CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: October 15, 1951 Released: October 22, 1951

UNITED AIR LINES, INC., FORT WAYNE, INDIANA, APRIL 28, 1951

THE ACCIDENT

At approximately 1932,[1] April 28, 1951, United Air Lines' Flight 129, a Douglas DC-3, N-16088, crashed and burned 2 6 miles east-southeast of Baer Field, Fort Wayne, Indiana The eleven occupants were killed and the aircraft was demolished

HISTORY OF THE FLIGHT

Flight 129 departed Cleveland, Ohio, at 1807, April 28, 1951, for Chicago, Illinois, with stops scheduled at Fort Wayne and South Bend, Indiana The crew consisted of Captain E K Swallow, First Officer H R Miller, and Stewardess Beverly Ellis, there were eight passengers on board at the time of departure The aircraft weighed 24,180 pounds, which was within the certificated gross weight limit of 25,320 pounds, and the load was properly distributed A flight plan filed by the crew with ARTC (Air Route Traffic Control) indicated an IFR (instrument flight rule) flight at a cruising altitude of 4,000 feet with South Bend and Toledo, Ohio, designated as the alternate airports The "Trip Weather Analysis" (a form prepared by the crew before departure) indicated that scattered cumulus and thunderstorms were expected south of the course to Fort Wayne Also, that a squall line extending in a north-south direction was moving eastward across Illinois and Indiana at an estimated speed of 35 miles per hour and was expected to be in the vicinity of South Bend upon the flight's arrival there

After takeoff, Flight 129 was advised by company radio that it was cleared by ARTC via Green Airway No 3 over Sandusky, Ohio, to the Toledo range, to maintain 3,000 feet and to contact Toledo approach control upon arriving there Flight 129 advised they were going to Fort Wayne and not Toledo Accordingly, ARTC amended the flight's clearance to proceed to Fort Wayne via Green Airway No 3 and Blue Airway No 44 and to maintain 4,000 feet The flight proceeded and a routine company radio report was made when over Sandusky At 1847, the flight reported over Toledo and estimated its arrival Fort Wayne at 1932 At this time, the Fort Wayne 1830 weather sequence report was given the flight which was, "ceiling estimated 25,000 feet, thin broken clouds, visibility 10 miles, wind southwest 5 miles per hour " Seventeen minutes later at 1904, Flight 129 called Toledo tower and requested, through ARTC permission to cruise at 2,300 feet because of turbulent conditions This was not approved because of other traffic At 1920 the flight reported it was approaching Fort Wayne and was changing to tower frequency The flight reported again when nineteen miles northeast of Baer Field and was advised that Runway 22 was the runway in use and that the wind was five to ten miles per hour from the southwest At the time this transmission was made there was a moderate amount of static and the flight reported "We are not receiving you very clearly but I think you said, 'Straight in runway 22' We will call later, closer in "

Because of thunderstorm activity in the area, three other aircraft were requesting instructions to land at approximately the time Flight 129 was making its approach Two of these aircraft landed successfully and the pilot of one, upon request, advised the tower that the thunderstorm was approximately ten miles west of the airport

At the time the four aircraft were approaching Baer Field, United's 120 was number four to land in the traffic pattern immediately behind Trans World Airlines' Flight 240, a DC-3 aircraft When these latter aircraft were approximately one and two and

[1] All times referred to herein are Central Standard and based on the 24-hour clock

one-half miles, respectively, from the approach end of Runway 22, the wind at the airport shifted to west-northwest and increased in velocity from 5-10 miles per hour to 40 miles per hour Both flights were advised by the tower of the sudden change of wind direction and increased velocity, and a landing on Runway 27 was suggested, it being more nearly into the wind Upon receiving this message the flights immediately turned to the left to align with this runway

