

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Appendix 2

WASHINGTON, D.C. 20590



OFFICE OF
THE ADMINISTRATOR

15 JUN 1970

Honorable John H. Reed
Chairman, National Transportation Safety Board
Department of Transportation
Washington, D. C. 20591

Dear Mr. Chairman:

The recommendation contained in your letter of 28 May 1970 to revise the Horlick-Racine Airport NDB (ADF) instrument approach procedure has been reviewed.

The Marion Fix on the final approach course is a stepdown fix to provide a 100' lower minimum descent altitude (MDA) when the fix is identified. FAA Handbook 8260.3A, paragraph 288c, U.S. Standard for Terminal Procedures (TERPS) specifies a maximum accuracy of plus or minus 2 miles for this fix. We are presently utilizing an ADF bearing from the Milwaukee LOM which is 6.1 miles from the final approach course with a fix accuracy of .7 of a mile. The fix accuracy when utilizing a radial from the Milwaukee VORTAC would be 2.1 miles due to the distance of 29 miles from the VORTAC to the final approach course. The VOR located on the Timmerman Airport at Milwaukee is close enough (1.7 mile fix accuracy) and could be used for this purpose.

Although any aircraft may request that the fix be identified by RADAR, we concur that the utility of the approach procedure would be improved by permitting aircraft with VOR and ADF receivers to use the lower MDA since dual ADF receivers are now required. However, this addition would not improve the safety of the procedure.

Your recommendation is being forwarded to the FAA Central Region and we are asking them to add a radial from the Timmerman VOR as a method to identify the Marion Fix providing flight inspection and procedures criteria are met.

Sincerely,

A handwritten signature in dark ink, appearing to read "J. H. Shaffer".

J. H. Shaffer
Administrator

SA- None

File No. 3-3766

AIRCRAFT ACCIDENT REPORT

MACK TRUCK, INC.

LEAR JET 23A, N1021B

HORLICK-RACINE AIRPORT

RACINE, WISCONSIN

NOVEMBER 6, 1969

Adopted: SEPTEMBER 9, 1970

NATIONAL TRANSPORTATION SAFETY BOARD

Bureau of Aviation Safety

Washington, D. C. 20591

MACK TRUCK, INC.
 LEAR JET 23A, N1021B
 HORLICK-RACINE AIRPORT
 RACINE, WISCONSIN
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File No. 3-3766

NATIONAL TRANSPORTATION SAFETY BOARD
DEPARTMENT OF TRANSPORTATION
AIRCRAFT ACCIDENT REPORT

Adopted: September 9, 1970

Mack Truck, Inc.
Lear Jet 23A, N1021B
Horlick-Racine Airport
Racine, Wisconsin
November 6, 1969

SYNOPSIS

Lear Jet N1021B, operated by Mack Truck, Inc., of Allentown, Pennsylvania, crashed at approximately 1107 c.s.t., November 6, 1969, into Lake Michigan while executing an instrument approach to Runway 22 at the Horlick-Racine Airport, Racine, Wisconsin. The flight had departed from Benton Harbor, Michigan, on an Instrument Flight Rules flight plan en route to Racine, Wisconsin. The flight had originated at Allentown earlier in the day. There were seven people aboard the aircraft; the pilot, copilot, and five passengers, none of whom have been found to date.

Shortly after the accident, a small amount of wreckage was recovered from the surface of the water. The flight was being vectored by radar to the Automatic Direction Finder final approach course to Runway 22 by Milwaukee Approach Control. Radar contact was lost shortly after the flight was advised that it was passing the Marion Intersection, a radar fix 3.6 nautical miles northeast of the radio beacon which is located on the southern boundary of the airport.

The Board determines that the probable cause of this accident was the continued descent below the prescribed approach path profile, for reasons unknown.

