

## CIVIL AERONAUTICS BOARD

**ACCIDENT INVESTIGATION REPORT**

Adopted: September 19, 1955

Released: September 22, 1955

AMERICAN AIRLINES, INC., CONVAIR 240, N 94234,  
NEAR SPRINGFIELD, MISSOURI, MARCH 20, 1955

The Accident

American Airlines Flight 711, a Convair 240, N 94234, crashed at 2236<sup>1/</sup> March 20, 1955. The accident occurred in an open field approximately 1-1/4 miles north-northwest of the Municipal Airport at Springfield, Missouri. Eleven of the 32 passengers, the first officer, and the stewardess were fatally injured. The other passengers, with one exception, and the captain were seriously injured. The aircraft received major damage by impact.

History of the Flight

Flight 711 of March 20 was a scheduled operation between Newark, New Jersey, and Tulsa, Oklahoma, with numerous intermediate stops. Among others the scheduled stops included Chicago, Illinois, and St. Louis and Springfield, Missouri. The flight originated on schedule at 1245, made three stops, and landed at Chicago at 1843. It was 23 minutes late because of Chicago traffic delay. In all other respects the flight was normal and routine.

A scheduled crew change was made at Chicago with Captain John Pripish, First Officer Glenn E. Walker, and Stewardess Rita M. Madaj assigned to continue the trip to its destination. The flight proceeded normally to St. Louis and landed at 2100. While there the crew was briefed and furnished the latest weather reports and forecasts for the remainder of the operation. Low ceiling and visibility forecast for Springfield, the next stop, indicated it might have to be overflown, this decision to be made by the captain upon arrival depending on the existing conditions. The weather conditions also required selection of a more distant alternate airport (Gage, Oklahoma), and commensurate additional fuel; the total aboard was 870 gallons. Thunderstorms over the route, previously an important consideration, were no longer a factor. These factors resulted in an additional delay and the flight departed at 2136, more than an hour behind schedule.

The IFR (Instrument Flight Rules) clearance issued by ARTC (Air Route Traffic Control) specified in part that the flight was cleared to the Springfield VOR (Visual Omni Range) Station via Victor Airway 14, to maintain 4,000 feet m. s. l. (mean sea level). Company records indicated that at departure the aircraft was loaded to a weight near, but less than the maximum allowable; the load was properly distributed.

<sup>1/</sup> All times herein are central standard and are based on the 24-hour clock.

American 711 reported en route to the company that it was over Vichy (a position along Victor Airway 14 about 100 miles from Springfield) and estimated it would reach the Springfield VOR station at 2233. Initial radio contact with Springfield Approach Control was established at 2218 and the flight gave it the same Springfield estimate. The approach controller transmitted the 2208 weather observation to the flight. Reported conditions were: Ceiling 400 feet overcast; visibility 10 miles; wind west 12; altimeter 29.68. In response to the controller's question the flight then indicated it intended to land at Springfield. Immediately thereafter clearance was issued for a standard range approach, instructing Flight 711 to report over the range station and when starting the procedure turn. Shortly thereafter the flight asked clearance to descend. There being no other traffic the controller cleared the flight for an approach and to descend whenever it wished. At 2229 the latest weather observation for the airport, completed at 2228, was transmitted to the flight. Conditions given were: Ceiling 500 feet overcast; visibility 8 miles, very light drizzle; wind west 10. The flight informed the controller it would make a circling approach to runway 31, the active runway. At 2234 the flight reported, "American 711, over the Omni at 34, proceeding to the field." Approximately two minutes later an explosion was seen and heard north-northwest of the airport and attempts to contact the flight thereafter failed.

A weather observation immediately following the accident was: Ceiling 500 feet overcast; visibility 5 miles, very light drizzle; wind northwest 8; altimeter 29.66.

### Investigation

Investigation conducted at the scene of the accident disclosed the aircraft cleared several trees bordering the northeast corner of an open field. The top of one was 27 feet higher than the point of the initial ground impact. This was about 200 feet beyond the trees which indicates that the aircraft, at a normal approach speed, was descending about 1,600 feet per minute. Impact was in an open, muddy, cultivated field at an altitude of 1,250 feet m. s. l. while the aircraft was heading 220 degrees magnetic. At impact the nose of the aircraft was depressed at a shallow angle and the right wing was slightly down. Gouges in the soft earth were made by the right wing, both engine nacelles, and the bottom of the fuselage. The wreckage path was along the impact heading for 1,100 feet and was strewn with various pieces of the aircraft as they separated from it. The major portion of the aircraft stopped in an upright position on a heading of 240 degrees. It was determined that the landing gear was fully retracted and the flaps were extended about 19 degrees.