When these aircraft were east of the airport the wind increased to 60-65 miles per hour with gusts to 85 miles per hour and a heavy rainfall began, accompanied by lightning and severe static The flights were quickly advised of the weather change but, due to the sudden decrease in visibility, neither flight was seen again by the tower Flight 129 immediately advised, "United 129 heading east " This was closely followed by a message from TWA's 240, "Pulling out " In order to avoid a possible collision the tower then requested separation altitudes for these aircraft from Chicago ARTC and was advised that Flight 129 was assigned an altitude of 4,000 feet and that Flight 240 was assigned 3,000 feet Both clearances were broadcast from the tower several times without acknowledgment

At 1932 an orange-colored flash was seen to the east-southeast from the tower It was later determined that United's Flight 129 had crashed in a field 2 6 miles east-southeast of the airport TWA's Flight 240 proceeded safely to Toledo

INVESTIGATION

Investigation disclosed that N-16088 was flying on an approximate heading of 120 degrees when it struck the ground and that at the time of impact it was in a near level attitude with the left wing slightly low Initial ground contact was made by the aircraft's left wing tip Wreckage was strewn over the ground a distance of 720 feet and the main wreckage came to rest in a wooded area several hundred feet distant from the point of initial impact [2]

A detailed examination of the wreckage revealed no evidence of fire, structural failure, or mechanical malfunction of any part of the aircraft or its components prior to impact The damage pattern to all propeller blades in the form of corrugations, severe nicks and gouges in the leading edges near the tips, together with the blade angle positions, indicated that considerable power was being produced by both engines when impact occurred

All instruments in the pilot's cockpit were damaged in such a manner that they were unreadable

The aircraft's records were examined and these indicated that the aircraft was airworthy on departing Cleveland

On April 28, 1951, the 1530 synoptic weather map prepared by the U S Weather Bureau showed an extensive high pressure cell lying off the Atlantic Coast with a moderate gradient extending through Ohio, Illinois, and Iowa A cold front extended from Lake Huron in a southwesterly direction across northern Michigan and Lake Michigan to Milwaukee, Wisconsin, where it joined a stationary front extending across southeastern Wisconsin, northwestern Illinois, and Iowa A squall line[3] was charted in a north-south direction across the extreme western part of Illinois Over Illinois and Indiana winds aloft between the 11,000 and 16,000-foot levels were blowing from west-southwest to west at approximately 30 knots

The U S Weather Bureau first forecast the movement of the squall line to be at the rate of 30 miles per hour At 1713, an hour before it was forecast to arrive there the squall line reached Chicago The Weather Bureau then amended its forecast to indicate the forward movement of the storm to be 40 miles per hour and reported severe turbulence in the storm area over northern Illinois A Chicago special weather sequence report, at 1719, reported a thunderstorm accompanied by heavy hail and wind from the north-northwest at 42 miles per hour with gusts to 57 miles per hour At 1831, the storm reached South Bend and was reported as being heavy with small hail and wind from the west-northwest at 35 miles per hour with gusts to 55 miles per hour Two pilots attempted to penetrate the storm in the vicinity of North Liberty and Goshen, Indiana,

[2] See Appendix A

[3] A squall line consists of a series of connected thunderstorm cells which are continually building up on their forward side and dissipating on the rearward side

but decided it was inadvisable to do so and returned to Fort Wayne

Several tornadoes were reported along the squall line, three were plotted as beginning near the Indiana-Ohio state border and extending eastward One of these tornadoes, in its formative stage, was a short distance east of the scene of the accident No evidence of tornado damage could be found along the flight path of the subject aircraft

Large hailstones were reported falling near the scene of the accident, however, it was determined that hail did not fall in this area until after the crash occurred

Neither the company meteorologist nor the Weather Bureau anticipated the rapid movement of the storm or its severity in the Fort Wayne area Investigation revealed that the storm progressed along northern Indiana at a rate averaging in excess of 60 miles per hour instead of the 40 miles per hour previously forecast It took approximately five minutes, only, for the storm to arrive over Baer Field after it had been reported as being 10 miles distant This indicated that the location of the storm was inaccurately reported since, to travel this distance in the time given, the storm would have moved at a rate far in excess of its known speed

