

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: December 21, 1954

Released: December 27, 1954

BRANIFF AIRWAYS, INC. - NEAR MASON CITY, IOWA, AUGUST 22, 1954The Accident

A Braniff Airways DC-3, N 61451, crashed in a farm field approximately 16 miles south of the airport at Mason City, Iowa, at 1703¹/₁ August 22, 1954. Ten of the 16 passengers aboard were killed and 6 received serious injuries. Of the crew of 3, the captain and first officer were killed, and the stewardess was seriously injured. The aircraft was demolished by ground impact.

History of the Flight

Braniff Airways Flight 152 of August 22, 1954, was a daily scheduled flight between Memphis, Tennessee, and Minneapolis, Minnesota, with intermediate stops at Little Rock and Fort Smith, Arkansas; Muskogee and Tulsa, Oklahoma; Kansas City, Missouri; Des Moines, Waterloo and Mason City, Iowa; Austin and Rochester, Minnesota.

Flight 152 departed Memphis, Tennessee, at approximately 0835 and the flight to Kansas City, Missouri, including all scheduled stops, was routine. The flight departed Kansas City at approximately 1422 after a flight crew change consisting of Captain Wm. Pickering, First Officer Wm. Wilde, and Hostess B. A. Truly.

The two segments to Des Moines and Waterloo, Iowa, were routine in all respects. Flight 152 cancelled its IFR clearance before each departure, proceeding VFR to the next scheduled stop.

Flight 152 was off the ground at Waterloo, Iowa, at 1641 with a gross load of 24,745 pounds, 601 pounds less than the maximum weight allowable. The Waterloo IFR clearance was also changed to VFR before the takeoff.

Shortly before 1700 Flight 152 was observed on its usual northwest course, but at a lower altitude, about 17 miles south-southeast of the Mason City Airport. This ground witness observed the Braniff DC-3 make a left turn over his farm and proceed almost directly west toward a light spot in a thunderstorm. As Flight 152 headed west at an altitude estimated by several eyewitnesses as 400 to 500 feet above the ground, it was observed to enter and disappear in the thunderstorm approximately 1 mile east of where the wreckage was later found. The crash occurred approximately 8 miles west of where the left turn over the farm was made.

¹/₁ All times mentioned herein are central standard time and are based on the 24-hour clock.

Eleven occupants were killed, a twelfth died several days later in a hospital and the seven survivors received serious injuries. Fire did not occur after impact.

Investigation

The location of the crash is 16 miles south of the Mason City, Iowa, Airport, the destination of Flight 152. The heading of the aircraft at the time of impact was 290° True. The time of the crash was established at 1703 by an impact-stopped aircraft clock on the instrument panel. Ground marks at the initial impact point indicated a level lateral and longitudinal attitude, gear and flaps retracted, with considerable downward or sink velocity. A low forward speed was indicated by the short distance (448 feet) that the aircraft skipped forward after the initial impact.

The extremely disintegrated condition of the bottom of the cabin and center section substantiated the level aircraft attitude and high sinking velocity. Both wings, outboard of the attach angle, were relatively undamaged. The deicer boots on the leading edge of both wings were undamaged and both navigation lights at the wing tips were intact and in place. The left wing tip was distorted downward at an angle of approximately 10° and there were compression wrinkles on the underside of both wing tips adjacent to the tip-to-wing panel attachment. The support legs of the cabin seats incurred compression bends, further substantiating the high sinking velocity at initial impact. No evidence was found to indicate power or structural failure, or malfunctioning of any aircraft control or component prior to impact. Settings and condition of the propeller blades indicated approximate cruise power at impact. All aircraft radio equipment was bench tested and found to function normally. The channel setting of the VOR^{2/} receiver was 114.9 megacycles which is the Mason City VOR frequency. Examination determined the course selector of the VOR to be 355° which is the VOR approach heading for Mason City Airport.

