperatures recorded on descent after passing New Florence were 32 degrees at 6,000 feet to 25 degrees at 3,000 feet. He said no ice formed on the airplane during cruising flight, descent, or in making the final approach at St. Louis. Joseph H. Washburn, Manager, Photographic Department, Lockheed Aircraft Corporation, Burbank, California, who was a passenger on board

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<sup>10/</sup> See Figure B, sketch of wreckage.



BROKEN LINE INDICATES PROBABLE FLIGHT PATH OF TWA FLIGHT C. NC 17815

NATURAL BRIDGE

0.4 Mile to Airport Boundary

ROAD

LONG ROAD

LONG ROAD

SCHOOL  
SIZE NOT TO SCALE

HOUSE  
SIZE NOT TO SCALE

WRECK NOT TO SCALE, SHOWN FOR POSITION ONLY.

LEFT ENGINE  
RIGHT ENGINE  
PART OF FUSELAGE  
PART OF FUSELAGE  
PART OF FUSELAGE  
PART OF FUSELAGE

HOUSE  
SIZE NOT TO SCALE

DISTANCE FROM FIRST TREE TO WRECKAGE = 463'

PORTION OF LEFT ELEVATOR  
PART OF LEFT STRUTTER  
TIP IN TREE - EL. 612'  
EL. TOP TREE 644'

PORTION OF RIGHT ELEVATOR  
PART OF LEFT AILERON (8')  
NOT IN ORIGINAL POSITION

FIRST TREE STRUCK  
SMALL BRANCHES AT 653'  
EL. TOP 653'

SECOND TREE STRUCK  
20' BRANCH CUT  
EL. TOP 649'

THIRD TREE STRUCK  
FIRST IMPACT OF ELEVATORS  
TORN BRANCHES KNOCKED OFF UP TO 8" DIA.  
EL. TOP 658'

TWO SMALL TREES BADLY DAMAGED AT TOP  
TIP OF FRONT ELEVATOR APPROX. 20'  
PART OF LEFT AILERON 7' LONG  
SMALL PART OF LEFT AILERON ON GROUND  
LANDING LIGHT PARTS  
SMALL TREES DAMAGED TO GROUND  
SMALL TREE BADLY DAMAGED TO GROUND

SCALE  
0 50 100 200

NOTE - TREES SHOWN IN HEAVY LINES ARE ACCURATELY LOCATED. TREES SHOWN LIGHTLY ARE NOT TO SCALE AND ONLY INDICATE PRESENCE OF OTHER TREES

SKETCH  
SHOWING LOCATION OF  
PLANE #353 AFTER CRASH  
JAN. 23, 1941  
SCALE 1" = 20' 0"  
FIG. B

Trip 6, stated that from his seat in the airplane he could see the upper part of the leading edge of the right wing and that he saw no indication of ice at any time on the trip from Kansas City to St. Louis.

An examination was made of the wreckage of NC 17315, including the engines, propellers, instruments, radio equipment, controls and other parts of the aircraft by representatives of the Civil Aeronautics Board, the Civil Aeronautics Administration, and TWA. The results of this examination showed that there was no structural or mechanical failure of the airplane prior to the time it contacted the trees southwest of the airport. All of the evidence indicates that considerable power was being developed from each engine at the time it struck some of the trees, but does not indicate that any appreciable amount of power was being used at the time the engine struck the ground. The master ignition switch was found in the "off" position with each of the individual engine ignition switches in the "on" position. It was not possible to determine whether the master switch had been pulled prior to the time the airplane finally came to rest, or whether its position resulted from the impact.

Only one altimeter face (No. 176BH-031-399), the one which was installed in the Captain's flight panel, was located after the accident. The hands had been broken off and it was thus impossible to determine the reading at the time of impact. Although the barometric scale on this altimeter was found after the accident to be set at 30.18, which was .02 of an inch lower than the setting received by the First Officer from the TWA radio operator at 4:04 A. M., it was impossible to determine whether this discrepancy resulted from an improper setting or from the impact.

