

CIVIL AERONAUTICS BOARD
AIRCRAFT ACCIDENT REPORT

ADOPTED: July 26, 1962

RELEASED: August 1, 1962

CONTINENTAL AIR LINES, INC., BOEING 707-124,
N 70775, NEAR UNIONVILLE, MISSOURI,
MAY 22, 1962

SYNOPSIS

On the night of May 22, 1962, a Continental Air Lines Boeing 707-124, N 70775, operating as Flight 11 en route from O'Hare Airport, Chicago, Illinois, to Kansas City, Missouri, was flying via Jet Route 26V at an altitude of 39,000 feet. A few minutes after Flight 11 had made a northerly deviation from course to circumnavigate a thunderstorm, in the vicinity of Centerville, Iowa, the radar image of the aircraft disappeared from the scope of the Waverly, Iowa, Flight Following Service. At approximately 2117 an explosion occurred in the right rear lavatory resulting in separation of the tail section from the fuselage. The aircraft broke up and the main part of the fuselage struck the ground about 6 miles north-northwest of Unionville, Missouri. All 37 passengers and crew of 8 sustained fatal injuries. The aircraft was totally destroyed.

The Board determines that the probable cause of this accident was the disintegrating force of a dynamite explosion which occurred in the right rear lavatory, resulting in destruction of the aircraft.

Investigation

Aircraft N 70775, a Boeing 707-124, arrived at O'Hare International Airport, Chicago, Illinois, from Los Angeles, California, as Continental Air Lines Flight 10 at approximately 1900 ¹/_{on} May 22, 1962. At O'Hare the aircraft received routine servicing and a turnaround inspection in preparation for scheduled departure to Los Angeles as Flight 11 with an intermediate stop at Kansas City.

The crew of Flight 11 had flown into O'Hare from Los Angeles as the crew of CAL Flight 4, a Boeing 720, landing there at 1913. The crew consisted of Captain Fred R. Gray, First Officer Edward J. Sullivan, Second Officer Roger D. Allen, Director of Passenger Services, David E. Olssen, and Stewardesses Marilyn Bloomquist, Mary McGrath, Martha Rush, and Stella Berry. Flight dispatch was accomplished by the dispatcher at the carrier's headquarters in Denver through the customer service agent in Chicago in accordance with company policy and procedure. The dispatcher's proposed flight plan cruising altitude of 28,000 feet from Chicago to Kansas City was changed to 39,000 feet by the captain because he had knowledge of thunderstorm activity west of Chicago. An en route time of 1:01 hours from Chicago to Kansas City was shown on the flight plan. Flight 11 was released from O'Hare with a takeoff gross weight and a center of gravity well within prescribed limits.

¹/_{All times herein are Central Standard Time based on the 24-hour clock.}

U. S. Weather Bureau forecasts indicated heavy thunderstorm activity associated with an active cold front and prefrontal squall lines between Chicago and Kansas City. A severe weather warning was in effect for an area which lay across part of the proposed route of Flight 11, predicting heavy thunderstorms, maximum tops of 50,000 feet, with severe to extreme turbulence and possibility of tornadoes.

Flight 11 reported off O'Hare Airport at 2035 and was vectored by departure control to Bradford, Illinois, reporting over Bradford at 29,000 feet on Jet Route 26 Victor at 2052. Just east of the Mississippi River, at approximately 2101, Flight 11 asked Chicago Air Route Traffic Control Center if it had a radar picture of the squall line just ahead of the flight. The reply was negative and the center handed the flight over to the Flight Following Radar Site at Waverly, Iowa, one minute later. At about 2102, Flight 11 requested information regarding penetration of the storm area, and the Waverly controller suggested a southerly circumnavigation of a thunderstorm lying across the aircraft's flightpath.

Additional discussion between Flight 11 and the controller developed the fact that the thunderstorm could be circumnavigated either to the south or to the north. The nature of this discussion indicated that the aircraft's radar was operating satisfactorily, and Flight 11 elected to pass to the north around the storm cell. After the aircraft passed around the storm, the controller informed the flight that a direct course to Kirksville from its present position should avoid all inclement weather. The crew then replied that they were starting a turn, and requested clearance direct to Kansas City. The Waverly controller approved this request and informed the flight that descent clearance was being processed.

