

NATIONAL TRANSPORTATION SAFETY BOARD

PB 208 198

AIRCRAFT ACCIDENT REPORT

MONMOUTH AIRLINES, INC.

Scheduled Air Taxi
Beech 99, N-986MA
Allentown-Bethlehem-
Easton Airport
Allentown, Pennsylvania
October 24, 1971



NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D. C. 20591

REPORT NUMBER: NTSB-AAR-72-3

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TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. NTSB-AAR-72-3		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Aircraft Accident Report: Monmouth Airlines, Inc., Scheduled Air Taxi, Beech 99, N986MA, Allentown- Bethlehem-Easton Airport, Allentown, Pa., October 24, 1971			5. Report Date December 29, 1971		
			6. Performing Organization 1971 Code		
7. Author(s)			8. Performing Organization Report No.		
9. Performing Organization Name and Address Bureau of Aviation Safety National Transportation Safety Board Washington, D. C. 20591			10. Work Unit No.		
			11. Contract or Grant No.		
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20591			13. Type of Report and Period Covered Aircraft Accident Report October 24, 1971		
			14. Sponsoring Agency Code		
15. Supplementary Notes					
16. Abstract At approximately 2314 e.d.t., October 24, 1971, Monmouth Airlines, Inc., scheduled air taxi Flight 98, a Beech Model 99, N986MA, crashed at approximately the 1,540-foot level of Blue Mountain during an instrument approach to the Allentown-Bethlehem-Easton Airport, Allentown, Pennsylvania. The captain, copilot, and two passengers were fatally injured. The four remaining passengers were seriously injured. The crash site was on the 360° radial of the Allentown VORTAC, on a rolling ridge 11 miles north of the Allentown-Bethlehem-Easton Airport and 5 1/2 miles north of the VORTAC station. The wreckage was distributed for 370 feet along a path of 180° magnetic. The aircraft caught fire shortly after impact. The cockpit and cabin area were destroyed. However, the surviving passengers were able to evacuate from the aircraft before fire reached the cabin area. The National Transportation Safety Board determines that the probable cause of this accident was the pilot's nonadherence to approved approach procedures for executing a nonprecision instrument approach in instrument flight conditions. The Board further finds that there is a high degree of probability that the extensive on-duty time and actual instrument flight time prior to this accident resulted in the fatigue of both pilots, and affected their judgment and decisions during the approach.					
17. Key Words Airlines, Scheduled Air Taxi, VORTAC nonprecision instrument approach, Approach Chart, premature descent, mountain ridge, fatigue, fire, fatal, survivors.			18. Distribution Statement Released to Public. Unlimited Distribution.		
19. Security Classification (of this report) UNCLASSIFIED		20. Security Classification (of this page) UNCLASSIFIED		21. No. of Pages 18	
				22. Price	

MONMOUTH AIRLINES, INC.
SCHEDULED AIR TAXI
BEECH 99, N986MA
ALLENTOWN-BETHLEHEM-EASTON AIRPORT
ALLENTOWN, PENNSYLVANIA
OCTOBER 24, 1971

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This report contains the essential items of information relevant to the probable causes and safety messages to be derived from this accident. However, for those having a need for more detailed information, the original factual report on the accident is on file in the Washington office of the National Transportation Safety Board. Upon request the report will be reproduced commercially at an average cost of 15¢ per page for printed matter and 75¢ per page for photographs, plus postage. (Minimum charge \$1.00.)

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20591
AIRCRAFT ACCIDENT REPORT

Adopted: December 23, 1971

MONMOUTH AIRLINES, INC.
SCHEDULED AIR TAXI
BEECH 99, N-986MA
ALLENTOWN-BETHLEHEM-EASTON AIRPORT
ALLENTOWN, PENNSYLVANIA
OCTOBER 24, 1971

SYNOPSIS

At approximately 2314 e.d.t., October 24, 1971, Monmouth Airlines, Inc., scheduled air taxi Flight 98, a Beech Model 99, N986MA, crashed at approximately the 1,540-foot level of Blue Mountain during an instrument approach to the Allentown-Bethlehem-Easton Airport, Allentown, Pennsylvania.

