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: October 9, 1953 Released October 13, 1953

METEOR AIR TRANSPORT, INC., LAMBERT FIELD, ST. LOUIS, MISSOURI
MAY 24, 1953

The Accident

Meteor Air Transport, Inc., Douglas DC-3, N 53596, crashed at about 0418 CST[1] May 24, 1953, on the east side of Lambert Field, St. Louis, Missouri, approximately 1,950 feet east of the north-south runway. The accident occurred while the aircraft was being maneuvered beneath the 400-foot ceiling preparatory to effecting a landing. Six of the seven company employees aboard, including the crew, were fatally injured and the aircraft demolished.

History of the Flight

Meteor Air Transport is an irregular carrier, and in this instance was transporting a Pratt and Whitney R-2800 engine and four company employees from Teterboro, New Jersey, to Oklahoma City, Oklahoma, where the engine was to be installed in a company C-46 aircraft. The flight departed Teterboro for St. Louis, Missouri, at approximately 2300, May 23, 1953, on a VFR Flight Plan filed by Captain Harold Carr with an estimated flight time of six and one-half hours. An instrument flight plan filed en route was approved from over Troy, Ohio, intersection via Green Airways 4 to St. Louis, Missouri, cruising at 4,000 feet. The flight proceeded in a routine manner and reported over Terre Haute, Indiana, at 0259, May 24, and at 0324 the following clearance was given to Vandalia radio for delivery to the flight: "ATC clears N 53596 to the Alton intersection to cross Alton at 3,000, Maintain 3,000, no delay expected, contact approach control approaching Alton." At 0357, N 53596 made its initial contact with the St. Louis Tower with the information that it was approaching Alton intersection at 3,000. In reply to an inquiry, N 53596 advised the tower that it carried ILS equipment and was recleared to the ILS Outer Marker[2] to maintain 3,000 with no expected delay and to report when over the Alton intersection. The flight was given the current St. Louis weather: ceiling measured 400 overcast, visibility 3 miles, fog and smoke, altimeter 29.93. It was cleared for an ILS approach to Runway 24 or 12,[3] wind wouth variable 5, to report leaving 3,000, passing Alton and the Outer Marker. N 53596 reported leaving 3,000 at 0408, passing Alton intersection at 0410½ and inbound over the Outer Marker at 0414. While the controller was watching the approach end of Runway 24 expecting N 53596 to come into view at any moment, a surging of engines was heard; and almost simultaneously a message was received from the flight stating that it was over the field with an engine out. The time as noted by the controller was 0415 at which time all runway and approach lights

1/ All times herein are Central Standard and based on the 24-hour clock.
2/ See Appendix B.
3/ The CAA approved ILS ceiling and visibility minimums, day or night, for St. Louis are straight-in approach to Runway 24, ceiling 400 feet, visibility 3/4 of a mile. Circling approach: ceiling 500 feet, visibility 1 1/2 miles.

were turned up to full intensity and the standby emergency alarm sounded. The pilot of the aircraft was advised that the surface winds were calm and to use any runway he could make. Shortly thereafter, the controller for the first and only time observed N 53596 at a position south of the field flying on a southeasterly heading above Natural Bridge Highway which runs parallel to Runway 12. The altitude of the aircraft was estimated at 300 feet and it appeared to be descending with the landing gear in a down position. Upon reaching an altitude of 200 feet, according to the controller, it started a climbing left turn and disappeared in the overcast. Repeated efforts to contact the flight were unsuccessful. It was learned shortly thereafter through the county sheriff's office that the aircraft had crashed adjacent to Brown Road near the McDonnell Aircraft Plant gate number 6. Navy emergency equipment was immediately dispatched to the scene. There was no fire. The occupants of the aircraft were Senior Captain S. J. Rankin, Captain Harold Carr, First Officers Edward J. Raftery and Arthur A. Ravitz, Stewardess Anne Marie Delicata, Superintendent of Maintenance John Swart and Floyd Evans, mechanic. Mr. John Swart was the only survivor.

Investigation

From the testimony of the survivor, it is apparent that throughout the flight from Teterboro, the four crew members took turns at the controls in varying seating arrangements. However, from the best information available, it appears Captain Rankin was occupying the left pilot's seat and Captain Carr the right seat when the accident occurred.