Investigation disclosed that the flight crew was thoroughly familiar with the route. The captain had flown for Braniff, and a predecessor company, regularly over the pertinent route for more than 10 years in the same type of aircraft involved in this accident. The first officer, previous to his employment by Braniff, had flown commercially in the Mason City area.

Investigation disclosed that company dispatching procedures were complied with and the operation of Flight 152 from a dispatching standpoint was entirely normal.

The course from Waterloo, Iowa, to Mason City, Iowa, is on a northwest heading and the air distance is 63 miles. Ground witnesses testified to visual flight rule weather conditions to and several miles west of where Flight 152 altered course and proceeded westward towards a lighter spot in the thunderstorm.

Seven minutes after Flight 152 departed Waterloo, Iowa, at 1641 a heavy thunderstorm was over the Mason City Airport and extending southwest. The

^{2/} Very high frequency omni range.

Mason City Braniff radio operator at this time was unable to contact Flight 152 and requested Braniff Flight 145 (southbound from Minneapolis) and the Waterloo company radio to relay Mason City weather to the flight. Flight 145 complied with this request and received acknowledgment of the message. At 1658 direct radio contact between Mason City company radio and the flight was established and at that time the flight advised it would hold southeast of Mason City due to thunderstorms to the west and northwest.

Approximately 20 persons^{3/} along the east-west line between the left turn and crash point (8 miles) were questioned as to their observation of the aircraft and weather conditions. The consensus of these witnesses was that a vigorous storm was in the area as the aircraft, at an estimated altitude above the ground of 400 to 800 feet, flew westward over them and disappeared into the lighter spot in the center of the storm. The nearest witness, 1 mile east of the crash, was in heavy rain immediately after the aircraft passed overhead.

Damage from the storm in the vicinity of the crash varied considerably. There were trees 12 inches in diameter broken off 18 feet above the ground a mile east of the crash. There was evidence of strong winds from all directions. A mile west of the crash a wooden silo was blown down toward the west and chicken coops twisted on their foundations. A mile west-northwest and a half mile east of the crash, corn stalks had been forced to the ground in 100-foot swirling counterclockwise circles. East of this point corn was blown down generally toward the east but with an occasional northeast or southeast direction. A mile and a half east of the crash 5 60-foot high H-shaped power line supports were blown down toward the east. The power company owning this line stated the poles were constructed to withstand a steady wind of 85 to 90 m. p. h.

A pilot of a Beech Bonanza, on a flight from the Omaha, Nebraska, area to Mason City, encountered the west edge of the thunderstorm at about the same time that Flight 152 entered from the east. By holding southwest of Mason City for a short period this aircraft remained VFR and landed without incident at Mason City at 1715.

There was testimony at the hearing to the effect that Captain Pickering, after checking the weather and preparing the flight plan at Kansas City, remarked that "it looked like it was building up to a rough trip north of Des Moines."

The advisory service of the Waverly, Iowa, Air Force radar station (approximately 40 miles southeast of the crash) was available to Flight 152 at any time after the departure from Waterloo, Iowa, however, no contact with the station was made. Procedures to use Air Force radar advisory service had been set up by Braniff's operations department some months before and were used frequently by Braniff flights. Some two hours later, at 1932, Braniff Flight 163 westbound contacted Air Force Waverly radar and upon being advised of thunderstorms in the Ft. Dodge area (approximately 60 miles southwest of Mason City) reversed its course and returned to Waterloo, Iowa.

^{3/} See Attachment A.

Weather. The synoptic weather maps for the morning of August 22, 1954, showed a low pressure center in Canada, a pressure trough southward through the Dakotas, Nebraska, and New Mexico. There was an occluded front in this trough from Canada southward to Nebraska with a cold front across northwestern Kansas and southeastern Colorado. A stationary front extended south-eastward into Missouri and Kentucky with the west portion becoming a warm front with northward movement. At the time of the accident the trough line and cold front were more than 200 miles west of Mason City. The stationary front had been moving northward as a warm front and by 1700 was in the immediate vicinity of Mason City, Iowa. A heavy thunderstorm area built up southwest of Mason City that passed the Mason City Airport about 1648 with heavy rains and gusty winds up to 48 m. p. h. A southern extension of this line of thunderstorm development existed south of Mason City. It was this storm area that Braniff Flight 152 entered.