The captain, copilot, and two passengers were fatally injured. The four remaining passengers were seriously injured.

The National Transportation Safety Board determines that the probable cause of this accident was the pilot's nonadherence to approved approach procedures for executing a nonprecision instrument approach in instrument flight conditions. The Board further finds that there is a high degree of probability that the extensive on-duty time and actual instrument flight time prior to this accident resulted in the fatigue of both pilots, and affected their judgment and decisions during the approach.

The Board made specific recommendations to the Federal Aviation Administration after this accident. See Attachment C for detailed information regarding the Board's recommendations and the FAA's reply.

INVESTIGATION

Monmouth Airlines, Inc., based at the Monmouth County Airport, Farmingdale, New Jersey, operates numerous scheduled air taxi flights in Northeastern United States.

Monmouth Airlines Flight 98 (Monmouth 98) of October 24, 1971, originated at Wilkes-Barre-Scranton Airport, Pennsylvania, and was to have terminated at the Allentown-Bethlehem-Easton Airport (ABE), Allentown, Pennsylvania. The flight departed Wilkes-Barre-Scranton at 2253 1/ with two pilots and six passengers, on an Instrument Flight Rules (IFR) clearance to the ABE Airport. The routing was "direct" to the Allentown VORTAC 2/ to maintain 4,000 feet.3/

At 2301, two-way radio contact was established between Monmouth 98 and Allentown Approach Control. During this initial radio contact, Monmouth 98 was given the current weather and altimeter setting and advised that a choice of approaches to the Allentown ABE Airport was available. ABE Airport has facilities for both a VOR and ILS 4/ approach. Monmouth 98 requested a VOR approach. The flight then was instructed by Allentown Approach Control to report when it was 12 miles north of the Allentown VOR.

At 2305, Monmouth 98 advised that the DME aboard the aircraft was not working too well and that it would be necessary to use the 030° radial of the East Texas VOR to establish a position 12 miles north of the Allentown VORTAC. Allentown Approach Control then asked Monmouth 98, "how far out do you think you are?" Monmouth 98 replied that it was estimating Allentown in about 6 minutes. At 2307, upon receiving the flight's position estimate, Allentown Approach Control cleared Monmouth 98 for a VOR approach to a landing on Runway 6. Monmouth 98 was requested to report when inbound over the Allentown VOR. Monmouth 98 acknowledged the clearance. This was the last known radio contact with the flight.

The wreckage of Flight 98 was located about on the 360° radial of the ABE VORTAC, on the ridge of Blue Mountain near latitude 40° 49' 40" N. and longitude 75° 29' 45" W. The terrain elevation of the accident site is approximately 1,540 feet. Blue Mountain is a rolling ridge with ridge top elevation varying between 1,500 and 1,600 feet. The ridge runs

-
- 1/ All times herein are eastern daylight based on the 24-hour clock.
 - 2/ VORTAC - A collocated Very High Frequency OMNI Range Station (VOR) and Tactical Air Navigation aid. These facilities are capable of providing distance information as well as azimuth to aircraft having distance measuring equipment (DME) on board.
 - 3/ All altitude and terrain elevations are mean sea level.
 - 4/ ILS - Instrument Landing System

in a generally east-west direction and is located 11 miles north of the ABE Airport and 5 1/2 miles north of the Allentown VORTAC.

Broken tree limbs and various aircraft components, including the outboard sections of both wings, portions of the horizontal tail surfaces, and the right engine, were distributed for 370 feet along a path of 180° magnetic.

Impact and fire damage precluded reliable documentation of the operation of any cockpit instruments except a clock and one of two altimeters. The damaged clock was stopped at 11:14.

A laboratory examination of the altimeter disclosed a setting of 30.02. Severe internal damage precluded a determination of preimpact operating capability.

The altimeter setting that was transmitted to the crew during the approach was 30.05.

The horizontal stabilizer was set between 2.62° and 2.87° leading edge up and the landing flaps were extended 66 percent. These settings were compatible with an instrument approach configuration.