The pilot of TWA's Flight 240 stated that when he was approaching the airport and was advised of the accelerated wind with gusts to 85 miles per hour, he immediately executed a left turn and proceeded to Toledo, also that little or no turbulence was experienced during this portion of the flight It should be noted that Flight 240 turned immediately ahead of and avoided the approaching storm, but that Flight 129 was caught in the storm during the turn [4] The few seconds in time and the short distance separating Flight 240 from the subject aircraft meant the difference between flying through reasonably stable air or severe down drafts and turbulence

ANALYSIS

A down draft is composed of cool relatively dense air It is logical to assume that practically all initial down drafts descend to the ground, then start fanning out, proceeding ahead of the storm by means of horizontal flow Thereafter, down drafts in new cloud developments along the forward edge of the storm lose most of their downward velocity before reaching the ground It is for that reason that a plane caught in a down draft usually can recover before being carried dangerously close to the ground In the case of the squall line at Fort Wayne the propogation of the storm was so rapid on the forward side that it resulted in an increased movement of the squall line amounting to 30 miles per hour or more As a consequence, the fanning out process never had time to form an outflow ahead of the storm and new down drafts descended to the ground because of the lack of the cushioning effect Although there is evidence to indicate that a tornado was in its initial stage of development near the scene of the accident, it is unlikely that it caused the aircraft to crash The forces which accompany even an incipient tornado would be different in character than those which forced this aircraft to the ground Had such forces been associated with this accident it is extremely doubtful that lateral control of the aircraft could have been maintained Since the testimony of witnesses who saw the aircraft in flight does not indicate loss of lateral control and the aircraft struck the ground in a near level attitude and with power on, it can reasonably be assumed that a severe down draft was encountered on the edge of the storm from which there was insufficient altitude to recover Down drafts of such magnitude are frequently a part of a line squall development but do not usually occur so close to the ground

Referring to Appendix B, the eastward movement of the forward edge of the squall line is shown in one-half minute intervals by means of dotted lines The path of TWA's Flight 240 is shown by a dashed line with time locations noted It is seen that at all times this flight was ahead of the squall line, but by a very narrow margin of less than a mile during a portion of the turn The solid line on the chart indicates the flight path of UAL's 129 with time locations This also shows that at 1931 1/2, the flight had penetrated the forward edge of the squall line and was still at that relative position at the time of the crash

FINDINGS

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

[4] The probable flight paths of the aircraft with respect to time and position relative to the storm are shown in Appendix B

1 The aircraft, the crew, and the company were properly certificated

2 The squall line moved across northern Illinois and northern Indiana considerably faster than was forecast

3 A line of thunderstorms was known to be approaching Fort Wayne However, it was believed that aircraft in the area could effect safe landings prior to the storm's arrival there

4 When the subject flight and another were approaching Runway 27, they were advised of the surface wind's increased velocity to 65 miles per hour with gusts to 85 miles per hour

5 When the approach was abandoned the aircraft encountered the forward edge of the squall line and was subjected to a severe down draft from which recovery could not be made

—38545

PROBABLE CAUSE

The Board determines that the probable cause of the accident was the severe down draft encountered which caused the aircraft to strike the ground in a near level attitude

BY THE CIVIL AERONAUTICS BOARD

/s/ *Donald W Nyrop*
/s/ *Oswald Ryan*
/s/ *Josh Lee*
/s/ *Joseph P Adams*
/s/ *Chan Gurney*

Supplemental Data

INVESTIGATION AND HEARING

The Civil Aeronautics Board received notification of the accident at 2035, April 28, 1951, from Civil Aeronautics Communications at Chicago, Illinois An investigation was immediately initiated in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended As part of the investigation, a public hearing was held on May 10, 1951, at Fort Wayne, Indiana

AIR CARRIER

United Air Lines, Inc , is a corporation organized and existing under the laws of the State of Delaware, having its principal office at 5959 South Cicero Avenue, Chicago, Illinois It holds a certificate of public convenience and necessity issued by the Civil Aeronautics Board authorizing the carriage of passengers and mail over a number of routes in the United States, including transcontinental route No 1 from California to New York It also holds an air carrier operating certificate issued by the Administrator of Civil Aeronautics