The Weather Bureau forecast for en route weather issued at Kansas City for the period of 1300 of the 22d to 0100 of the 23d indicated conditions between Kansas City and Mason City as follows: South portion - scattered clouds at 6,000 feet, high broken clouds becoming occasionally broken at 4,000 feet, visibility 5 miles with light thundershowers. North portion - broken clouds 3,000 to 4,000 feet, and broken clouds at 10,000 feet, occasional light rain-showers and widely scattered afternoon and evening thundershowers in the warm sector. Local turbulence was forecast in the vicinity of thunderstorms. The terminal forecast applying to Mason City for the period 1450 to 1830 was scattered clouds at 600 feet, ceiling 4,000 overcast, winds south-southeast 12, occasional light rain showers or thundershowers, visibility briefly 1 mile. The company forecast for Iowa covering the period 1200 to 2000 was for broken to overcast 1,000 to 1,500 feet, broken to overcast 6,000, occasional moderate rainshowers, visibility 1 mile plus light to moderate turbulence. No amendments were issued to either the Weather Bureau's or the company's Iowa forecast.

The Air Force issued severe weather advisories from Tinker AFB, Oklahoma. These advisories are transmitted on an Air Force teletype circuit and the Weather Bureau forecast centers at Fort Worth, Chicago, and Kansas City have a drop on the circuit. On August 22, 1954, the Air Force issued two severe weather advisories, pertinent to the South Dakota, Nebraska, Minnesota, and Iowa area, one at 0930 and one at 1614, forecasting heavy thunderstorms, gusts to 50 knots, isolated hail at various altitudes and severe^{4/} turbulence in thunderstorms. This last advisory forecasted a line of thunderstorms that would have been 60 miles west of Mason City by 1700.

Radar storm detection information is normally available from the Weather Bureau at Des Moines but the equipment was inoperative for 2 1/2 hours before the accident, consequently advisories from that source were not available for use by Flight 152.

^{4/} The AF's use of severe turbulence corresponds approximately with the Weather Bureau's definition for heavy turbulence.

Analysis

The flight's estimated time en route Waterloo-Mason City was 23 minutes for the 63 mile flight, a ground speed of 164 m. p. h. At the point where the left turn to the west was made, 46 miles, or 17 minutes, of the segment had been flown and the approximate time of the turn would be 1658. This is the time that the flight advised that it would hold southeast of Mason City. It is 8 miles, or 3 minutes, from where the turn was made to the crash point, making an arrival time of 1701 at the crash point. The small time discrepancy between 1701 and 1703 can be explained by the probable reduced airspeed, due to the known turbulence experienced by Flight 152 in the last 5 minutes of flight. From the above it is evident that Flight 152 did not hold southeast of Mason City any appreciable time. Although the aircraft's exact altitude at the time could not be accurately determined, several witnesses estimated its height as 400 to 800 feet above the ground. The reason why the flight proceeded into the thunderstorm area at this low altitude rather than hold clear of the storm can only be conjectured. Undoubtedly the captain had encountered many similar appearing storms during his years of operation over the route and it is quite possible that he entered the lighter area between the darker clouds on either side in order to get on the back side of the storm and subsequently land at Mason City.

At about the time the flight left Waterloo the previously reported towering cumulus had developed into thunderstorms scattered over the state but not forming into a true squall line. One of these thunderstorm areas formed to the southwest of Mason City and moved northeast to the Mason City Airport at 1648. Further thunderstorm building progressed rapidly at the southwest end of this development with one or more thunderstorm cells reaching the mature heavy rain stage at about the time Flight 152 arrived in the area of the accident. The light area that ground eyewitnesses stated Flight 152 flew into can be accounted for by the lighter color of the rain curtain in contrast to the darker clouds above and on either side. By the time the flight went into the light spot the rain was very heavy and a downdraft established. It is evident that a very strong downdraft developed in this rain area. Substantiation for the strong, gusty winds is shown by the damage done by these winds in the area of the accident and some of the gusts may have exceeded 80 m. p. h. In the initial stage of a downdraft of this nature the strong downward component continues to the surface and it appears probable that Flight 152 penetrated the storm in the initial stage of this downdraft. Further contributing to the loss of altitude is the possibility of a sudden airspeed loss as the aircraft proceeded into the divergent winds from the storm center.