Impact forces were severe and high vertical and fore and aft forces were developed during the initial ground contact. These forces broke the nose section from the fuselage and crushed the lower structure upward to the floor support beams. Vertical compression buckling was induced in areas which did not contact the ground and deflected the sides of the fuselage outward. The right wing was separated and destroyed by the impact and an explosion which occurred in the fuel tank area. The left wing was torn off and came to rest

relatively intact in an inverted position several yards ahead of the main wreckage. The passenger seats, with the exception of the last row, were torn free and thrown forward. Examination of this wreckage, although severely damaged, disclosed no evidence of fatigue cracking, structural failure, or malfunctioning controls prior to impact.

Both engines were torn out and broken into several sections by impact. Examination of their combustion chambers, oil pumps, oil screens, front and rear accessory drives and bushings, and interiors of the power sections failed to disclose evidence of malfunction or failure before impact. The propeller blade angles at impact were in the positive pitch range and both were positioned about 40 degrees. This indicated both engines were developing appreciable power in nearly equal amounts. The amounts were normal for the Convair while circling to land.

The radio and navigational equipment was examined and although damaged failed to disclose evidence of malfunction or failure before impact. Pertinent ground navigational facilities, examined immediately after the accident, were operating within accepted tolerances. The aircraft altimeters were found set and indicating correctly.<sup>2/</sup>

Supporting the physical examination of the structure, powerplants, propellers, and controls were the several radio contacts made by the flight, which were normal and indicated no difficulty. According to company records the aircraft had been properly maintained during its service history.

It was learned that an Air Defense Radar Installation, near Springfield, made sequence photographs of one of its radar scopes to compile a radar picture of the weather situation and its progress. This was being done while Flight 711 was approaching Springfield and radar impressions (blips) of the aircraft were included on the photographs. The pictures, made at definite intervals a few seconds apart by an automatic camera, showed the flight's progress. These blips, when transferred to an aeronautical chart, indicated the flight was first "picked up" near Vichy. It was then following Victor Airway 14 on a heading of approximately 231 degrees. The flight passed the Springfield VOR station slightly north of it, then turned left until headed toward the airport. The radar blips on the photographs ended near the crash site. The radar plotting indicated that the average groundspeed of the aircraft after it passed the station was within the normal range for the Convair aircraft while approaching an airport before making a circling approach.

There are three CAA approved instrument approach procedures for the Springfield Airport - the low frequency range approach, the VOR approach, and an ADF (Automatic Direction Finder) approach. The VOR facility was being used during the approach of Flight 711. The VOR instrument approach procedure

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<sup>2/</sup> American Airlines' procedure for setting the two aircraft altimeters indicates to the crew the aircraft altitude both above mean sea level and above the airport of next landing. The captain's is set to read altitude above the airport and the first officer's to mean sea level.

associated with a flight from St. Louis requires that the aircraft turn right upon reaching the VOR and establish an outbound track of 13 degrees. It then requires a procedure turn and an inbound track of 193 degrees. This track, if maintained, will pass over the station again and intersect the threshold position of runway 19, 7.8 statute miles from the station. Minimum en route altitude from Vichy is 2,600 feet m. s. l. Minimum altitudes during the approach are 2,600 feet m. s. l. over the station, 2,300 feet m. s. l. during the procedure turn, and 1,867 feet m. s. l. (600 feet above the airport) when over the station inbound to the airport. The circling minimum weather conditions for American Airlines' Convair flights are: Ceiling 500 feet and visibility 2 miles. The airport field elevation is 1,267 feet m. s. l.

During the public hearing a company witness stated that under the circumstances he believed the approach path depicted by the radar plots was in accord with the approved VOR instrument approach procedure. He stated that considering the degree of turn to the airport from Airway 14, the distance involved, and the en route altitude compared to the specified minimum altitude for the airport, the approach as executed was a safe and reasonable interpretation of the VOR instrument approach procedure. He believed the approach was within the limitations imposed by the Civil Aeronautics Administration and American Airlines.