The aircraft was observed by competent witnesses to twice approach the airport below the overcast from the north and disappear, headed in a southerly direction. These witnesses were all located in the vicinity of the Administration Building at the northwest corner of the airport. All stated the engines appeared to be functioning normally. The aircraft was also observed by three Navy guards located at the Navy entrance on Natural Bridge Highway just south of the tower on the south side of the airport who stated they got a fleeting glimpse of the airplane as it passed overhead in a southeasterly direction. They stated that during this period they noticed that the left engine was either windmilling or feathered. It must have been shortly thereafter that the tower controller observed N 53596 at a position south of the field flying on a southeasterly heading above Natural Bridge Highway. Whether or not the message from the pilot to the controller, that he was over the field and had an engine out, was received before or after the aircraft was first observed over the field in the vicinity of the Administration Building has not been determined.

Mr. John Swart, who survived the accident, testified that, from his seat in the rear of the cabin, he saw the lighted sign on the McDonnell Aircraft Factory located on the north side of the field, both times they passed across the airport. He further stated he believed both engines functioned normally throughout the circuits of the field and that the only change in power he recognized was when the aircraft climbed slightly when crossing the field the first time. He stated also that, a short time before the crash, the aircraft "trembled" twice in rapid succession, there was no recognizable change in power at that time, and the aircraft continued flying in level flight. He said, "I made a statement to my mechanic friend that it felt like it was going to stall."

A few seconds later the aircraft again "trembled" and the right wing dropped. The crash followed immediately.

It was determined that the aircraft struck the ground on an undeveloped portion of the airport approximately 1,950 feet east of the mid-point of the north-south runway which is itself located on the eastern side of the airport proper.4/ The tip of the right wing made initial contact with the ground with the aircraft on a northerly heading. After going straight for a distance of 65 feet with the right wing tip making a deep gouge in the earth, the aircraft cartwheeled to the right, changing its heading through approximately 270 degrees where, after sliding rearward about 10 feet, it came to rest right side up. The forward section of the fuselage comprising the pilot's compartment was crushed beyond any semblance of form, both engines were torn from the wings, and the R-2800 engine being carried in the passenger compartment was thrown through the cabin roof and came to rest approximately 40 feet beyond and east of the main wreckage.

Upon examining the wreckage, the landing gear was found in the fully extended and latched position, the wing flaps fully retracted, elevator trim slightly nose-high and rudder trim neutral. Cockpit damage was so extensive that readings of cockpit instruments were meaningless. The two altimeters were found lying on the ground away from the main wreckage where they had been thrown by the impact. The altitude needles were both inoperative due to damage to the gearing. However, the barometer settings were found at 29.90 and 29.96 inches, respectively.

The aircraft came to rest practically level both laterally and longitudinally. Since the four fuel tanks located in the center section were undamaged and no leakage from the system existed, reasonably accurate sticking of the tanks was possible. The following amounts of fuel were found:

80 gallons - left main tank

70 gallons - right main tank

40 gallons - left auxiliary tank

10 gallons - right auxiliary tank

Examination of the fuel system disclosed that the selector valve for the left engine was on the left main tank containing 80 gallons of fuel, while the selector valve for the right engine was on the auxiliary tank containing 10 gallons of fuel. The position of the cockpit control for the left engine selector valve could not be determined. However, the cockpit control for the right engine selector valve was found to be jammed in the right auxiliary tank position, which is in agreement with the position of the selector valve. Due to this agreement and the nature of the ground impact damage, which merely relieved the rigging loads in the cables between the cockpit control and the valve, it is apparent that the right engine was being fed from the right auxiliary fuel tank immediately prior to the time of impact. No evidence was

4/ See attached Appendix A.

found during an examination of the wreckage to indicate that the aircraft was not in an airworthy condition at the moment of impact with the ground.