1. INVESTIGATION

1.1 History of the Flight

Lear Jet, N1021B, was on a corporate business flight, which originated in Allentown, Pennsylvania, November 6, 1969, at approximately 0707 ¹/₂ on an Instrument Flight Rules (IFR) flight plan, to the Horlick-Racine Airport, Racine, Wisconsin, with a crew of two and five passengers. There is no weather reporting station at the destination airport. The 0665 weather observation at General Mitchell Field, Milwaukee, Wisconsin, located 12 nautical miles north of the Racine Airport, was:

Indefinite ceiling zero, sky obscured, visibility zero, fog, haze, smoke, temperature 31° F., dew point 31° F., wind 260°. 5 kts., altimeter setting 29.99 inches, Runway Visual Range (RVR), Runway 01 less than 600 feet.

At 0819, near the Pullman, Michigan, VORTAC, N1021B requested the Racine weather and was given the 0816 observation from Milwaukee which was:

Indefinite ceiling zero, sky obscured, fog, smoke, wind 190°, 3 kts., RVR Runway 01, 600 feet variable to 800 feet.

N1021B then requested and received clearance to Ross Field, Benton Harbor, Michigan, which is approximately 24 nautical miles southwest of Pullman.

The flight landed at Benton Harbor at 0832; the aircraft was refueled and the pilot received a weather briefing.

The flight departed from Benton Harbor at 1044, ~~HR~~ to Racine, Wisconsin, at an assigned altitude of 11,000 feet, which was subsequently changed to 12,000 feet. Five passengers and a crew of two were aboard.

The 1027 Milwaukee weather available prior to departure of the flight from Benton Harbor was:

Measured 200 feet broken, visibility 1/11 mile, fog, smoke, wind 190°, 3 kts., altimeter setting 30.01, RVR Runway 01, 600 feet variable to 2,400 feet.

When the flight was approaching the Braves Intersection, which is approximately 20 miles east of the Racine Airport over Lake Michigan, it was cleared by Chicago Center to descend to and maintain 6,000 feet. At 1101, the Chicago Center effected a radar handoff of the flight to Milwaukee Approach Control.

¹/₂ All times herein are central standard, based on the 24-hour clock.

When the flight was in the vicinity of the Horlick Intersection, approximately 12 nautical miles east of Racine, it was instructed to turn right to a heading of 360° for radar vectors to the final approach course for an ADF approach to Runway 22, to maintain 5,000 feet. The flight reported out of 6,000 for 5,000 feet. While on the 360° heading the flight was further cleared to descend to 2,100 feet and instructed to turn left to a heading of 240° to intercept the final approach course of 206° to the Racine Airport. Approximately 6 nautical miles northeast of the Marion Intersection, the flight intercepted the final approach course and was cleared for its approach. The flight acknowledged the instructions to descend to 2,100 feet, but did not report vacating 5,000 feet or reaching 2,100 feet.

At 1101:55, the following Milwaukee weather information was transmitted to United Air Lines Flight 455 by Milwaukee Approach Control on the same frequency that N1021B was guarding:

"...Three hundred scattered, one mile, fog, smoke,
runway visual range more than six thousand. Altimeter
three zero zero one."

At 1103, while on a heading of 360° and after having acknowledged clearance to descend to 2,100 feet, the flight requested, "...and do you have the Racine weather?"

Milwaukee Approach Control replied, "No, we have nothing down there 'uh' everybody has been making the approach there all right though."

Note: According to FAA flight progress strips, six instrument approaches were made to the Horlick-Racine Airport, from 0910 through 1040. Of the six approaches made during this period, two were missed.

No further weather information was requested by or provided to Lear Jet N1021B. However, witnesses at Milwaukee and Racine stated that, at the time of the accident, there was a dense fog bank which extended generally from the shoreline out over Lake Michigan. The depth of the surface-based fog ranged from 200 to 600 feet, with clear sky above. Witnesses further stated that the tops of the tall towers in the area were clearly visible, protruding from the top of the fog. A pilot who had completed an approach to Racine prior to the accident stated that the top of the Wind Point marine light (elevation 691 feet m.s.l. or 111 feet above the lake) was clearly visible during his approach. The Wind Point light is approximately 1 3/4 miles south-southeast of the Marion Intersection.