The records show that the St. Louis radio range was monitored continuously by the Civil Aeronautics Communications Station at St. Louis, and hourly by the Communications Stations at New Florence, Missouri; Rolla, Missouri; and Effingham, Illinois. There was no evidence from any source that the St. Louis radio range was not operating normally.

An investigation of all weather services involved disclosed that the forecasts and other weather advices made available to the pilot prior to departure were substantially accurate. The official observational facilities maintained at St. Louis functioned in an entirely normal manner throughout the flight. The observer on duty conformed at all times with the approved practices and carried out his duties adequately.

#### Conduct of the Flight

The dispatching of the flight from Kansas City was in accordance with proper procedure. Captain Scott discussed the weather conditions with the company flight superintendent and meteorologist prior to departure from Kansas City and was at the time of departure fully cognizant of the fact that both the ceiling and the visibility in the vicinity of St. Louis were expected to lower. It is to be noted that the ceiling at St. Louis at this time was 800 feet, visibility three miles, with scattered clouds at 500 feet. That the ceiling and the visibility at St. Louis were actually lowering was brought to Captain Scott's attention by broadcasts which he received during the flight. At 3:42 a.m. when he received a weather broadcast over

New Florence, Missouri, the ceiling at St. Louis had lowered to 600 feet, visibility two miles, with scattered clouds at 300 feet. The 3:55 a.m. St. Louis weather report which was broadcast to the Captain at 4:04 a.m. indicated a ceiling of 500 feet, visibility one and one-half miles, with scattered clouds at 200 feet. These weather reports were broadcast to Trip 6 by the TWA radio operator on duty at St. Louis. The 4:09 a.m. Weather Bureau report, which was broadcast at 4:10 a.m. over the simultaneous St. Louis radio range, indicated a ceiling of 400 feet, variable, visibility two miles, light drizzle, light fog, wind NNE 5 m.p.h., with scattered clouds at 200 feet.

In view of the fact that the pilot knew that the weather was showing a definite downward trend and that the last report received by him indicated that the ceiling had reached the minimum of 400 feet prescribed by the Civil Aeronautics Administration and was variable, Captain Scott should have exercised the utmost caution during the final approach not to descend below that minimum in order to break out under the overcast. Captain Scott apparently did not exercise that degree of caution. First Officer Dioguardi estimated that at the time the airplane broke out of the overcast its altitude was approximately 300 feet above the ground. Captain Scott, upon discovering that the overcast extended below the approved minimum altitude of 400 feet, had a clear duty to apply power and proceed to his alternate airport instead of continuing with his landing approach.

It is reasonable to believe that Captain Scott first intended to land on the No. 1 runway but that, after breaking out of the



overcast at a point too close to the airport and too high to effect a normal landing on No. 1 runway, he proceeded across the airport with the intention of circling to the left for a landing on No. 6. Witnesses in the control tower and on the ground testified that the airplane flew across the airport at an altitude which did not vary to any noticeable extent and during that time the lights of the airplane were clearly and constantly visible, unobscured by scattered clouds or scud. If any of the scattered clouds reported to be at 200 feet were in the flight path of Trip 6, the testimony of the eye witnesses indicates that the airplane flew across the field at an altitude below 200 feet. As already mentioned (page 13) the evidence derived from subsequent simulated flights, although undertaken by daylight with consequent possibility of error by the witnesses, indicated that Trip 6 was no higher than 200 feet above the airport and the testimony given by the surviving passengers is not in conflict with this. Since the area west and southwest of the airport is thinly populated and devoid of visible landmarks at night, it is obvious that Captain Scott planned to remain underneath the overcast during the turn rather than to pull up into the overcast, thereby necessitating another instrument approach or proceeding to his alternate.

Captain Scott had years of experience as an airline pilot on the type of equipment involved and had been flying into St. Louis since 1933. During this time it is certain that he became well acquainted with the conditions at the Lambert-St. Louis Airport and was well aware of all obstructions in the immediate vicinity. Nevertheless, Captain Scott flew the airplane at an altitude too low to clear the trees.