FLIGHT PERSONNEL

Captain Eugene K Swallow, age 31, was employed by United Air Lines December 18, 1941 He had accumulated 6,827 flying hours, of which 5,694 were on DC-3 type equipment He held a currently effective airline transport rating No 33025-40 with appropriate ratings His last instrument check was accomplished December 31, 1950, and route check August 28, 1950 His last CAA physical examination was accomplished February 19, 1951

First Officer Herman R Miller, age 24, was employed by United Air Lines February 7, 1951 He had accumulated a total of 1,121 hours, of which 121 hours were on DC-3 type equipment He held a valid airman certificate with commercial and instrument ratings His last CAA physical examination was accomplished January 29, 1951

THE AIRCRAFT

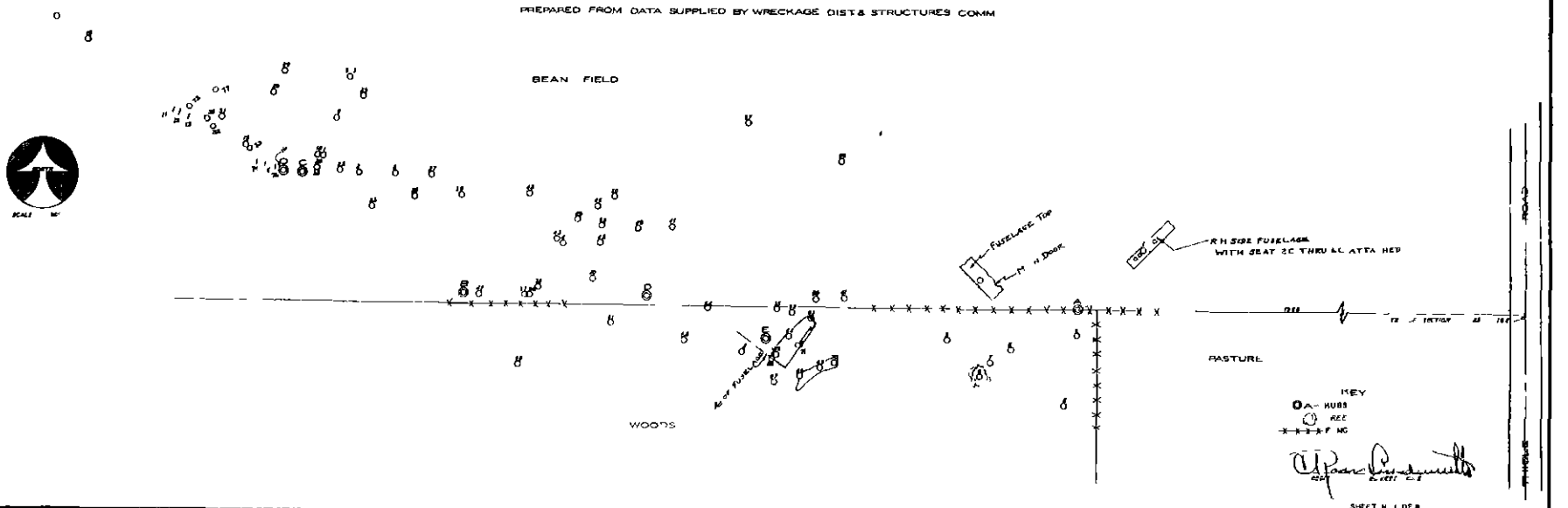
N-16088, a Douglas DC-3, was manufactured March 1937 It had accumulated a total aircraft flying time of 43,550 hours Its last aircraft overhaul was accomplished April 5, 1951 It was equipped with two Pratt & Whitney Model R-1830-92 engines Both engines had accumulated a total of 151 54 hours since last overhaul The engines were equipped with Hamilton Standard hydromatic propellers

APPENDIX A
SHEET 1

"WRECKAGE DISTRIBUTION CHART 1"