There was no evidence of a preimpact malfunction of the airframe, powerplants, or associated components.

The powerplants, airframe, and associated components revealed nothing that would have contributed to mechanical malfunction prior to impact. All electronic navigational equipment and instrumentation was damaged by fire to the extent that meaningful determination of preimpact operating conditions, frequencies, or OMNI bearing selector settings could not be made.

The maintenance records indicated that the aircraft had been maintained in accordance with Federal Aviation Regulations and company procedures and requirements.

Reported weather conditions at the Allentown ABE Airport at 2257, on October 24, 1971, were: scattered clouds at 500 feet, measured ceiling 800 feet, overcast, visibility 5 miles, light rain and fog, temperature 59°, dew point 59°, wind 090° at 12 knots, altimeter setting 30.05.

The Allentown ABE Airport is located on the north side of the tri-city metropolitan complex of Allentown, Bethlehem, and Easton, Pennsylvania. The Allentown Queen City Municipal Airport is located south of the cities.

The Queen City Municipal Airport is close to the ABE Airport, and has a VOR-1 approach plate with peculiar similarity to the ABE VOR-1 approach plate. The Queen City VOR-1 approach utilizes the East Texas VOR facility

for the approach to Queen City Airport. The ABE VOR-1 approach utilizes the Allentown VOR facility for the approach to ABE. However, the minimum altitude over the final approach fix for the Queen City approach is 1,600 feet, whereas the minimum altitude over the final approach fix for the ABE approach is 2,200 feet. Both of these approach plates were filed together in the same approach plate binder utilized by Monmouth Airlines. (See Attachment B for approach details and minima for each facility.)

The surviving passengers reported that there was no indication of the impending accident on the flight from Wilkes-Barre to Allentown. According to their statements the curtains separating the cockpit from the passenger compartment were closed before the takeoff from Wilkes-Barre, thus they were unable to observe the crew's activity during the flight. They said that although the flight was very rough, the sound of engines seemed normal. Just before impact they had the sensation of being suddenly squeezed very hard into their seats, followed immediately by "crashing and bursting sounds." They said that the aircraft caught fire shortly after coming to rest and that there were several explosions during the ensuing fire which destroyed the cockpit and cabin area. The surviving passengers were still strapped in their seats after the fuselage came to rest. They were able to evacuate the aircraft before the fire reached the cabin area.

On the day of the accident the crew had been on duty approximately 14 hours and, of that time, had flown a total of 5 hours and 30 minutes under instrument flight rules. At approximately 1900, and again at 2100, the copilot called his wife to inform her that he would not be home as soon as he had originally expected. He commented that there had been delays in the schedule throughout the day.

The crew was properly certificated except for the captain, whose medical certificate had expired for commercial pilot privileges on June 30, 1971.

The aircraft had been maintained in an airworthy condition.

Post-mortem examination of the pilots did not reveal any evidence of preexisting disease or physical impairment.

ANALYSIS AND FINDINGS

Monmouth Flight 98 on October 24, 1971, operated normally from the departure point, Wilkes-Barre, Pennsylvania, until its arrival in the vicinity of the ABE Airport.

During the approach the aircraft was descended prematurely and struck a mountain approximately 11 miles north of the airport, and 5 1/2 miles from the Allentown VORTAC.

No evidence of preimpact failure or malfunction of the aircraft, powerplants, controls, associated systems, or components was found.

In view of the post-mortem findings, the Safety Board believes that the captain's failure to have a currently valid medical certificate was not a contributing factor in this accident. However, the long on-duty hours, and the considerable number of hours of flight under instrument flight rule conditions, may well have resulted in fatigue for both pilots, which affected their judgment and decisions during the instrument approach to the ABE Airport.

A direct flight from Wilkes-Barre to the Allentown VORTAC will result in a flight path of about 180° magnetic. This is also the inbound heading for the VOR-1 approach to the ABE Airport.