The first tree struck by the airplane as it was circling the field in order to land on No. 6 runway extended three feet into a 20 to 1 glide path to one of the other runways, No. 4. Since there does not appear to be any excusable reason for Pilot Scott's circling the field toward runway No. 6 at such a low altitude, the failure to place an obstruction light on this tree cannot be held to be a cause of the accident. The accident, however, raises the question whether a dangerous obstruction did, at the time, exist for any plane which might have been using No. 4 runway.

The Civil Aeronautics Authority in its report to Congress dated 11/ March 23, 1939, in recommending Federal participation in the development

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11/ "Control of the surroundings is one of the major necessities of sound airport development, yet it seems to have been one of the least regarded of matters. Most airports are left with no protection whatever for their approaches.

"About half of the States have adopted laws giving cities or counties the right to purchase land and if necessary to acquire it by condemnation for airport purposes, either for original establishment or for later improvement and enlargement, and also to use either negotiation or condemnation in acquiring rights in the air space surrounding the airport as an assurance against its invasion by obstructions. The procedure of acquiring air rights has, however, been little used. . .

"There is the alternative of zoning, which is the simplest solution, avoiding separate dealings with a multitude of property holders, and therefore the most satisfactory way that can be adopted, but little has been done with that. Only nine States, all of them east of the Mississippi, have airport zoning statutes of any kind; though to be sure some others appear able to act under a general power extending to all public purposes. . .

"This is a chapter of factual record, and no argument is interposed here on the broad question of zoning policy and the desirability of the extension of zoning to new objects; but it is part of the essential fact of the present status of the American airport system that the possibility of safe and efficient use of an airport is entirely dependent on its surroundings, and that few communities have so far adopted any measures to protect airports against the erection of high neighboring structures that would seriously impair their value."  
(House Document No. 245, 76th Congress, 1st Session.)

and improvement of an adequate national system of airports, discussed at length the problem of hazards around airports and, in particular, obstructions which constitute definite hazards in the line of approach to runways. The Administrator at the present time has no power to require the marking of obstructions, except indirectly through his exercise of the power to restrict air carrier operations into an airport. The City of St. Louis owns and operates the Municipal Airport, but the land on which these trees stand is privately owned.

While the failure to have the tree obstruction lighted cannot be reasonably held in any way responsible for this accident and while it has not caused any accident to airplanes approaching No. 4 runway, it appears desirable to the Board that the group of trees of which this one was a part should, in the interest of the greatest degree of safety, be removed, trimmed or lighted in the future.

### III.

#### CONCLUSION

##### Findings

We find, upon all of the evidence available to the Board at this time, that the facts relating to the accident involving NC 17315, which occurred near Robertson, Missouri, on January 23, 1941, are as follows:

1. The accident which occurred at approximately 4:15 A. M., January 23, 1941, to TWA's Trip 6 of that date, resulted in major damage to aircraft NC 17315, fatal injuries to one passenger and one member of the crew, serious injuries to four passengers and one member of the crew, and minor injuries to six passengers and one member of the crew.

2. At the time of the accident, TWA held a currently effective certificate of public convenience and necessity and an air carrier operating certificate authorizing it to conduct the flight.

3. Captain Scott and First Officer DiGuardi were physically qualified and held proper certificates of competency to operate as air carrier pilots over the route between Kansas City and St. Louis, Missouri.

4. Aircraft NC 17315 was currently certificated as airworthy at the time of the accident.

5. Trip 6 was cleared in accordance with proper procedure from Kansas City, Missouri, to St. Louis, Missouri.

6. At the time of departure from Kansas City and at the time of the accident, the gross weight of the airplane did not exceed the permissible gross weight <sup>12/</sup> and its load was properly distributed with reference to the location of the center of gravity.

7. At the time of departure from Kansas City to St. Louis the airplane carried sufficient fuel to permit flight at normal cruising power to St. Louis and thereafter for about five hours, thus making available to Captain Scott a choice between a number of alternate airports.