For several minutes Waverly attempted to contact Kansas City Center without success and so informed the flight, whereupon Flight 11 replied "Okay, we can probably reach them on your radio, do you want to send us over?" This was the last transmission heard from Flight 11 and is believed, by the controller, to have occurred at approximately 2114. Within approximately one minute of this transmission, however, the Waverly controller established contact with Kansas City Center and attempted to effect a radar handoff of Flight 11. At the same time Waverly tried unsuccessfully to contact Flight 11 to request that they establish communications with Kansas City on 133.95 mcs. Waverly also attempted to identify to the Kansas City Center the radar target location of Flight 11 as about 10 miles south of the intersection of Airways J45V and J64V, and moving in a southerly direction. The Kansas City controller momentarily observed an indistinct target at this approximate position but this target disappeared after two or three sweeps of the antenna and was never useable for radar handoff purposes. The Waverly controller stated that at approximately 2115, one minute after Flight 11's last transmission, he observed the aircraft's transponder return and subsequently the primary target begin to fade from the radar scope. It was later determined that the aircraft had crashed 6 miles north-northwest of Unionville, Missouri.

Numerous people in the vicinity of the accident site were contacted during a search for eyewitnesses to the accident, but none could be found who could positively correlate what they saw with the Continental aircraft. Several persons in the vicinity of Cincinnati, Iowa, and Unionville, Missouri heard loud and unusual noises. Two witnesses saw a big flash or ball of fire of short duration in the sky. The times at which these phenomena occurred were estimated by witnesses as between 2110 and 2130. All witnesses stated that the weather was clear at the time.

A B-47 from Forbes AFB, Topeka, Kansas, was flying in the vicinity of Kirksville, Missouri, at the approximate time of the accident and was headed in a northerly direction at 26,500 feet. The aircraft commander later reported that he saw a bright flash in the sky forward of and above his position. After referring to his navigation logs he estimated the flash to have occurred at 2122, near the location where the last radar target of Flight 11 had been seen by Waverly. He further stated that weather in the area at the time was clear with little or no turbulence.

The foil magazine removed from N 70775's flight recorder showed little damage, but there was extensive denting of the recorder case, severe distortion of the mounting bracket, and considerable damage to the internal mechanism. All of the parameter values recorded on the foil were readable and showed a normal operation of the aircraft. These values closely coincided with the aircraft's reported flight profile from liftoff at O'Hare Airport until 42 minutes later, when the vertical acceleration trace indicated extremely large excursions and all other traces became unreliable. The recorder indicated that the aircraft had encountered moderate turbulence at several intervals throughout the flight, but that for about five minutes prior to the last normal trace the air was smooth. Correlation of the flight recorder readings with the reported takeoff time indicates that at 2111, on encountering the last appreciable turbulence, the aircraft turned from a magnetic heading of 270 degrees to a heading of 247 degrees. It held this heading for about 30 seconds, and then turned further left to 230 degrees, holding within 10 degrees of the latter heading from approximately 2113 to the point where the traces became abnormal. The pressure altitude trace indicated a normal descent, from 39,000 feet, was begun at approximately 2115 and it continued at a fairly constant rate of 1,000 feet per minute for 2 minutes 7 seconds to an altitude of 36,800 feet. The indicated airspeed trace during this same interval of time shows an unsteady increase from 250 to 274 knots. The acceleration trace for this period of time varies little from 1.0 g except for a five-second interval at about 2116, when it jumped slightly between 0.78 and 1.23 g. Approximately one minute later, approximately 42 minutes after liftoff, or at approximately 2117, the flight recorder traces became extremely active.

The fuselage of N 70775, minus the aft 38 feet, and with part of the left and most of the right wing intact, struck the ground, headed westerly down a 10-degree slope of an alfalfa field located about 6 miles north-northwest of Unionville, Missouri and 1-1/2 miles west of State Highway No. 5. The nose of the aircraft dug into the ground at a 20-degree angle, with some telescoping of the fuselage just aft of the cockpit; however, the remaining fuselage, although badly broken, was not telescoped. The fuselage and wings struck the ground in a nose-down attitude and with the lateral axis almost level. There were indications of rotation about the vertical axis at impact, but the absence of drag marks down the hill reflected an almost complete lack of horizontal speed. The landing gear was down and locked; the wing flaps were up. An emergency checklist was found between the captain's yoke and his instrument panel. Two flight deck clocks had stopped at 2121:15 and 2121:45, respectively.

The engines were found at four separate locations within an area 1/2 mile wide and 3/4 mile long, with the closest engine approximately 1-1/8 miles southwest of the main wreckage. Each engine was partially buried in the ground on impact from an almost vertical fall. Inspection of the engines indicated that there was little or no rotation of compressors or turbines at ground impact.