Extensive investigation was conducted with regard to possible tornadoes but it can be definitely stated that a fully developed tornado reaching to the ground did not occur. There is insufficient evidence to state whether a vortex aloft occurred. With regard to this storm, had the radar set at Des Moines been in operation it would not have been capable of determining the intensity of the storm due to the distance being beyond its effective range. Radar storm detection information could have been provided by the Air Force station at Waverly (approximately 40 miles from the scene of the accident) had the pilot of Flight 152 requested such service.

The Weather Bureau's forecast for Mason City, Iowa, did not contain information that would properly warn the pilot of conditions that would be encountered, and this is also true of the company forecast. If the storm that developed near Mason City had been anticipated by the forecaster, a severe weather forecast would have been required.

Findings

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

1. The flight crew, aircraft, and air carrier were currently certificated for the subject flight operation.
2. According to company records the aircraft's load was properly distributed so that the center of gravity of the aircraft was within approved limits.
3. There was no evidence of structural or power failure or malfunction of controls or communications prior to impact.
4. The dispatching of the flight was normal and in accordance with company procedures.
5. The flight advised that it would hold southeast of Mason City.
6. The flight was observed to enter and disappear in a thunderstorm.
7. The aircraft crashed in an area where severe storm ground damage occurred.
8. The U. S. Weather Bureau at Kansas City received the U. S. Air Force severe weather advisories but considered their forecast in effect at the time to be adequate.
9. The weather forecast issued by the Weather Bureau and Braniff did not indicate the severity of the storm that was encountered.

Probable Cause

The Board determines that the probable cause of this accident was that the flight while endeavoring to traverse a thunderstorm area encountered very heavy rain, divergent winds, and strong downdrafts that forced the aircraft to the ground.

BY THE CIVIL AERONAUTICS BOARD:

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

/s/ OSWALD RYAN

/s/ JOSH LEE

/s/ JOSEPH P. ADAMS

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 1815C, August 22, 1954. 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 was held in Dallas, Texas, on September 28, 29, and 30, 1954.

Air Carrier

Braniff Airways, Inc., is a scheduled air carrier incorporated in the State of Oklahoma, with its principal offices in Dallas, Texas. It operates under currently effective certificates of public convenience and necessity issued by the Civil Aeronautics Board and air carrier operating certificate number 18 issued by the Civil Aeronautics Administration. These certificates authorize the company to transport by air persons, property and mail between various points in the United States and between Houston, Texas, and the South American countries of Peru, Brazil, and Argentina.