A representative of the CAA, an Air Carrier Safety Agent assigned to the carrier involved, stated that the approach indicated by the radar track of Flight 711 was not consistent with the requirements of the VOR instrument approach procedure. He stated that the full procedure for Springfield, considering the facilities, is expected to be completed when instrument conditions exist. He said that the purpose of the outbound track, the procedure turn, and the inbound track is to permit a flight to descend to a lower safe altitude within a known area. These permit the flight crew to establish a track to the airport with a facility check after that track has been established and also afford the crew more time to complete final cockpit checks before visual contact is made for landing. The testimony of this witness was based upon Civil Air Regulations, Sections 60.46 and 40.364.3/

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3/ 60.46 Instrument Approach Procedure. When instrument letdown is necessary, a standard instrument approach procedure specifically authorized by the Administrator shall be used, unless:

(a) A different instrument approach procedure specifically authorized by the Administrator is used, or

(b) A different instrument approach procedure is authorized by Air Traffic Control for the particular approach, provided such authorization is issued in accordance with procedures approved by the Administrator.

40.364 When an instrument approach is necessary, the instrument approach procedures and weather minimum authorized in the operations specifications shall be adhered to.

Captain Pripish, because of severe injuries, was unable to remember any of the events of Flight 711. He stated, however, that his interpretation of the instrument approach would not permit eliminating the outbound heading, procedure turn, and the inbound track if instrument conditions prevailed.

The surviving passengers described the flight as very pleasant before the accident. Nearly all agreed it was smooth and the engines' sound seemed normal. One, an aircraft mechanic, said there was no indication of engine malfunction. Numerous passengers observed the "Fasten Seat Belt" sign come on and recalled that the stewardess had passed down the aisle checking their belts. During the entire flight and until the instant of impact there was no warning of the crash or indication of an emergency declared in the passenger cabin.

Two passengers stated the flight between St. Louis and Springfield was mostly above or between cloud layers. They stated that during the latter part of the trip the engine power sound lessened, and the aircraft descended and entered the clouds which at times blotted out their view of the wing light. They stated that until the aircraft descended below the clouds they could not see any lights on the ground. Several passengers said they saw widely scattered ground lights through a light mist shortly before the impact. One, seated on the left, stated he saw lights to his left in the general area of the airport one or two minutes before the crash.

A passenger seated on the right in the front aisle seat was able to see into the dimly lighted pilot compartment but was unable to see enough of the pilots to determine who was holding the controls. He stated that an instant before the crash he heard one of them cry out in an excited, loud, and warning voice, "My God, we are going to hit the ground." Instantly, there was a roar of power and the impact followed almost simultaneously. Several others heard the increase of power. These witnesses were not in accord as to whether the turn to the airport was made while the aircraft was in the clouds or after it descended below them.

Several ground witnesses located from about 3-1/2 miles south of the Omni range station to positions on the airport saw the aircraft. A housewife located 3-1/2 miles south of the Omni, saw the aircraft below the clouds heading southwest toward the airport, and was impressed by the fact that it seemed quite low. Another witness saw the aircraft pass over at a very low altitude and saw it continue to descend until it struck the ground less than 1/2 mile beyond. A witness on the airport watched the aircraft come into view north of the airport, saw it proceed toward the airport, apparently flying level, and then descend gradually until it disappeared behind obstructing terrain. He saw a flash, then heard an apparent engine roar. All witnesses who saw and heard the aircraft believed it was low compared to other flights. They all believed the sound of the engines was normal.

Investigation disclosed that the crew was qualified for the flight, and had received the required preflight rest period. Captain Pripish had flown into Springfield Airport about 55 times. Early in the morning of March 20 he was scheduled for another flight that evening and was notified of this;

however, a scheduling situation required him to be assigned to Flight 711. As a reserve captain he was qualified over several routes, including the one involved.

First Officer Walker, furloughed by a reduction in force, had recently been recalled by the company and after completing the checkout requirements was assigned to Flight 711 as his first flight. Captain Pripish knew this, having been informed under a normal procedure of the company in the interest of good operating practices. Many witnesses with whom the crew members had personal contact before and during the flight stated that both appeared to be in excellent spirits and normal in every respect.