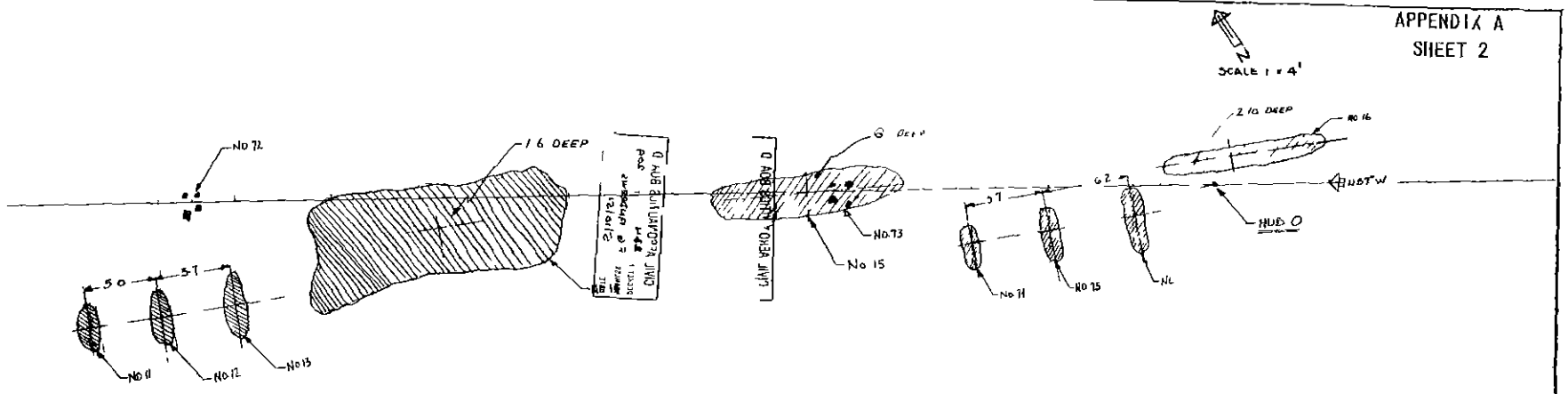
AIRCRAFT ACCIDENT
UAL DC-3 N16088
FORT WAYNE, INDIANA
APRIL 28, 1951

PREPARED FROM DATA SUPPLIED BY WRECKAGE DIST & STRUCTURES COMM



SHEET N 1 OF 8

APPENDIX A
SHEET 2



WRECKAGE DISTRIBUTION CHART II

AIRCRAFT
UAL DC-3

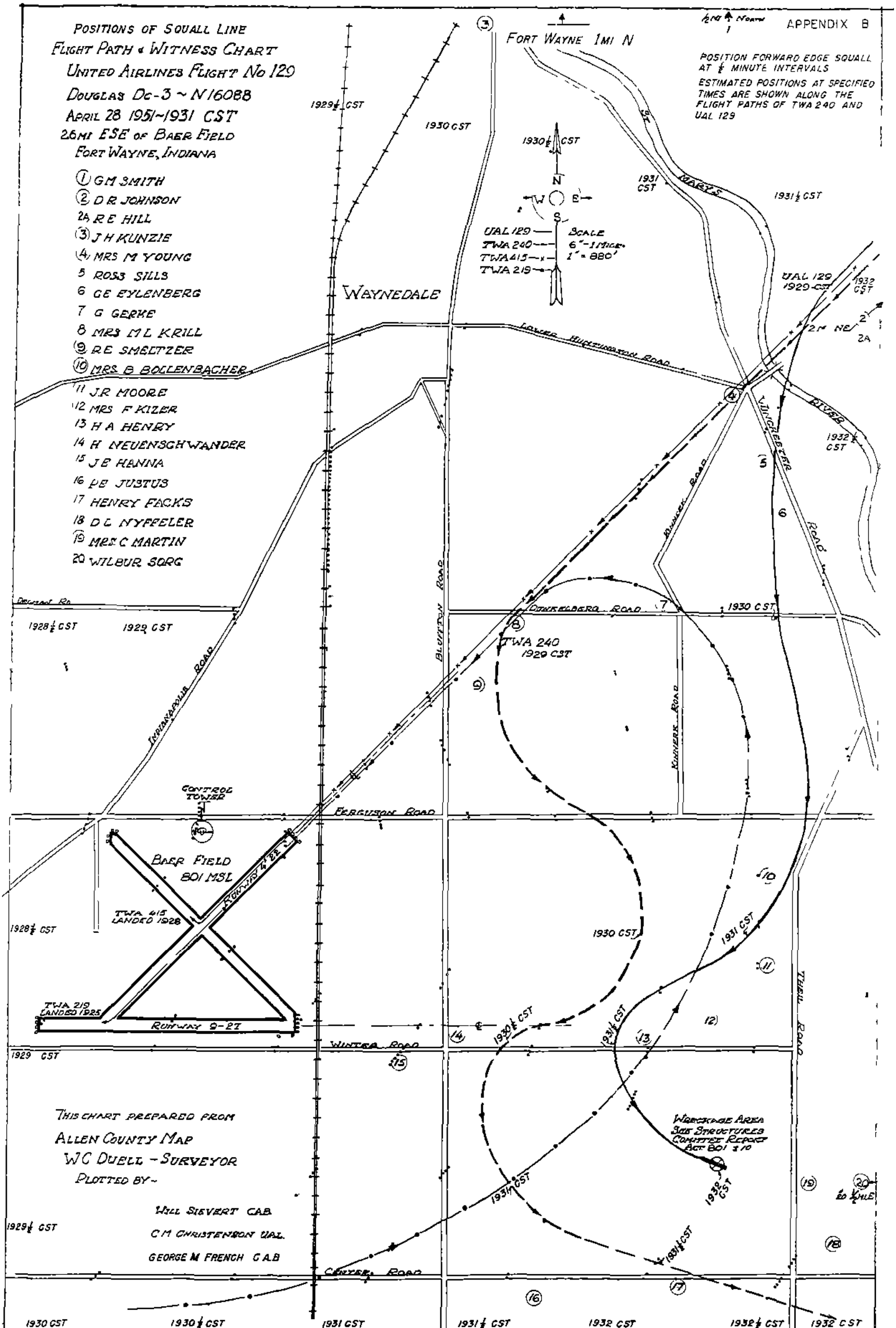
ACCIDENT
N16088

FORT WAYNE, INDIANA.