Flight Personnel

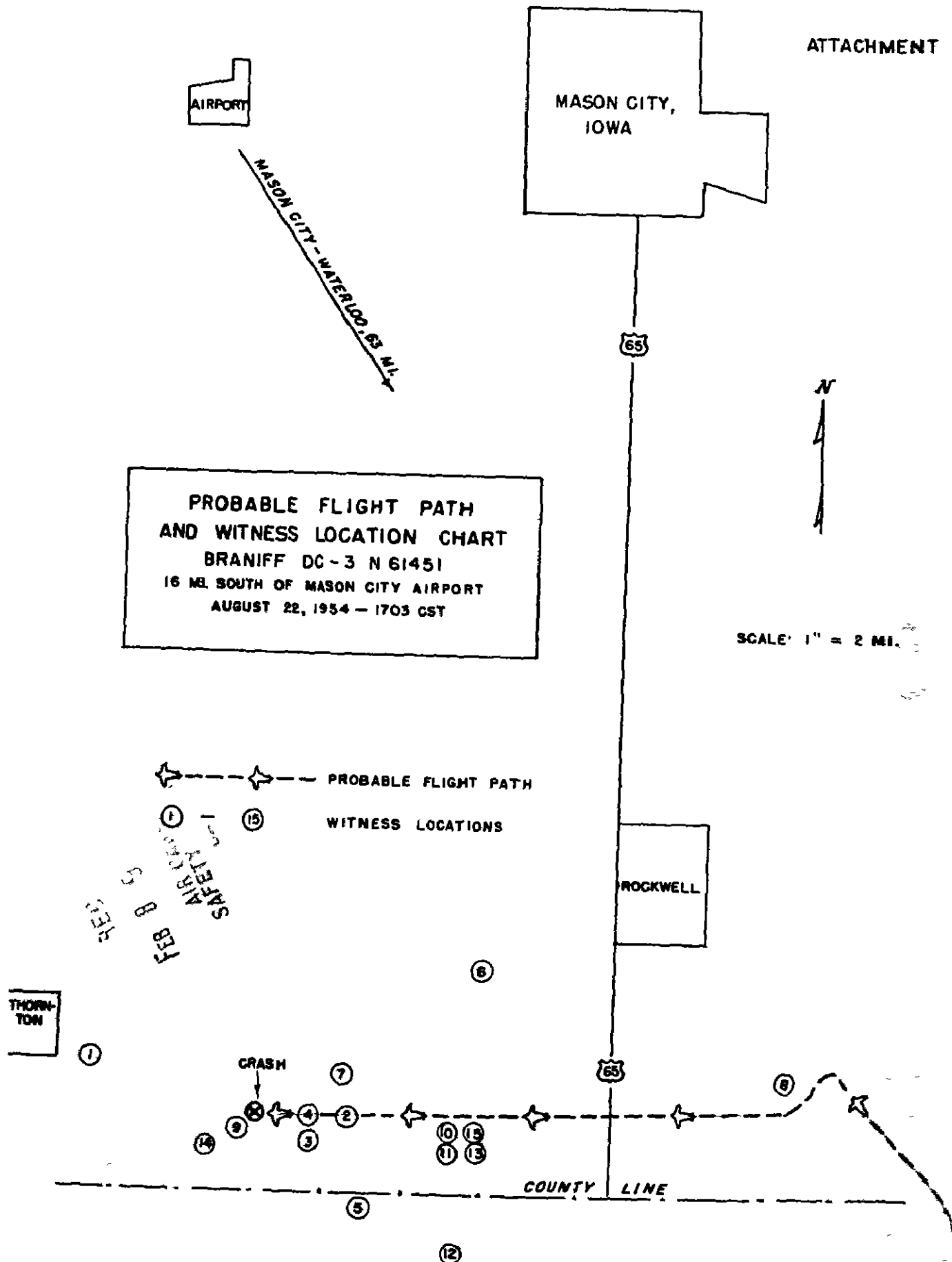
Captain William Anthony Pickering, age 40, held a currently effective airline transport certificate with the appropriate rating for the subject aircraft. Captain Pickering was employed by Braniff Airways on September 5, 1942. He had a total of 11,077 pilot hours, of which approximately 8,000 were in the type of equipment involved. His last instrument check was accomplished July 7, 1954, and his latest physical examination was on February 3, 1954.

First Officer William Bruce Wilde, age 31, held a currently effective commercial pilot certificate with an appropriate rating for the subject aircraft. He was employed by the company on April 2, 1951. His total pilot time was 5,682 hours, of which approximately 2,700 hours were in DC-3 equipment. First Officer Wilde's latest physical was taken October 13, 1953, and his last route check was on October 28, 1953.

Hostess Bettie Ann Truly was employed by the company on April 28, 1952.

The Aircraft

N 61451, a Douglas DC-3C, was manufactured August 17, 1942. The manufacturer's serial number was 4630, and the aircraft had a total time of 23,062 hours. It was currently certificated by the Civil Aeronautics Administration. The aircraft was equipped with Pratt & Whitney Model 1830-92, S13CG engines and Hamilton Standard Model 23E50-473 propellers.