An examination of the engines, propellers and their accessories indicated that both power plants were operable prior to impact. This was further substantiated by normal operation of both carburetors when flow tested and by satisfactory bench tests of propeller feathering pumps, fuel boost pumps, propeller governors and engine fuel-driven pumps. The carburetor fuel strainers were found free from all foreign material. Upon removal of the carburetor from the left engine, it was noted that the main fuel supply line from pump to carburetor, the fuel regulator and the fuel transfer line were filled with gasoline. However, when the carburetor was removed from the right engine, the pump to carburetor and transfer lines were empty and the regulator contained less than a gill of gasoline.

Weather information transmitted on teletype circuit 8002 was available to the crew at Teterboro which included surface weather reports from Teterboro to St. Louis, upper air winds, regional and terminal forecasts through Pennsylvania but not including Ohio, Indiana and Illinois. However, the crew obtained the terminal forecast for St. Louis by telephone which indicated ceiling 800 feet, overcast, visibility 6 miles with haze and smoke, during the period 0100 to 0500. At 0150, while the flight was en route, the St. Louis terminal forecast was amended as follows: period 0150 to 0300, ceiling 500 feet, overcast, visibility 4 miles with fog and smoke; and for the period 0300 to 0430, ceiling 400 feet, overcast, visibility 3 miles with fog and smoke. Weather reports indicated that, during flight, scattered to broken clouds well above 10,000 feet and good visibility prevailed from Teterboro to Columbus. At Dayton it was overcast at 6,500 feet and a low overcast continued on to St. Louis with decreasing ceiling. AtSt. Louis at time of arrival, the ceiling was recorded as 400 feet and visibility 3 miles with fog and smoke. The ceiling and visibility at Lt. Louis had been dropping steadily for several hours preceding the accident and the base of the cloud was probably ragged. In connection with the approach and landing, no turbulence of importance existed and no precipitation was occurring. Moisture and temperature conditions were within the range of possible induction system icing.

The operation of the instrument landing system and low frequency range was checked immediately after the accident. The operation of a low frequency range was normal in all respects and all courses on the ground check showed well within the allowable tolerances. Monitor indications on both the ILS Localizer and Glide Path showed normal operation. One aircraft had made an ILS approach and landing a short time before the accident and another shortly thereafter. In both instances the pilot's reports indicated normal operation. On the morning of May 24, a flight check of the low frequency range and ILS equipment showed all facilities operating normally.

It was determined that the aircraft's gross weight at take-off was 26,523 pounds, which was 1,323 pounds more than the approved takeoff weight of 25,200 pounds.5/

5/ The specifications for this model aircraft, issued by the CAA, limit the gross weight for carriage of passengers, or passengers and cargo, to 25,200 pounds, and to 26,900 pounds for cargo only.

Analysis

The fact that the aircraft was overloaded approximately 1,323 pounds upon departure from Teterboro is not considered significant in this accident since consumption of fuel en route reduced the weight to well under the approved gross maximum upon its arrival at St. Louis.

The flight from Teterboro to the St. Louis ILS Outer Marker appears to have been routine; however, the movements of the aircraft after leaving the Outer Marker to the point of impact are not clear. The fact that the tower asked and the flight acknowledged that it was equipped to make an ILS approach does not definitely indicate that this kind of an approach was attempted. To the contrary, three significant facts indicate that such an approach either was not made or, if started, was abandoned. First, the tower controller, after clearing the flight to make an ILS approach, watched the approach end of Runway 24 but the aircraft never came into his view. Second, the aircraft was never observed over the airport on an ILS localizer course. It is difficult to understand how an off-course error of such magnitude could have been made in such a short distance.6/ Third, witnesses who were in the vicinity of the Administration Building on the north side of the airport twice observed the aircraft fly over them in a southerly direction at approximately right angles to Runway 24, the ILS runway.

The two witnesses on the north side of the field said that both engines were functioning normally each time the aircraft passed over them.7/ However, the two Navy guards who were on the south side of the field thought that the left engine was inoperative when they observed the aircraft. It is believed, however, that these latter witnesses who had only a fleeting glimpse of the aircraft almost directly overhead in the haze and smoke were in error and that due to an optical illusion thought that this engine's propeller was turning only slowly. Testimony of the survivor, Mr. Swart, the company's Chief of Maintenance, clearly indicates that both engines were functioning normally until the final left turn at which time the aircraft trembled and the right wing dropped. This witness' testimony seems far more credible than that of the Navy witnesses on the ground since he was sitting in the cabin and was in a position to hear the sound of the engines clearly.