Since the flight had been cleared from Wilkes-Barre direct to ABE, the pilot likely would have established course on the Allentown 360° radial utilizing the Allentown VORTAC. Hence, in referring to the approach plate, his main concern might have been the minimum altitude over the final approach fix. According to the Allentown Approach Control communications transcript, the pilot used the 030° radial of the East Texas VOR to establish a 12-mile position north of the Allentown VORTAC because of the erratic operation of his DME. That the 12-mile fix was established is shown by the pilot's computation of the 6-minute estimate from the station. It is possible that at this point, as a result of fatigue and the previous flight delays, the pilot elected to make a straight-in approach to the ABE Airport without proceeding to the VOR station at the minimum en route altitude, or executing the procedure turn as required. If, in this circumstance, the Allentown Queen City VOR-1 approach chart was used mistakenly to determine the minimum altitude for crossing the final approach fix, the aircraft would have been descended to 1,600 feet instead of the correct altitude of 2,200 feet as shown on the Allentown-Bethlehem-Easton chart. (See Attachment B.) The result would be a descent below terrain elevation in the Blue Mountain area.

The possibility of misreading the altimeter as a cause was considered. If the pilot misread the altimeter by 1,000 feet, and believed he was descending through 2,600 feet in anticipation of station passage at 2,200 feet, the result would have been descent into obstructing terrain.

In either event, it is apparent that the correct procedure was not being followed since the time interval of 8 minutes between the report of "6 minutes" from the station and the time of the crash would not have permitted the aircraft to overhead the station, proceed outbound on the 360° radial, and execute the procedure turn to the inbound heading. That the pilot was descending intentionally on a final approach course is indicated by the landing gear extension and the use of final approach flaps.

Had the correct procedure been followed, there would have been several opportunities for the crew to become aware of an altimeter misreading or the unintentional use of the wrong approach chart.

The Board also considered the possibility of erroneous station passage depiction by the VOR course indication needle. It is realized that if needle fluctuation occurred it could be interpreted as station passage. However, since impact occurred some 5 1/2 miles from the VORTAC, the "to-from" feature of the VOR receiver instrumentation should have shown a steady indication of flight "to" the station. The "to-from" indicator is the primary means of determining station passage.

The damaged condition of the cockpit instruments precluded a meaningful determination of the VOR receivers' functional operating capabilities or other evidence that would support a VOR course indicator malfunction.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of this accident was the pilot's nonadherence to approved approach procedures for executing a nonprecision instrument approach in instrument flight conditions. The Board further finds that there is a high degree of probability that the extensive on-duty time and actual instrument flight time prior to this accident resulted in the fatigue of both pilots, and affected their judgment and decisions during the approach.

RECOMMENDATIONS

The Board recommended that the Federal Aviation Administration:

- (1) Require some conspicuous and distinctive marking to be affixed to the Allentown approach plates to enable pilots to identify the proper plate quickly and positively. The words "CAUTION -- VERIFY PROPER APPROACH" or similar phraseology may be appropriate.
- (2) Promptly review all instrument approach plates to determine instances of potential approach plate misidentifications in other locations, and if found, institute the same remedial action.
- (3) As an interim measure, notify the public of this potential hazard by whatever means you deem most expeditious and effective.

See Attachment C for detailed information regarding the Board's recommendations and the FAA's reply.