SOURCE: Map of Cerro Gordo County, Iowa, dated 1953
COMB-DC-15030

CIV. BOARD
UNITED STATES OF AMERICA
CIVIL AERONAUTICS BOARD
WASHINGTON, D. C.

(Report No. SA-194)

FOR RELEASE:

IN THE MATTER OF INVESTIGATION OF ACCIDENT INVOLVING AIRCRAFT
OF UNITED STATES REGISTRY N 61451, WHICH OCCURRED NEAR MASON
CITY, IOWA, ON AUGUST 22, 1954.

NOTICE OF HEARING

Notice is hereby given, pursuant to the Civil Aeronautics Act of 1938, as amended, particularly Section 702 of said Act, in the above-entitled proceeding that hearing is hereby assigned to be held on September 28, 1954, at 9:00 a.m. (local time) in The Baker Hotel, Commerce, Alford & Jackson Streets, Dallas, Texas.

Dated at Washington, D. C., September 15, 1954.

Robert M. Chrisp

Robert M. Chrisp
Presiding Officer

(ORAL)

Braniff Airways
D-C-3

CIVIL AERONAUTICS BOARD

WASHINGTON 25, D. C.

FOR RELEASE:

CAB 54-34

IMMEDIATE
September 14, 1954

CAB SETS HEARING DATE ON ACCIDENT AT MASON CITY, IOWA

The Civil Aeronautics Board today announced that it would hold a public hearing seeking to determine the cause of an accident involving a Braniff Airways' DC-3 which occurred near Mason City, Iowa, on August 22, 1954. The aircraft crashed in a severe thunderstorm and of the 3 crew and 16 passengers aboard, the captain and first officer and 10 passengers received fatal injuries.

The Board will convene the public hearing on Tuesday, September 28, 1954, at 9:00 a.m. (local time) in the Baker Hotel, Dallas, Texas.

Mr. Robert W. Garisp, Chief, Hearing and Reports Division, of the Board's Bureau of Safety Investigation, has been designated as Presiding Officer.

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CIVIL AERONAUTICS BOARD
Washington

August 24, 1954

TO: Messrs. Gurney, Denny, Ryan, Lee, Adams,
The Executive Director

FROM: Director, Bureau of Safety Investigation

SUBJECT: Preliminary Aircraft Accident Notification:
Braniff Airways Flight 152, Douglas DC-3,
N 61451, approximately 10 miles south of
Mason City, Iowa, August 22, 1954

Braniff Flight 152, northbound, with Captain William Pickering, First Officer William Wilde, Stewardess Betty Truly, and 16 passengers, crash landed in an open farm field approximately 10 miles south of Mason City, Iowa, at approximately 1700C. Eleven persons, including the captain and first officer, received fatal injuries; there were eight survivors, including the stewardess. The aircraft was demolished upon impact but did not burn.

The flight approached Mason City and is reported to have held south of the airport because of an approaching thunderstorm which was moving in a northeasterly direction. Radio contact was maintained with the flight but at no time was an emergency declared. Preliminary investigation discloses that the aircraft struck the ground slightly nose-down, with the wings level and the landing gear and flaps retracted.

Witnesses describe the thunderstorm as being very severe and report 5 inches of rain in 5 hours, accompanied by heavy hail. As the thunderstorm approached the airport the surface wind changed from southeast 8 mph. to west with peak gusts to 48 mph. Just previous to the approach of the thunderstorm, Mason City weather conditions were 1500 scattered, ceiling estimated 3000 feet, lower broken clouds at 1800; visibility 5 miles; wind SE 8 m.p.h.; temperature 79; dew point 72; altimeter 29.98.

CAB Investigators Philip N. Goldstein of the Kansas City office, Fred G. Powell of the Chicago office, and Will C. Slevert of the Washington office are at the scene.

W. K. Andrews