APRIL 28, 1951

SHEET NUMBER 3 OF 3 SHEETS

STATION	LOCATION	DESCRIPTION
No. 1	N. 48 degrees E. 48' From Hub "A"	R.H. side of fuselage including main entrance door and FWD 6 seat bays.
No. 2	S. 13 degrees W. 62' " " "	Main landing gear tire, wheel & oleo strut
No. 3	S 17 degrees W 17' " " "	Cylinder
No. 4	N. 75 degrees W 67' " " "	Fuselage top from main cabin door FWD 15 bays, from baggage rack to baggage rack both racks attached by Elec conduit
No. 5	S. 77 degrees W. 88' " " "	Engine.
No. 6	S. 58 degrees W. 51' " " "	Landing gear retraction strut assembly
No. 7	S. 58 degrees W. 67' " " "	Engine
No. 8	S. 56 degrees W. 78' " " "	24 inch Maple tree.
No. 9	N. 57 degrees W. 177' " " "O"	Trailing edge wing tip and red glass, first contact
No 10	N. 57 degrees W. 152' " " "	Shallow hole 18 inches wide by 6 feet long.
No.11	N. 63 degrees W. 82' " " "	First left propeller slice in ground.
No 12	N 63 degrees W. 76' " " "	Second left propeller slice in ground.
No 13	N. 63 degrees W. 71' " " "	Third left propeller slice in ground
No 14	N. 60 degrees W. 56' " " "	Hole 6 feet wide and 17 feet long.
No.15	N. 57 degrees W. 30' " " "	Hole 3 feet wide and 14 feet long.
No.16	N. 65 degrees E. 2' " " "	Hole 12 feet long 20 inches wide and 34 inches deep
No.17	N. 44 degrees E. 15' " " "C"	Rudder pedal
No 18	18 inches E. of No. 17	Cylinder ear.
No.19	N. 31 degrees E. 41' from Hub "C"	Cylinder complete with intake and exhaust rockers
No.20	N. 77 degrees E 10' " " "	Propeller, right.
No.21	N. 90 degrees E. 37' " " "	Propeller, left.
No 22	N. 87 degrees E 25' " " "	Oil radiator cowling.
No.23	S. 65 degrees E. 50' " " "	Oil radiator.
No.24	N. 90 degrees E. 61' " " "	Piece of control pedestal, right.
No.25	N. 39 degrees E. 63' " " "	Battery hatch door.
No.26	S. 79 degrees E. 75' " " "	Elevator leading edge.
No.27	S. 89 degrees E. 84' " " "	Right hand instrument par 1 including only one gage (oil pressure)
No.28	N. 8 degrees W. 53' " " "O"	Metal angle " $\frac{1}{2}$ inch by 13/16 inch" from left wing
No.29	Due North 64' " " "	Metal Angle " $\frac{1}{2}$ inch by 13/16 inch" from left wing.
No.30	Per center line of No. 14	Piece of cylinder head from left engine.
No.31	N. 50 degrees W. 53' from Hub "O"	Part of attach angle from left wing
No.32	N. 57 degrees W. 102' " " "	Navigation light, Left wing.
No.33	N. 27 degrees E. 68' " " "	Left wing tip structure.
No.34	S. 65 degrees E. 50' " " "	Belly plate attach angle
No 35	S. 85 degrees E. 105' " " "	Landing gear flight brake
No.36	N. 77 degrees E. 10' " " "	Appelton grounding plug.
No.37	N. 90 degrees W. 78' " " "D	ADF Loop to fuselage mounting.
No.38	N. 90 degrees W. 76' " " "	Fuel Dump Chute