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

/s/ ISABEL A. BURGESS
Member

December 29, 1971

CREW HISTORY

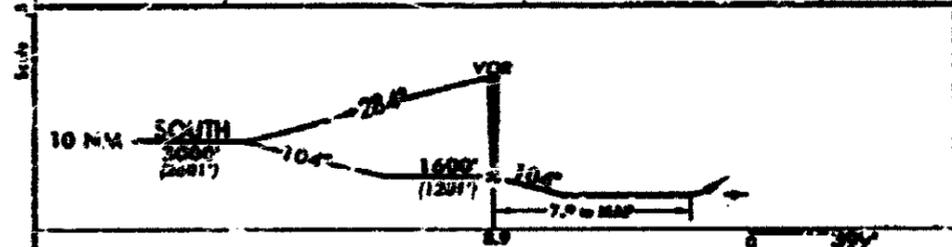
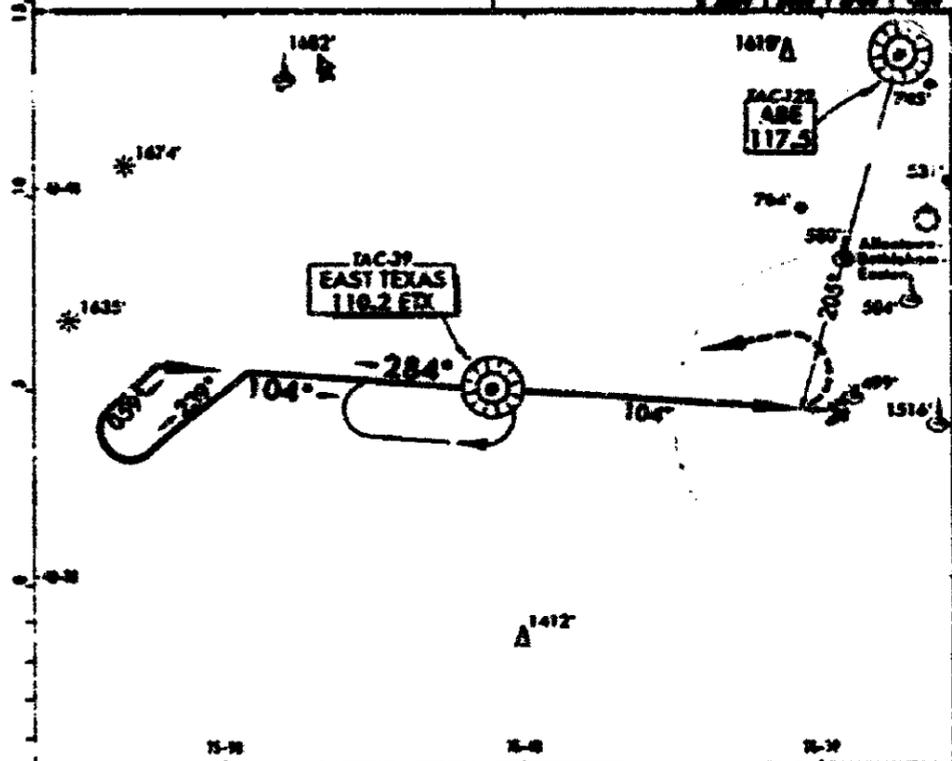
Captain Richard S. Ricotta, aged 28, held Airline Transport Pilot certificate number 1736863. His first-class medical certificate, with no limitations, was dated June 30, 1970. A first-class medical certificate is valid for 12 months from the date of issue for the exercise of commercial pilot privileges.

Captain Ricotta completed his Federal Aviation Administration (FAA) competency check to pilot a Beech 99 aircraft under IFR conditions on October 7, 1971.

The copilot, James Richard Crawford, aged 25, held Commercial Pilot's certificate number 1669226, with flight instructor, instrument, single- and multiengine land, and rotocraft ratings. Mr. Crawford held a current first-class FAA medical certificate, with no limitations, dated February 25, 1971.

Copilot Crawford was regularly employed by the New York City Police Department as a helicopter pilot. His association with Monmouth Airlines included voluntary flying as a copilot on an infrequent basis. At the time of the accident it was the policy of Monmouth Airlines to use copilots who agreed to fly for the experience without other compensation.