Four large pieces of the aircraft were scattered in a northeasterly direction along the aircraft's flightpath 4 to 6-1/2 miles from the main wreckage. One of these, a 29-foot section of the left wing, was found about 4 miles away. The outboard panel and tip of the left wing were located 6-1/2 miles northeast of the main wreckage. The horizontal stabilizer and elevator assembly was lying in a hayfield about 1/2 mile north of the 29-foot wing section. About 6 miles northeast of the main wreckage the vertical fin and rudder assembly, with about half of the station 1440 and 1507 frames and some top skin still attached, was found intact having dropped almost vertically into thick woods. A soot-covered "assist" handle from one of the airplane's lavatories, a pillow, and some tissue paper were found lodged inside an aperture between the station 1440 frame and the fin. A small amount of blood and other human remains were found on the aft surface of this frame. Numerous abrasion marks and several punctures were found on the surfaces of the fin. There were also abrasions on the right horizontal stabilizer with blue smears matching cabin interior components.

Fragments of the airplane were scattered along a narrow path 40 miles long in a northeasterly direction from the main wreckage. Low density materials such as papers, napkins, pillows, and insulation were recovered at distances up to 120 miles away.

Examination of the wreckage showed no evidence of metal fatigue, structural or systems failure or malfunction, fire in flight, or collision with another aircraft or foreign object. The condition and pattern in which the wreckage was found indicated a high altitude breakup and disintegration of the aircraft in flight.

During the initial stages of the investigation, about 20 feet of the fuselage between stations 1220 and 1440 could not be found. An intensified search for the missing wreckage was conducted; all scattered wreckage, including pieces of the missing section, were consolidated at one location and two mockups of the aft fuselage area were constructed. One consisted of the fuselage exterior from about 10 feet forward of the main entrance door to the empennage; the other mockup, the interior in the same general area. As interior and exterior pieces of the fuselage were refitted into their original positions on the two mockups it was found that the pieces became progressively smaller from all directions toward a focal point inside the right rear lavatory. Most of the pieces of this compartment were mere fragments or were entirely missing. Localized bulges and deformations of aircraft skin; jagged perforations of skin, structure and equipment from objects propelled at high velocity; concentrations of gray-black deposits applied under heavy force; aircraft skin pushed straight out over rivet heads; and other such evidence clearly revealed that a high-order detonating force had emanated from the lavatory. The physical evidence further showed that this force had originated in the waste towel bin underneath the washbasin counter of the right rear lavatory, and had acted in all directions from this point.

Thirty-six bodies were recovered from the main wreckage and eight were found at various points from three-tenths of a mile to almost two miles back along the flightpath. One passenger in the main wreckage survived the accident but succumbed to fatal injuries about 1-1/2 hours after his rescue, which occurred several hours after the accident. The captain, first officer, and second officer were in their normal crew locations. Three smoke masks in the cockpit were found with face plates demolished, oxygen hoses broken, and with blood and tissue adhered to the inside and outside of each mask. Toxicological and pathological

examinations of the flight crew bodies disclosed no abnormalities. No indication of burns was found on any of the bodies.

A review of the maintenance records of N 70775 revealed no significant irregularities prior to the aircraft's departure from O'Hare Airport on the night of May 22, 1962.

Analysis and Conclusions

Regarding the operational and maintenance aspects of this accident, the records show that the flight crew was properly qualified, that the aircraft was dispatched in accordance with company policies and procedures, and that the aircraft was airworthy at the time the flight departed from O'Hare Airport.

Statements made by controller personnel who had the aircraft under radar surveillance during most of the flight, traces made by the aircraft's flight recorder, and witness statements regarding local weather conditions indicate that Flight 11, though having encountered thunderstorms across its flightpath, had safely circumnavigated them and was in clear weather conditions with no significant turbulence when the disaster occurred. It is therefore concluded that weather was not a factor in this accident.

All available evidence indicates that the aircraft started disintegrating at an appreciable altitude in the vicinity of Centerville, Iowa, and at a time determined to be approximately 2117. This conclusion is supported by the Waverly radar controller, who observed the aircraft's transponder and primary radar target begin to fade from his scope at approximately 2115. Groundwitnesses in the vicinity who heard unusual noises or saw a flash or ball of fire in the sky placed the time somewhere between 2110 and 2130. The B-47 pilot who saw a flash in the sky estimated the time of the flash as being 2122. However, the most reliable evidence regarding the time of the explosion is considered to be that indicated by the aircraft's flight recorder as being 2117.

The physical evidence showed that the landing gear was down and that the flight crew was wearing smoke masks at the time of impact. In addition, the emergency checklist was found between the captain's yoke and his instrument panel. This evidence leads to the belief that upon experiencing an explosion, which would of course be followed by explosive decompression, the crew initiated the required emergency descent procedures. It is also thought that the crew donned smoke masks due to the dense fog which forms in the cabin immediately after explosive decompression.