No.39	N. 87 degrees W. 71' " " "	Belly skin from dump chute bell crank six bays aft.
No.40	N. 73 degrees W. 37' " " "	Engine cylinder
No.41	N. 20 degrees E. 47' " " "	Leading Edge Wing LH from landing Light inboard to Sta. 14.
No.42	N. 43 degrees W. 46' " " "	ILS Antenna
No.43	N. 60 degrees W. 69' " " "	Dump Valve from fuel tank
No.44	N. 60 degrees W. 65' " " "	Radio Panel from Contr ~ Pedestal
No.45	N. 43 degrees W 67' " " "	Front Cargo Door Latch
No.46	N. 30 degrees W. 65' " " "	Eight feet of L - Leading Edge Skin from Landing Light Out Board.
No.47	N. 90 degrees W 109' " " "	Portion of Engine Ring Cowl Leading Edge
No.48	N. 56 degrees W. 100' " " "	Aileron Section. L H
No.49	N. 8 degrees W. 43' " " "	Portion of fuel tank cover L.H.
No.50	N. 19 degrees W 66' " " "	Four Feet of left wing spar cap including Station 142
No.51	S. 52 degrees W. 29' " " "	Left elevator.
No.52	S. 60 degrees E. 71' " " "	Portions of right Stabilizer and Elevator
No.53	N 34 degrees W. 53' " " "	Part of Wing Attach Angle from Left Wing
No.54	S 80 degrees E 40' " " "	Piece of Aileron L.H
No.55	S. 85 degrees E. 85' " " "	L.H wing, 20 feet of spar and skin.
No.56	S. 61 degrees W 95' " " "	Section of Engine Ring Cowling with Cowl Flap.
No 57	N. 30 degrees E. 129' " " "	Piece of Engine Cowling
No.58	N. 55 degrees E 153' " " "	Piece of Engine Nacelle with Engine Mount Cluster
No.59	S 85 degrees E 95' " " "	Landing Gear and Flap Control Valves
No.60	N. 89 degrees E. 110' " " "	Piece of left Aileron including Hinge
No.61	N. 90 degrees E. 128' " " "	Magnetic Compass.
No.62	S. 40 degrees E. 37' " " "	Trim Tab
No.63	N. 67 degrees E 32' " " "E"	Right Hand Wing Tip.
No.64	N. 85 degeees E. 14' " " "	Landing light.
No.65	S. 32 degrees E. 12' " " "	Wing Fuselage Intersection.
No.66	S. 9 degrees E. 14' " " "	Wing Center Section Shear Point
No.67	S. 10 degrees E. 29' " " "	Flap Actuating Cylinder
No.68	S. 41 degrees E. 32' " " "	Intersection of fuselage center line with aft stabilizer spar
No.69	S. 62 degrees E. 40' " " "	Front Jamb and Cargo Door Sill Intersection.
No.70	S. 71 degrees E. 41' " " "	FWD End of Fuselage Wreckage
No.71	S. 66 degrees E. 24' " " "	Portion of L.H. Center Section from Shear Point to Station 142
No 72	N. 57 Degrees W. 74' from Hub "O"	Plexiglass pieces left landing light
No.73	N. 57 Degrees W 27' " " "	ADF Loop Housing fragments
No.74	N. 69 Degrees W. 18' " " "	First right propeller slice in ground
No.75	N. 70 Degrees W 12' " " "	Second right propeller slice in ground
No.76	N. 77 Degrees W. 6' " " "	Third right propeller slice in ground
No.77	N. 40 Degrees W. 68' " " "	Wing Tip to Outer Wing Splice