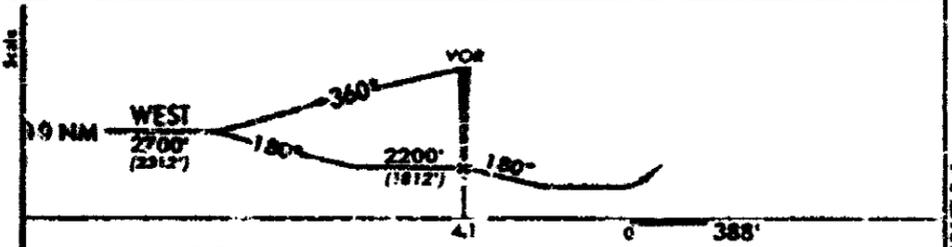
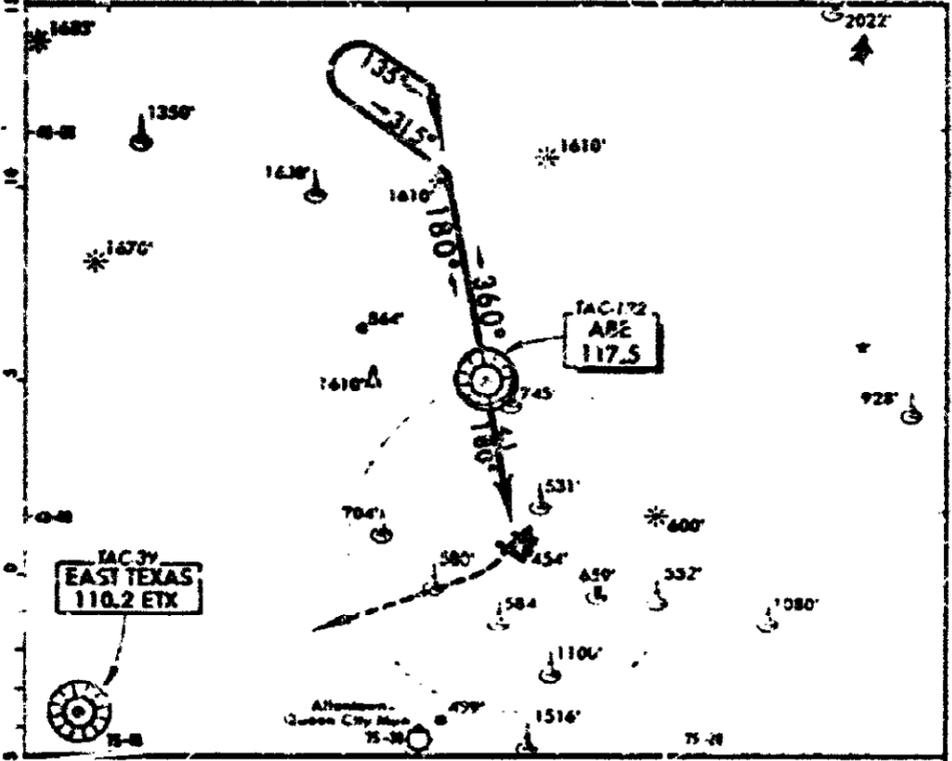
Jeppesen Approach Chart SEP 24/71 (23.1) ALLENTOWN, PA. - QUEEN CITY MUNI VOR-1
 Apt. Elev 399' VOR 118.2 ETX
 Use Altimeter FSS altimeter setting.
 Vcr 10°W Class B VOR/TAC
 ALLENTOWN Approach 118.2



PULL UP: turn LEFT to 3000 feet to ETX VOR and hold WEST.

CIRCLE TO LAND	
A	1180' (592')-1
B	1260' (597')-PA
C	NA
D	NA
E	NA

Jeppesen Approach Chart OCT 1/71 (23.1) ALLENTOWN PA. - BETHLEHEM-EASTON VOR-1
 APT. Elev 388' VOR 117.5 ABE
 Use Altimeter FSS altimeter setting.
 Vcr 10°W Class B VOR/TAC
 ALLENTOWN Approach 118.2



PULL UP: turn RIGHT to 2700 feet to ETX VOR and hold WEST on R-292, RIGHT turns.

CIRCLE TO LAND	
A	980' (592')-1
B	980' (592')-1 1/2
C	980' (592')-2
D & E	980' (592')-2
Non-Std Eng Apt	1340' (657')-2

ATTACHMENT B

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 17, 1971

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 3rd day of November 1971.

FORWARDED TO:

Honorable John H. Shaffer)
Administrator)
Federal Aviation Administration)
Washington, D. C. 20591)

SAFETY RECOMMENDATION A-71-60 thru 62

On October 24, 1971, an aircraft crashed while executing a VOR instrument approach to the Bethlehem-Easton Airport, Allentown, Pennsylvania. This accident resulted in four fatalities and four serious injuries. Preliminary investigation of the accident and a review of the VOR approach procedures for the Allentown area indicate that the VOR approach plates may have been a factor in this accident.