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12/ The "standard gross weight" of an airplane is the maximum allowable gross weight for landing, while the "provisional gross weight" of an airplane is the maximum allowable gross weight for take-off. When an airplane takes off at its maximum provisional gross weight, the weight of the airplane is reduced by gasoline consumption at least to the standard gross weight for landing prior to arrival at its next scheduled stop. If sufficient gasoline has not been consumed between the time of take-off and any emergency landing, gasoline can be dumped by the use of tested and approved dump valves in order to reduce the total weight to the approved gross weight for landing. At the time of the accident, the total weight of the airplane had been reduced, since its departure from Kansas City, by approximately 900 pounds.

8. Trip 6 proceeded normally from Kansas City until it arrived over the St. Louis radio range station at 4:04 A. M. at an altitude of 1,700 feet.

9. Successive weather reports had indicated a constantly and rapidly lowering ceiling and a constantly diminishing visibility at the Lambert-St. Louis Airport.

10. After arriving over the St. Louis radio range station, Captain Scott began a standard instrument let-down-through procedure.

11. While executing this procedure and about two minutes before he broke out of the overcast, Captain Scott received the 4:09 A. M. weather report, which indicated a variable ceiling of 400 feet with lower scattered clouds at 200 feet and visibility of two miles with light drizzle and light fog.

12. Although the minimum ceiling prescribed for TWA at St. Louis by the Civil Aeronautics Administration was 400 feet, Captain Scott, instead of going to his alternate when he observed that the ceiling was below that minimum, continued his descent and broke out of the overcast at approximately 300 feet.

13. Captain Scott broke out of the overcast too close to runway No. 1 to effect a normal landing from that altitude.

14. After breaking out of the overcast, Captain Scott continued across the airport at an altitude of 200 feet or less.

15. At no time during the flight across the airport or beyond the airport did Captain Scott make use of the landing lights on the airplane.

16. Shortly after passing over the west boundary of the airport, the pilot started a left turn; while in the turn the airplane contacted trees 113 feet above the level of the airport and 2,200 feet southwest of the southwest end of runway No. 4.

17. Full power was applied to the engines in an attempt to pull up but other trees were struck and the pilot lost control. The aircraft crashed to the ground at a point approximately one-fourth of a mile southwest of the airport boundary.

18. Captain Scott was flying the airplane during the entire flight from Kansas City to St. Louis and was at the controls at the time the airplane first contacted the trees.

19. Aircraft NC 17315 and all of its equipment functioned normally up until the time the accident occurred.

#### Probable Cause

Upon the basis of the foregoing findings and the entire record available to us at this time, we find that the probable cause of the accident to NC 17315 (TWA Trip 6) on January 23, 1941, was the action of the pilot in attempting a landing under adverse weather conditions in disregard of the minimums prescribed by the Civil Aeronautics Administration and in maneuvering for such landing at a dangerously low altitude.

#### Recommendations

1. The Board recommends that the Administrator of Civil Aeronautics encourage the development and installation of a continuously monitoring apparatus for ceiling light projectors at all airports used by air carriers.

The purpose of this device is to give a continuous observation of the height of clouds and through proper setting of the instrument a change in the ceiling to some predetermined lower value would automatically set off an alarm. When such device is in operation, scud clouds moving across the field would be detected in this manner.

2. The Board has recommended to the Administrator that when a solid cloud cover prevails at an altitude of 800 feet or less and the horizontal visibility is officially reported to be less than five miles, the height of the ceiling shall be from the base of the lowest cloud form officially reported. The Board suggested that this recommendation be made effective and enforced until such time as additional studies indicated that other action of a more fundamental and permanent character should be taken. It is understood that such action was taken by the Administrator immediately to carry the recommendation into effect.

BY THE BOARD:

/S/ Harlee Branch  
Harlee Branch, Chairman

/S/ Oswald Ryan  
Oswald Ryan

/S/ G. Grant Mason, Jr.  
G. Grant Mason, Jr.

/S/ George P. Baker  
George P. Baker

Edward P. Warner, Vice Chairman, did not take part in the adoption of this report and recommendation.