Therefore, it is apparent that the pilot did not experience any mechanical difficulties with either engine during the circling of the airport prior to the accident. More probably he elected to remain visually contact with the airport rather than execute a missed-approach procedure; and that since the ceiling was below the autnorized minimum of 500 feet prescribed for a circling approach, he reported having an engine out. This indicated a possible emergency to the tower controller who then cleared the flight to land on any runway.

There is no logical reason why the supply of fuel to the right engine should have been taken from the auxiliary tank with only 10 gallons of fuel

6/ The distance from the Outer Marker to the approach end of Runway 24 is 4.8 miles.

7/ It is obvious that the times reported earlier in this report for the aircraft when in the vicinity of St. Louis are in error as these do not permit sufficient elapsed time for the aircraft to have circled the airport twice.

available when the right main tank still contained approximately 70 gallons. The only conclusion that can be reached is that during the times the pilots changed positions in the cockpit prior to reaching St. Louis, the change over from auxiliary to main tank was overlooked. If there had been any surges in power, the pilots would have immediately discovered the cause and would have turned the handle of the fuel selector valve to the right main tank.

Because the carburetor and related fuel lines of the right engine contained little or no fuel and there was only about 10 gallons of fuel in the tank being used, the Board concludes that during the final left turn the outlet of the fuel tank became unported allowing air to enter the line, and that immediately following this turn the engine suffered a critical loss of power due to fuel starvation. The Board further concludes that the loss of power from this engine, together with the reduced air speed of the aircraft at the time, caused the right wing to drop and the aircraft to settle at an altitude too low to effect recovery.

Findings

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

1. The carrier and the aircraft were properly certificated, and the aircraft was in an airworthy condition on departure from Teterboro.

2. The crew was properly certificated and held appropriate ratings for the type of flight undertaken.

3. The St. Louis weather given the pilot as he approached the Alton intersection was ceiling 400 overcast, visibility 3 miles, fog and smoke, wind south 5, altimeter 29.93.

4. The flight circled the airport in an attempt to remain contact below the authorized minima.

5. Mismanagement of fuel resulted in the right engine stopping.

6. Ample fuel remained for continued flight at the time of the accident.

7. When the pilot was executing a left turn near the southeast corner of the airport, the right engine stopped and the aircraft fell striking the ground on the right wing.

Probable Cause

The Board determines that the probable cause of this accident was mismanagement of fuel resulting in loss of power and control while circling the field preparatory to an approach for landing.

BY THE CIVIL AERONAUTICS BOARD:

/s/ OSWALD RYAN

/s/ HARMAR D. DENNY

/s/ JOSH LEE

/s/ JOSEPH P. ADAMS

/s/ CHAN GURNEY

SUPPLEMENTAL DATA

Investigation and Hearing

At approximately 0650, May 24, 1953, the Civil Aeronautics Board received notification of the accident through the communications facilities of the Civil Aeronautics Administration. Investigation was immediately initiated in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. The public hearing in connection with investigation of this accident was held at St. Louis, Missouri, on June 16 and 17, 1953.

Air Carrier

Meteor Air Transport, Inc., a large irregular air carrier, is a Delaware corporation with its principal offices at the Teterboro Air Terminal, Teterboro, New Jersey. It holds a Letter of Registration issued by the Civil Aeronautics Board and an Operating Certificate issued by the Civil Aeronautics Administration which authorizes it to operate as a large irregular air carrier in the transportation of passengers and cargo.

Flight Personnel

Captain Ernest J. Rankin, age 42, became an employee of Meteor Air Transport on April 12, 1950. He was employed first as First Officer on DC-3 equipment, promoted to Captain on December 20, 1950, on DC aircraft and to Captain on C-46 aircraft in March, 1952. His total time as pilot was 4,641 hours, of which 1,361 hours as Captain had been accumulated on DC-3 equipment. He held an ATR Certificate No. 622964 with Commercial privileges, single and multi-engine land. His last instrument check on DC-3 ILS approach at Teterboro was accomplished on February 16, 1953. His last physical was taken in March, 1953.