At 1230 a surface cold front extended northeastward from Amarillo to near Wichita and Chicago. There was minor wave action on this front and it formed the southern boundary of a cold air mass which was moving southeastward across the Plains States. Relatively low pressure existed at the surface in Oklahoma, Texas, and New Mexico with a trough extending northeastward into Missouri and Illinois. As a result of this situation and other factors considerable thunderstorm activity existed in Missouri and a solid deck of low clouds existed to the north and west of the cold front. This front moved southeastward during the afternoon and evening of March 20 and passed Springfield at 2208. The passage was immediately followed by a small pressure jump.

When Captain Pripish reached St. Louis he called the American Airlines dispatcher at Ft. Worth by long distance telephone to determine whether or not the thunderstorms permitted the flight to continue. At this time the front was expected to pass Springfield about the time the flight would arrive but the severe thunderstorms had dissipated and were no longer considered important. Low ceiling and visibility were expected, however, and the possibility that Springfield would be below limits was recognized.

Weather observations for the Springfield Airport were taken on the airport and incorporated the use of the ceilometer, an electronic measuring device for determining the height of the ceiling. The weather observations indicated an overcast ceiling, without any breaks, for a considerable period before and after the accident. These observations reflected only the conditions that existed at the airport. Meteorologists who testified at the public hearing stated that weather conditions at the VOR station were not definitely known; however, based on their training and experience and considering all the factors involved, different conditions in the area of the VOR station were considered possible but not probable.

### Analysis

After radio contact was established with Springfield Approach Control the flight was given an approach clearance which required it to report upon reaching the VOR station and when it began the procedure turn. Subsequent to this clearance Flight 711 received another which was "cleared for an approach." This clearance, in effect, notified the flight there was no other traffic. It also voided the reporting requirements and permitted the flight to make any approach it desired. The clearance, however, did not permit or intend to permit any other approach except the full instrument approach if instrument conditions prevailed. From the flight's estimate to the VOR station, its report over the station, the time of the accident, and the radar plot it is clear the complete instrument approach procedure was not made.

Weather conditions in the Springfield area strongly indicate the top of the overcast was between 3,000 and 4,000 feet m. s. l. and the overcast at the airport was without breaks with its base about 500 feet above the surface. Analysis of the situation also suggests that these conditions prevailed in the area of the VOR station. It is therefore believed that the entire prescribed instrument procedures should have been made. The Board nevertheless recognizes the possibility that the flight may have established visual contact with the surface in the area of the VOR station and proceeded visually toward the airport. If the crew did establish visual contact at the minimum en route altitude before or upon reaching the station it was permissible for the flight to have proceeded visually to the airport without following the instrument approach procedure. This action would also have been permitted under an emergency condition; however, based on all the available evidence it is believed that no emergency occurred.

From the testimony of several eyewitnesses it is apparent that the aircraft was nearly on the 193-degree inbound radial to the airport from the Omni and that it was flown below the overcast for several miles before it struck the ground. During this time the aircraft was in the same relative positions over the ground required by the approved VOR instrument approach procedure. From the evidence available during this segment the aircraft was also apparently in the normal configuration for an approach to the airport before circling to land. The height of the base of the overcast and the distance involved indicate the rate of descent of the aircraft was not high during most of this distance. However, just prior to impact the aircraft was descending about 1,600 feet per minute.

It will be recalled a passenger heard one of the pilots cry out just before impact, "My God, we are going to hit the ground." This, and other evidence, indicates the crew was not aware the aircraft was so low and that it was descending. It is probable that at this time the pilots were devoting their attention outside the cockpit and possibly toward the distant airport lights while flying over flat, dark, and sparsely lighted terrain in somewhat restricted visibility. An important psychological factor enters into an approach under these conditions and has been credited a factor in other accidents or near accidents.<sup>4/</sup> The effect of such conditions has given flight crews an erroneous impression of altitude and/or the illusion that the aircraft is flying horizontally with respect to a distant light or group of lights when in reality the nose attitude of the aircraft is up or down. Under such circumstances, as shown by previous incidents, the crews have not realized the situation and have not been warned by their physical senses of the danger. Other crews in similar situations have broken off trailing antennas or actually struck a ground object before realizing their positions.