The aircraft crashed 10 miles north of the airport and 5 miles north of the Allentown VOR at an altitude of 1,600 feet mean sea level (m.s.l.). In an attempt to ascertain why the aircraft was at that altitude, at that point, the VOR approach plates were reviewed closely. It was noted that 1,600 feet m.s.l. is the low station altitude for the Allentown VOR approach to the Queen City Municipal Airport, utilizing the East Texas VOR. The VOR approach to the Bethlehem-Easton Airport, using the Allentown VOR, has a low station altitude of 2,200 feet m.s.l.

Since both instrument approach plates are entitled "VOR-1" and have the word Allentown twice in proximity thereto, it is entirely possible that haste, poor lighting, or other factors might have caused the pilots to select the wrong approach plate for the approach they were conducting. Thus, when the aircraft was cleared for the approach and erroneously descended to 1,600 feet m.s.l., there was inadequate terrain clearance, and the ensuing accident was inevitable.

Honorable John H. Shaffer

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In light of the foregoing, it is the opinion of the National Transportation Safety Board that some method must be instituted to preclude, insofar as possible, selection of the improper instrument approach plate. To this end, the Board recommends that your Administration:

1. Require some conspicuous and distinctive markings to be affixed to the Allentown approach plates to enable pilots to identify the proper plate quickly and positively. The words "CAUTION--VERIFY PROPER APPROACH" or similar phraseology may be appropriate.
2. Promptly review all instrument approach plates to determine instances of potential approach plate misidentifications in other locations, and if found, institute the same remedial action.
3. As an interim measure, notify the public of this potential hazard by whatever means you deem most expeditious and effective.

Members of our Bureau of Aviation Safety will be available for consultation in this matter if desired.

This recommendation will be released to the public on the issue date shown above. No public dissemination of the contents of this document should be made prior to that date.

Reed, Chairman; Laurel, McAdams, Thayer, and Burgess, Members, concurred in the above recommendations.


By: John H. Reed
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20572

C O P Y



OFFICE OF
THE ADMINISTRATOR

26 NOV 1971

Honorable John H. Reed
Chairman, National Transportation Safety Board
Department of Transportation
Washington, D. C. 20571

Dear Mr. Chairman:

This is in response to your Safety Recommendations A-71-60 through 62 dated 17 November 1971 concerning a Monmouth Air Lines accident in the vicinity of Allentown, Pennsylvania.

The conditions cited in your recommendations have been reviewed. Based on available information, we do not consider that the VOR approach plates were a contributing factor in this accident nor do we consider that the recommended actions are appropriate.

The Board has based their recommendations on the premise that the pilot may have selected the wrong VOR approach plate due to some similarity between the airport names, haste on the part of the crew, or poor lighting.

Our review of the ATC recordings indicate that the pilot was fully aware of his position, the navigation facilities he was utilizing and that he was familiar with the destination airport. The pilot reported that he would utilize the East Texas VOR 030° radial to report his position 12 miles north of the Allentown VOR. He also reported that he wanted a VOR approach to the south of the airport. He was subsequently cleared for the VOR approach, to land on runway 6 with instructions to report at the VOR inbound. In order to make a VOR approach utilizing either approach plate, a pilot must proceed to the VOR by airways at MEA and execute a procedure turn, since RADAR is not available and a straight-in without a procedure turn is not authorized. If the pilot selected the wrong approach chart, he would be required to make a procedure turn on the 284° radial, and the crash site which was approximately 5 miles north of the Allentown VOR does not substantiate this theory.

In view of the pilot's voice transmissions and the location of the crash site, we do not believe that he utilized the incorrect chart, that he was planning his approach in haste, or that he was having any cockpit difficulties.

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In summary, this was a routine, scheduled air taxi operation. The pilot flew regularly into the Allentown, Bethlehem-Easton Airport and was familiar with the route and airport environments; therefore, the information available to the FAA does not support the action recommended by the Board.

Sincerely,

(signed) Jack
J. H. Shaffer
Administrator

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