At the time the flight intercepted the final approach course, the approach controller who had been controlling the flight from the East Arrival Position was relieved and moved to the East Departure Position. The controller who assumed the East Arrival Position and control of N1021B was briefed by the preceding controller that N1021B was 6 miles from the Marion Intersection, on final approach course to the Horlick-Racine Airport.

While inbound on the final approach course at 1106:10, N1021B stated, "And two one Baker is requesting a radar fix now." The Approach Controller replied, "We'll call out Marion for you."

The Marion Intersection is located over Lake Michigan, 1.0 nautical mile from the shoreline on a bearing of 026°, 3.6 nautical miles from the Racine NDR (nondirectional radio beacon) and a 286° magnetic bearing to the Milwaukee outer compass locator. The minimum descent altitude over the Marion Intersection or radar fix on final approach is 1,269 feet. If the aircraft is equipped with dual, simultaneously operating Automatic Direction Finders, or if a positive radar fix is obtained over the Marion Intersection, further descent to 1,169 feet is authorized.

The flight was observed on radar on the final approach course and, at 1106:55, Approach Control advised, "Two one Bravo, I show Marion." At this time, the aircraft was over the Marion Intersection, tracking slightly to the left of course. Shortly thereafter, the radar target faded from the radarscope at a position that was subsequently identified as, latitude 42° 48' 00" N. and longitude 87° 46' 30" W.

Radar contact with the aircraft was lost when it was 2.1 nautical miles from the threshold of Runway 22 and 0.5 nautical miles after it passed the Marion Intersection. There was no subsequent communication from the aircraft.

Wreckage was recovered from the surface of the lake at this location by a search helicopter, approximately 15 minutes after the accident.

The approach of N1021B was simulated in a helicopter and monitored by Milwaukee Approach Control. During the simulated approaches, the primary and transponder radar targets faded from the radarscope as the helicopter descended through 680 feet, over the same point at which the target of N1021B faded from the radarscope. At this point: the elevation of surface of the lake is approximately 600 feet.

1.2 Injuries to Persons

<u>Injuries</u>	<u>Crew</u>	<u>Passengers</u>	<u>Others</u>
Fatal	2"	5*	0
Nonfatal	0	0	0
None	0	0	

*No bodies have been recovered to date.

1.3 Damage to Aircraft

The aircraft was destroyed. Approximately 400 pounds of wreckage were recovered.

1.4 Other Damage

None,

1.5 Crew Information

The pilot, Mr. James R. Simmons, aged 40, held a commercial airman Certificate issued July 30, 1954, with airplane single- and multiengine land ratings. Mr. Simmons was instrument-rated and held a type rating in the Hawker Siddeley 125, and received his Lear 23/24 rating December 16, 1966. Mr. Simmons had a total flight time of 7,067, 333 hours of which were actual instrument flight time and approximately 625 hours were in the Lear Jet. In addition, he had accrued a total of 21 hours in the DH-125. He held a first-class medical certificate, dated March 21, 1969, with no limitations.

The copilot, Mr. George K. Strunk, aged 28, held a commercial pilot certificate, issued September 9, 1966, single- and multiengine land rating. Mr. Strunk made application for and received an instrument rating. At the time of this application, he had a total flight time of 270.1 hours. Mr. Strunk was not type-rated in the Lear Jet. Mr. Strunk held a first-class medical certificate dated April 30, 1969, with no limitations. Mr. Strunk had a total of 2,200 hours. Of this total, 250 hours had been accrued in the Lear Jet. He had logged 100 hours of actual instrument time and 750 hours in multiengine aircraft.

There is no evidence to indicate that either pilot had engaged in recurrent training or proficiency checks.