At separation of the tail, the remaining aircraft structure pitched nose down violently, causing the engines to tear off, after which it fell in uncontrolled gyrations. After separation from the aircraft the engines assumed a trajectory which allowed sufficient time for their compressors and turbines to coast to a negligible r.p.m. before impact with the ground.

Reconstruction and examination of the aft fuselage proved conclusively that the forces which caused the initial disintegration radiated from a point within the used towel bin underneath the washbasin in the right rear lavatory. The violence of the explosion was clearly shown by the pattern of breakup and projection of fragments emanating from this focal point. Such evidence was in sharp contrast to the damage caused by an explosion resulting from any combustible material or source connected with the operation of the aircraft, its systems

or components. The Federal Bureau of Investigation laboratory analyses of residues collected on material from the right rear lavatory and surrounding structure established that the explosive used was dynamite.

Evaluation of all the evidence leads logically to the conclusion that a dynamite device was placed in the used towel bin of the right rear lavatory with the express intent to destroy the aircraft.

During the early stages of the investigation, when the first clues of such a possibility were found, the Federal Bureau of Investigation was apprised of all such evidence so that the apparent criminal aspects of the accident could be properly pursued. The FBI immediately initiated a full-scale investigation.

Probable Cause

The Board determines that the probable cause of this accident was the disintegrating force of a dynamite explosion which occurred in the right rear lavatory resulting in destruction of the aircraft.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ALAN S. BOYD
Chairman

/s/ ROBERT T. MURPHY
Vice Chairman

/s/ CHAN GURNEY
Member

/s/ G. JOSEPH MINETTI
Member

/s/ WHITNEY GILLILLAND
Member

S U P P L E M E N T A L D A T A

Investigation

The Civil Aeronautics Board was notified of this accident at approximately 2130 on May 22, 1962. Investigators were immediately dispatched to the scene and an investigation was initiated in accordance with the provisions of Title VII of the Federal Aviation Act of 1958.

Air Carrier

Originally incorporated as Varney Air Transport, Inc., in Nevada on December 15, 1934, the name of the carrier was changed to Continental Air Lines, Inc., in 1937. With headquarters at Stapleton Field, Denver, Colorado, Continental Air Lines holds a certificate of public convenience and necessity issued by the Civil Aeronautics Board to engage in the transportation of persons, property, and mail. The carrier also possesses a valid air carrier operating certificate issued by the Federal Aviation Agency.

Crew

Captain Fred R. Gray, age 50, held a valid airline transport pilot certificate No. 32369 with type ratings in Viscount, Convair 240, 340, 440, DC-6/7B, DC-3 and Boeing 707 aircraft. His physical qualifications were current and without waivers. Captain Gray originally qualified in the Boeing 707 on May 18, 1959, and had his last proficiency check April 26, 1962. He had an estimated total flying time of 25,000 hours, of which 2,600 hours were in Boeing 707 aircraft.

First Officer Edward J. Sullivan, age 41, possessed a valid airline transport pilot certificate No. 467903 with type ratings in DC-3 and Viscount aircraft. His physical qualifications were current, with a waiver concerning eyeglasses. First Officer Sullivan originally qualified in Boeing 707 aircraft September 16, 1961 and his last proficiency check was given on the same date. He had an estimated total flying time of 14,500 hours of which 600 hours were in Boeing 707 aircraft.

Second Officer (Flight Engineer) Roger D. Allen, age 32, held a valid flight engineer certificate No. 1319169 as well as a commercial pilot certificate with single, multiengine land and instrument ratings. His physical qualifications were current and without waivers. Second Officer Allen was originally qualified in Boeing 707 aircraft in June 1960, and his last line check was accomplished March 27, 1962.

Director of passenger services was David E. Olssen, age 39.

Stewardesses were Marilyn Bloomquist, age 24, Mary McGrath, age 20, Martha Rush, age 23, and Stella Berry, age 21.

Aircraft

The aircraft was a Boeing 707-124, U. S. Registry N 70775, manufacturer's serial No. 17611, manufactured June 16, 1959, with a total flying time of 11,945:55. Time since last periodic inspection was 183:43. The aircraft was powered with four Pratt & Whitney JT3C-6 engines with time since overhaul and total times as follows:

<u>Engine Position</u>	<u>TSO</u>	<u>TT</u>
1	860:06	7561:42
2	2007:57	8409:33
3	1054:47	5893:16
4	1639:10	6535:34