APPENDIX B
POSITIONS OF SQUALL LINE
FLIGHT PATH & WITNESS CHART
UNITED AIRLINES FLIGHT No 129
DOUGLAS DC-3 ~ N16088
APRIL 28 1951~1931 CST
2.6MI ESE OF BAER FIELD
FORT WAYNE, INDIANA
1 G M SMITH
2 D R JOHNSON
2A R E HILL
3 J H KUNZIE
4 MRS M YOUNG
5 ROSS SILLS
6 G E EYLENBERG
7 G GERKE
8 MRS M L KRILL
9 R E SMELTZER
10 MRS B BOLLENBACHER
11 J R MOORE
12 MRS F KIZER
13 H A HENRY
14 H NEUENSCHWANDER
15 J E HANNA
16 P E JUSTUS
17 HENRY FACKS
18 D L NYFFELER
19 MRS C MARTIN
20 WILBUR SORG
FORT WAYNE 1MI N
POSITION FORWARD EDGE SQUALL AT ½ MINUTE INTERVALS
ESTIMATED POSITIONS AT SPECIFIED TIMES ARE SHOWN ALONG THE FLIGHT PATHS OF TWA 240 AND UAL 129
UAL 129
TWA 240
TWA 415
TWA 219
SCALE
6" - 1 MILE
1" = 880'
WAYNEDALE
ST MARYS RIVER
LOWER HUNTINGTON ROAD
WINCHESTER ROAD
KUNKER ROAD
BLUFFTON ROAD
DUNKELBERG ROAD
INDIANAPOLIS ROAD
FERGUSON ROAD
WINTER ROAD
CENTER ROAD
THIEL ROAD
UAL 129 1929 CST
TWA 240 1929 CST
CONTROL TOWER
BAER FIELD
801 MSL
RUNWAY 4-22
RUNWAY 9-27
TWA 415 LANDED 1928
TWA 219 LANDED 1925
WRECKAGE AREA
SEE STRUCTURES COMMITTEE REPORT
1932 CST
THIS CHART PREPARED FROM
ALLEN COUNTY MAP
WC DUELL - SURVEYOR
PLOTTED BY -
WILL SIEVERT CAB
C M CHRISTENSON UAL
GEORGE M FRENCH CAB
1928½ CST
1929 CST
1929½ CST
1930 CST
1930½ CST
1931 CST
1931½ CST
1932 CST
1932½ CST