1.6 Aircraft Information

The aircraft records disclosed the following information, as of October 29, 1969:

Date of last annual inspection was July 17, 1969.
Aircraft total time at last annual inspection was 2054:20 hours.

Date of last 100-hour inspection, October 29, 1969.
Total time on aircraft was 2203:50 hours.

Aircraft static system check was accomplished July 1968.

The records on file at Lear Jet Industries, Inc., indicate that on July 17, 1968, engineering change record No. 425, the following maintenance was accomplished on Lear Jet N1021B:

1. ECR 611 - changed internal defog system.
2. Pitot static system lines changed to 3/8 inch (.375) from 1/4 inch (.250).
3. Service Kit 286 - Hydraulic system filter replacement.
4. Install hot leading edge and strobe light.
5. Service Kit 237 - Tail cone ventilation system for cooling of electrical components in tail cone.
6. Service Kit 238 - Relocate cabin safety valve - cabin pressurization - static source to tail cone.

All available records indicate that N1021B was in an airworthy condition and that there were no known airframe or powerplant discrepancies prior to the accident.

Since very little wreckage was recovered, the weight and balance configuration at the time of the accident are unknown.

The fixed base operator's records at Ross Field, Benton Harbor, Michigan, indicate that N1021B was serviced with 468.8 gallons of Phillips A-50 type Jet fuel. A sample of fuel taken from dispensing facility was tested for contaminants and proved negative.

1.7 Meteorological Information

Morning surface weather charts showed a relatively narrow, essentially north/south high pressure ridge over Lake Michigan. Fog was reported over much of the Upper Great Lakes Region, including the Milwaukee/Racine area. At the time of the accident, the fog in the Milwaukee/Racine area was in the process of burning off or moving off the land, but was persisting over Lake Michigan. Reports from pilots flying in the area indicated that the top of the fog bank varied from around 200 to 600 feet above the water, and that it was possible to see the water surface intermittently. Prior to departure from Benton Harbor, the pilot of N1021B solicited and received a weather briefing from the South Bend Flight Service Station (FSS). The briefing covered actual and forecast weather for the flight. The pilot received additional updated weather information from the Milwaukee FSS shortly before takeoff.

1.8 Aids to Navigation

The Horlick-Racine Airport has an approved ADF Approach utilizing the nondirectional beacon (NDB) located on the airport. The minimums for a straight-in approach to Runway 22 are a minimum descent altitude of 1,269 feet and 1 mile visibility. With dual, simultaneously operating ADF's, or a positive radar fix over the Marion Intersection, further descent to 1,169 feet is authorized upon passing Marion.

The radar installation at Milwaukee Approach Control consisted of ASR-6 (Airport Surveillance Radar) with an antenna rotation rate of 15 r.p.m.

The Horlick-Racine NDB, the Milwaukee Approach Control Radar, and the radar positioning of the Marion Intersection showed no discrepancies in their operation or accuracy during a flight check of these facilities, which was conducted by the FAA subsequent to the accident.

1.9 Communications

There were no communication difficulties involved in this accident. The communications with this aircraft are covered under Section 1.1, History of the Flight.

1.10 Aerodrome and Ground Facilities

Horlick-Racine Airport is located on the western shore of Lake Michigan, approximately 46 nautical miles north of Chicago. The field elevation is 669 feet.

The airport is not served by a control tower or weather reporting station. Unicorn is available. There were no reported communications from this aircraft to the Horlick-Racine Unicorn. Runway 22 is 100 feet wide and 5,825 feet long.

The Milwaukee altimeter setting is utilized for making approaches to the Horlick-Racine Airport. Milwaukee is approximately 12 nautical miles north of Racine. The weather information and radar services are provided through Milwaukee Departure and Approach Control. Weather information for Milwaukee is also available through the Automatic Terminal Information Service.

1.11 Flight Recorders

Not installed, nor required.

1.12 Wreckage

To date, approximately 400 pounds of wreckage have been recovered. All recovered wreckage was floating on the surface of the lake.