The likelihood of this situation relative to Flight 711 cannot be positively determined because the primary evidence of it would be provided by the crew's testimony, which was unavailable to the Board. However, the similarity of the circumstances of this and other occurrences lends credence to this explanation.

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<sup>4/</sup> 1. Reference "The Sensory Illusion of Pilots," by E. P. Jacoby.  
2. CAB Accident Investigation Reports 44-000 and 44-277

Findings

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

1. The company, the aircraft, and the crew were currently certificated.
2. The flight was properly dispatched and cleared according to instrument flight rules.
3. At the St. Louis departure the aircraft was loaded to a weight less than the maximum allowable and the load was properly distributed.
4. En route weather conditions were correctly forecasted and the conditions at Springfield were better than expected.
5. Weather conditions at Springfield were above the minimums for an American Airlines Convair aircraft to make a VOR instrument approach and to circle for the landing.
6. The flight did not execute the CAA approved VOR instrument approach procedure but proceeded directly from the station toward the airport.
7. Analysis of the existing weather conditions indicates that before the aircraft turned toward the airport visual reference with the ground was possible but not probable at the required altitude.
8. While approaching the airport the aircraft was nearly on the 193-degree inbound radial required by the VOR instrument approach procedure and was flown visually below the overcast for several miles.
9. The aircraft descended until it struck the ground approximately 1-1/4 miles north-northwest of the airport.
10. There was no evidence found indicating malfunction or failure of the aircraft and there was no indication of an emergency aboard the aircraft.

Probable Cause

The Board determines that the probable cause of this accident was a descent to the ground while approaching the airport caused by the crew's inattention to their flight instruments and a possible sensory illusion giving them an erroneous impression of the attitude of the aircraft.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ROSS RIZLEY  
/s/ JOSH LEE  
/s/ CHAN GURNEY  
/s/ HARMAR D. DENNY

Joseph P. Adams, Vice Chairman, did not participate in the adoption of this report.



# S U P P L E M E N T A L   D A T A

## Investigation and Hearing

The Civil Aeronautics Board was notified of this accident at 2330, March 20, 1955. An investigation was immediately initiated in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. A public hearing was ordered by the Board and held in Springfield, Missouri, April 27 and 28, 1955.

## Air Carrier

American Airlines, Inc., is a scheduled air carrier incorporated in the State of Delaware with its principal offices in New York, New York. The carrier operates under a currently effective certificate of public convenience and necessity issued by the Civil Aeronautics Board and an air carrier operating certificate issued by the Civil Aeronautics Administration. These authorize the company to transport by air persons, property, and mail between various points in the United States including the route over which the accident occurred.

## Flight Personnel

Captain John Prupish, age 39, held a currently effective airline transport certificate and rating for the subject aircraft. Captain Prupish was employed by American Airlines on October 4, 1944, and with the exception of 2-1/2 years was continuously employed with the company. He was promoted to captain July 6, 1953. He had accumulated 9,670 flying hours, of which 1,324 were in Convair aircraft. His last 6-month check was completed March 2, 1955, his last CAA physical examination was January 20, 1955.

First Officer Glenn E. Walker, age 30, was employed by American Airlines on June 15, 1953, and furloughed November 30, 1953. He was recalled by the company March 7, 1955. He held a currently effective airman certificate with commercial pilot and instrument ratings. His total flying time was 1,922 hours, 2 of which were in the Convair aircraft before boarding Flight 711 at Chicago. First Officer Walker was qualified as First Officer March 19, 1955. His last CAA physical was accomplished February 12, 1955, and his last instrument check was completed March 17, 1955.

Stewardess Rita Mary Madaj, age 23, was employed by American Airlines March 19, 1953. Her latest emergency procedure checkout was completed August 5, 1954.

## The Aircraft

N 94234, a Convair CV-240 aircraft, was manufactured May 17, 1948, and delivered to the carrier May 26, 1948. The airframe had accumulated 13,383 hours, 1,702 hours since overhaul which was completed May 22, 1954. The engines were Pratt and Whitney R-2800-83AM4A and the propellers were Hamilton Standard 43E60-7.