Captain Harold Carr, age 31, was employed as First Officer on DC-3 aircraft with Meteor on January 6, 1951, promoted to Captain on DC aircraft May 4, 1953. His total time as a pilot was 2,729 hours, of which 789 hours were as First Officer and 31 hours as Captain. He held ATR Rating No. 636077 and commercial privileges, single and multi-engine land. His last ATR instrument check and competency check were accomplished on May 4, 1953. His last physical was accomplished in December, 1952.

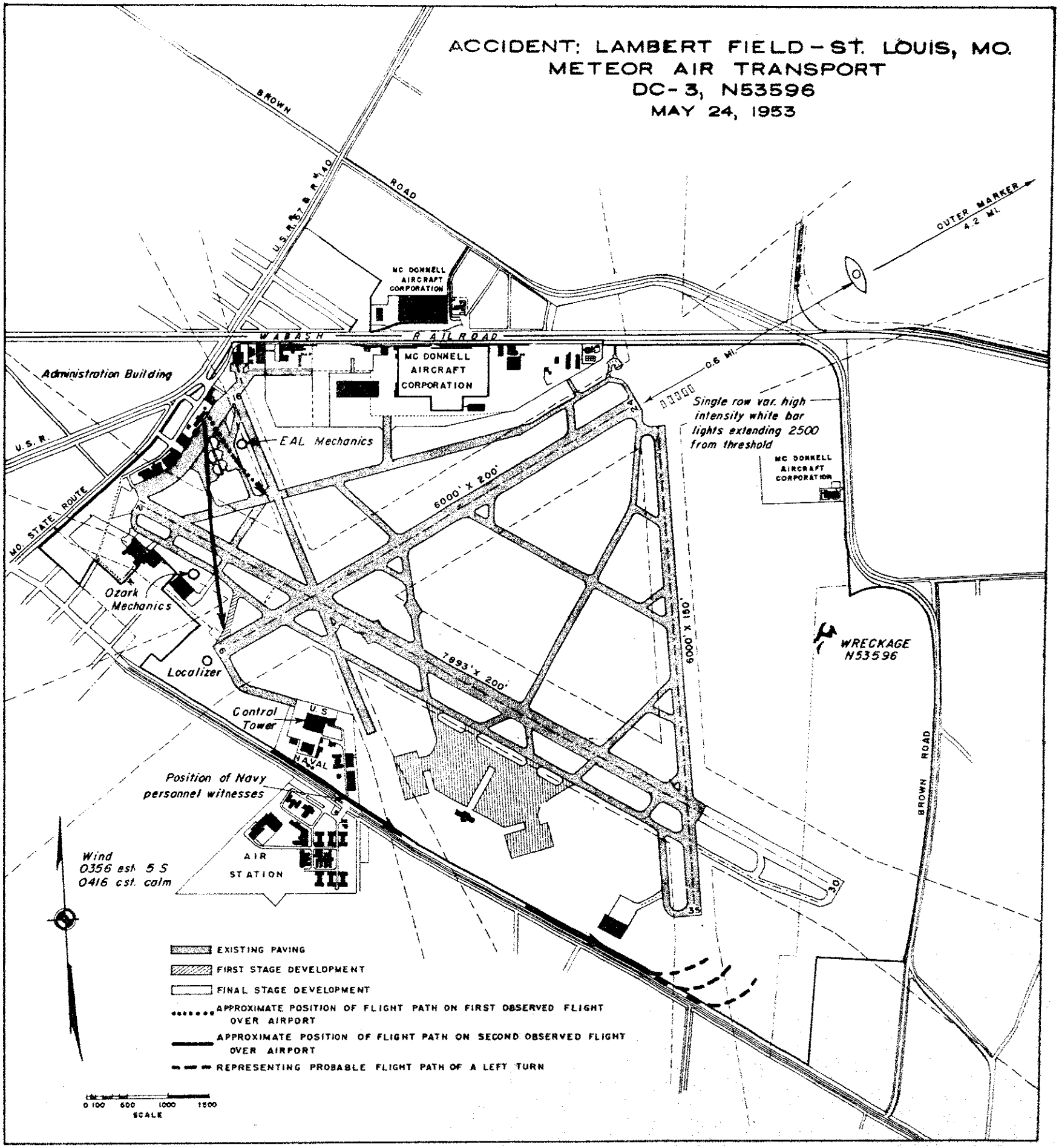
First Officer Edward Joseph Raftery, age 26, became an employee of the Meteor Air Transport on November 17, 1952, as First Officer on DC equipment. His total time as pilot was 554 hours, of which 338 hours were as copilot on DC-3 equipment. He held Commercial Certificate No. 1210031 with single engine land and instrument ratings. His last physical was accomplished in March, 1953.