The following aircraft wreckage was recovered:

1. Upper portion of main entrance door. The lock pins were fully extended.
2. Seat cushion for seat on right side of cabin aft of copilot.
3. The backs of both cabin seats which had separated at the lower mounting points.
4. The backs of the dual rear cabin seat which had separated at the lower mounting point.
5. A section of the left wingtip fuel tank. The section measured 45 inches from the forward tip. The underside of the tip was pressed upward.
6. A section of the Fiberglass nose cone that measured $18\frac{1}{2}$ inches from the tip to the separation and $20\frac{1}{4}$ inches wide.
7. The tip of the right wing fuel tank that measured $14\frac{7}{8}$ inches from the tip and 15 inches wide.

An extensive search for survivors was initiated approximately 15 minutes after N1021B disappeared from the radarscope of Milwaukee Approach Control. Coast Guard and private boats arrived in the area in approximately 1 hour from the time of the crash. Search efforts continued until darkness. No survivors were found.

An exhaustive underwater search commenced on November 9, 1969, and continued through November 12, 1969, without success.

Several hours after the accident, two temporary buoys were placed in the area of an oil slick and one in the center of floating debris. A buoy was placed in the area identified by Milwaukee Approach Control radar as the area where the aircraft target disappeared from the radarscope. Extensive underwater search activities were conducted in these areas.

The search continued from the three known areas using the side-scanning sonar and scuba divers with no success. No other wreckage was recovered.

1.13 Fire

Unknown.

1.14 Survival Aspect

This was a nonsurvivable accident.

1.15 Tests and Research

None.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

Since only a very small portion of this aircraft was recovered, the Board must confine its analysis to operational, meteorological, and aircraft record data.

The company chief pilot identified the voice of George K. Strunk as the one recorded by Milwaukee Approach Control and who was designated as copilot. Company records reflected that James R. Simmons was the Pilot-in-command. There was no evidence, either on the flight to Benton Harbor, Michigan, earlier in the morning, or en route from Benton Harbor to Racine, Wisconsin, that there was any aircraft malfunction or discrepancy.

The ATC communications recordings and statements from the controllers, did not reflect that the flight was having any difficulty or problem complying with the air traffic control clearance and instructions issued.

The pilot showed an interest and concern with the existing weather conditions at the proposed destination airport by diverting to Benton Harbor because of weather. He called the South End FSS for a detailed weather briefing for his destination and also called the Milwaukee FSS long distance for additional updated weather information.

The possibility of an improper altimeter setting was considered. In reviewing the transcriptions, it was noted that the controller at Milwaukee Approach Control, who was working N1021B, did not give an altimeter setting directly to N1021B at any time during the approach. However, an altimeter setting was given, and acknowledged, when N1021B was handed off from the Chicago Center to Milwaukee Approach Control. In addition to this altimeter setting, a Milwaukee altimeter setting was given to United Flight 455 at 1101:55, as Flight 455 was inbound to Milwaukee, on the same frequency on which approach instructions were being given to N1021B. The altimeter setting as given to N1021B by Chicago Center and the altimeter setting given to United Flight 455 were the same, i.e., 30.01.

Information received from the chief pilot of Mack Truck, Inc., confirmed that the static system was checked July 1968. The review of the aircraft records revealed no maintenance discrepancies relative to the pitot static system from July 1868 to November 3, 1969.

Records at Lear Jet Industries, Inc., disclosed that on July 17, 1968, engineering change No. 425 was accomplished on N1021B, as follows:

"Pitot static system lines changed to 3/8 inch (.375) from 1/4 inch (.250)."

The analysis of the weather situation at the Horlick-Racine Airport revealed that fog was persistent over the airport until about 1000. At this time, the fog began to dissipate rapidly in the vicinity of the field, but remained over the shoreline. The tops of the fog bank were generally 200 feet to 600 feet above the water. Visibility above the fog bank was good. There was also no reported icing.