First Officer Arthur A. Ravitz, age 28, became an employee of Meteor Air Transport March 16, 1953, as Link Trainer Instructor and as First Officer on DC-3 equipment. His total time as pilot was 551 hours, of which 101 hours were as First Officer on DC-3 equipment. He held Commercial Certificate No. 1038955 with instrument, single and multi-engine land ratings. His last physical was accomplished in May, 1953.

Stewardess Anne Marie Delicata, age 23, became an employee of Meteor Air Transport March 30, 1953. She qualified as a stewardess for Meteor Air Transport on April 5, 1953, had a total time of 223 hours in the air as stewardess and had been previously employed as stewardess by Argonaut Airways of Miami, Florida.

The Aircraft

The aircraft, a DC-3-C, serial number 20433 was purchased by Meteor Air Transport from the War Assets Administration on April 2, 1946. It was equipped with two Pratt and Whitney Model R1830-92 engines and Hamilton Standard Model 23E50 propellers. The total time of the aircraft as of May 24, 1953, as indicated by company records was 10,923 hours, of which 3,830 hours had been accumulated since overhaul. The left engine had accumulated 914 and the right 523 hours since overhaul. All airworthiness directives, instrument markings and placards had been complied with.



55014

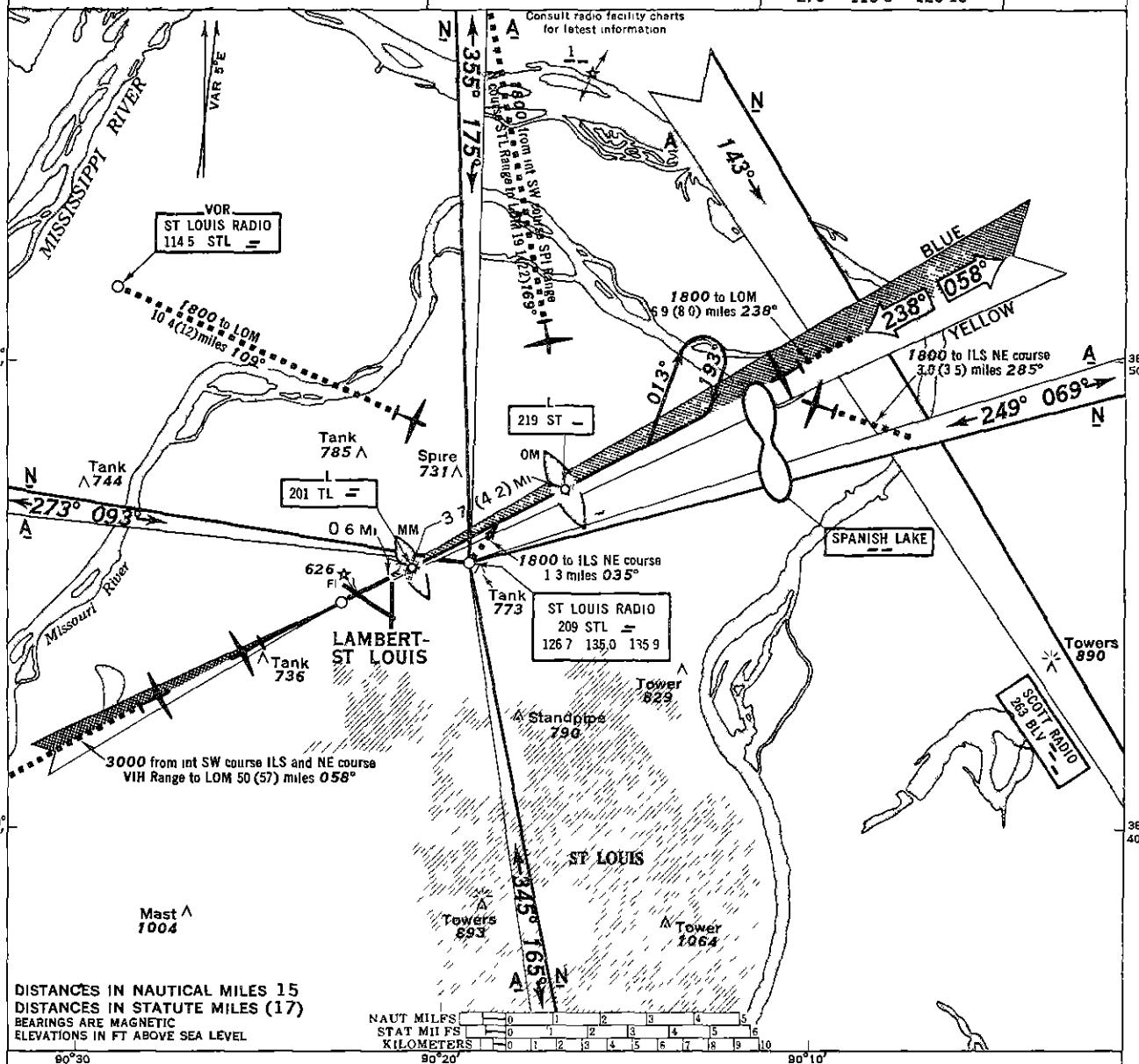
APPENDIX A

INSTRUMENT APPROACH CHART - ILS

MINIMUM SAFE ALTITUDES
100 Nautical Miles *2800*
25 Nautical Miles *2100*

LAMBERT-ST LOUIS AIRPORT
ST LOUIS, MO

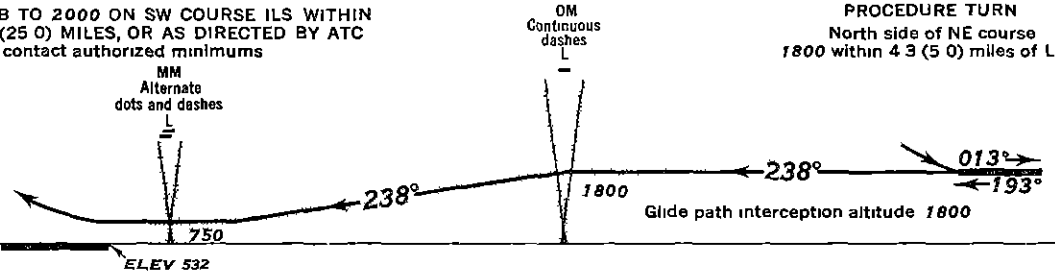
ST LOUIS APPROACH CONTROL	LAMBERT-ST LOUIS LOCALIZER	LAMBERT TOWER	ELEV
209 118 3 126 18	Z 110 3 I•• STL .•:.	278 118 3 126 18	*558*



MISSED APPROACH

CLIMB TO *2000* ON SW COURSE ILS WITHIN 21 7 (25 0) MILES, OR AS DIRECTED BY ATC if not contact authorized minimums

STANDARD INSTRUMENT APPROACH PROCEDURE



PROCEDURE TURN
North side of NE course
1800 within 4 3 (5 0) miles of LOM

1 0 1 2 3 4 5 6 Naut Miles 7 8 9
2 1 *MINIMA FOR MILITARY USE ONLY* 3 4 5 6 7 Stat Miles 8 9 10 11

		DAY				NIGHT			RATE OF DESCENT FEET PER MINUTE										
LANDING		MIN ALT	CEIL	VIS		MIN ALT	CEIL	VIS	KNOTS	90	110	130	150	MPH	100	120	140	160	180
STRAIGHT IN	A	*958*	400	1	A	*958*	400	2		440	535	630	730		420	505	590	675	760
CIRCLING		*1058*	500	1½		*1058*	500	2											

PRICE FIVE CENTS
55091

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30 JAN 1953

AL-360-ILS

APPENDIX B