Based on information from pilots flying in the Racine-Milwaukee area, it was evident that the latter stages of the approach would have been flown above the fog bank.

Since only a small portion of the aircraft was recovered, the exact aircraft configuration at the time of the accident could not be determined.

2.2 Conclusions

From the background information available and the limited amount of recovered aircraft wreckage, the following conclusions are made:

(a) Findings

1. Radar vectors were provided by Milwaukee Approach Control for N1021B to intercept the inbound ADF course for the Horlick-Racine Airport and fixed the aircraft at Marion.
2. There are no official weather observations taken for the Horlick-Racine Airport.
3. Current altimeter setting information was available to the flight.
4. Three-eighths inch pitot static lines were installed in N1021B which was the latest configuration for the aircraft model.

(h) Probable Cause

The Board determines that the probable cause of this accident was the continued descent below the prescribed approach path profile, for reasons unknown.

3. RECOMMENDATIONS

During the investigation, the Board made a recommendation to the Federal Aviation Administration dealing with fix accuracy and identification utilizing VOR radials when possible. In response to the recommendation, the FAA is adding a radial from the VOR as a method to identify the Marion Fix, providing flight inspection and procedures criteria are met.

The present ADF approach is made on the 206° inbound bearing of the Horlick-Racine Beacon (RBN). At 3.6 nautical miles from the RBN, the Marion Fix is utilized to determine the altitude minima for the approach. The Marion Fix can only be determined by radar assistance

from Milwaukee Approach Control and/or an ADF bearing from the Outer Marker of the General Mitchell Airport ILS. To use this fix, the descending aircraft must have either dual ADF capability and/or receive an assist from Milwaukee Approach Control.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOHN H. REED
Chairman

/s/ OSCAR M. LAUREL
Member

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

Isabel A. Burgess, Member, did not participate in the adoption of this report.

September 9, 1970.



DEPARTMENT OF TRANSPORTATION Appendix 1
NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20591

May 28, 1970

OFFICE OF
THE CHAIRMAN

Honorable John H. Shaffer
Administrator
Federal Aviation Administration
Department of Transportation
Washington, D. C. 20590

Dear Mr. Shofier:

Lear Jet, N1021B, crashed into Lake Michigan on November 9, 1969, while executing an Automatic Direction Finding (ADF) approach to the Horlick-Racine Airport. As a consequence of this accident, we are submitting an air safety recommendation for your consideration.

The present ADF approach is made on the 206° inbound bearing of the Horlick-Racine Beacon (RBN). At 3.6 nautical miles from the RBN, the Marion Fix is utilized to determine the altitude minima for the approach. The Marion Fix can only be determined by radar assistance from Milwaukee Approach Control and/or an ADF bearing from the Outer Marker of the General Mitchell Airport ILS. To use this fix, the descending aircraft must have either dual ADF capability and/or receive an assist from Milwaukee Approach Control.

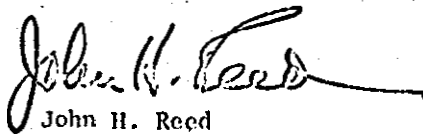
The capability of the Marion Fix can be expanded by designating a radial of the Milwaukee VORTAC (MKE) to support further the fix. Adoption of this suggestion would permit this fix to be utilized by aircraft with single ADF and VOR capability, and serve as an additional backup to dual ADF equipped aircraft. The sole question to be resolved would be the ability of the MKE VORTAC to supply sufficient signal strength to support this requirement. Therefore, we recommend that you investigate the feasibility of designating a radial of the MKE VORTAC as an additional method of identifying the Marion Fix. Should the MKE VORTAC possess the capability of supporting this requirement, this radial should be made a part of the Marion Fix, and all procedures should be modified accordingly.

Honorable John H. Shaffer

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This recommendation should serve to improve operations at the Morlick-Racine Airport both from the standpoint of safety as well as utility.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "John H. Reed", with a long horizontal flourish extending to the right.

John H. Reed
Chairman