

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Washington, D.C. 20594

Airworthiness Group Chairman's Factual Report

June 6, 2022

A. ACCIDENT CEN19MA312

Location: Monclova, Ohio
Date: September 11, 2019
Time: 0239 eastern daylight time
Aircraft: Convair 440, registration N24DR

B. GROUP

There was no group formed for this activity.

C. SUMMARY

On September 11, 2019, at 0239 eastern daylight time, a Convair 440 airplane, N24DR, impacted trees and terrain while on final approach to runway 25 at the Toledo Express Airport (TOL). The accident site was located about 1/2-mile from the runway arrival threshold in Monclova, Ohio. Both pilots were fatally injured. The airplane was destroyed by impact forces and a postimpact fire. The airplane was registered to a private individual and operated by Ferreteria E Implementos San Francisco under Title 14 Code of Federal Regulations Part 125 as a non-scheduled cargo flight. Night visual meteorological conditions prevailed, and the flight was being operated on an instrument flight rules flight plan. The flight originated from the Millington-Memphis Airport (NQA), Millington, Tennessee, at 2314 central daylight time and was destined for TOL.

The NTSB investigation team met at the accident site from September 12 – 15, 2019 to document the airworthiness (systems and structures) aspects of the airplane.

At the end of the on-scene phase of the investigation, the following airplane components were removed and retained by the National Transportation Safety Board for further examination:

1. Various Flight Instruments
2. Appareo Stratus 2S Portable ADS-B Receiver
Part Number: 153510-000008
Serial Number: Not available
3. ACK Digital Altitude Encoder
Part Number: A30.02.00
4. iPad

Photographs of the instruments were taken in the NTSB Materials Laboratory.

All “four corners” of the airplane were found in the wreckage. No evidence of a pre-impact systems or structural failure was noted.

D. DETAILS OF INVESTIGATION

The airplane was identified by the manufacturer as:

Manufacturer:	Convair
Manufacturer Type:	CV-440F
Serial Number:	393
Year of Manufacture:	1957

The accident impact and post-crash fire consumed most of the airplane and cargo. The relevant aspects of the airplane’s systems and structures were documented.

1. AIRPLANE SYSTEMS

The relevant airplane systems were documented according to the following categories:

A. Auto Flight

Flight deck components of the auto flight system were in the wreckage. Two gyros were noted but damaged by fire and impact.

B. Equipment & Furnishings

The flight deck seat belt usage was undetermined. Several seat belt buckles and one 4-point buckle were noted. The associated straps were consumed by fire.

C. Fire Protection

Two hand-held fire extinguishers were noted in the wreckage. The bottles exhibited evidence of thermal damage.

Three of the four hardened engine fire extinguisher bottles were noted in the wreckage, in the post-crash fire. Each of the bottles exhibited evidence of thermal damage. However, one bottle was noted as still charged. The bottle was subsequently discharged by local authorities.

D. Flight Controls

Both flight deck control columns and control wheels were in the main wreckage. Both columns exhibited impact and fire damage. Both columns had control cables still attached. One control wheel had a button on the right-hand wheel grip.

Primary Flight Control Systems

Control cable continuity was confirmed for each primary flight control system to the extent possible, given the initial fragmentation due to impact sequence and post-crash fire. In general, the control cables were traced from the flight control surface (aileron, rudder, elevator) through the associated structure, to the fuselage, and forward to the flight deck. For each control surface, the cable runs were continuous except in areas of structure break or severe fire damage.

For a control check in the fuselage and flight deck area, the cables were traced through the area of the burnt wreckage to each of the control columns, except in areas of structure break or severe fire damage. All control quadrants in the center wing/fuselage area and between the flight deck area and empennage were consumed by fire.

Pitch Control System

The left elevator was noted intact on the left horizontal stabilizer. The right elevator was fragmented into three sections, with the inboard portion of 34.5 inches remaining on the empennage.

The pitch control system cables in the empennage were noted and accounted at the area of the bulkhead. Cable continuity was confirmed for the left elevator; only a portion of the right elevator remained on the empennage and the cables did not appreciably move the surface.

Left elevator trim control cable continuity was confirmed; the cable did not move the portion of the right elevator trim tab still attached to the empennage.

Roll Control System

The roll control cable continuity was confirmed at the “inboard” portion of the left aileron and inboard to the area of the engine nacelle but could not be continued into the area of severe fire damage due to fragmentation of the cable.

The left aileron trim cable continuity was confirmed in the large section of wing to the trim servo motor.

The right aileron and trim control cables were noted in the main wreckage. However, due to the fragmentation of the aileron and wing, the continuity could not be assessed.

Yaw Control System

Rudder pedals were found in the wreckage. The pedals were found separated from the input quadrant.

The rudder and rudder trim control surfaces appeared intact and were connect to the vertical stabilizer.

The yaw control cable continuity was confirmed in the empennage area, forward of the aft bulkhead. When pulled, the rudder cables moved the rudder.

Secondary Flight Control Systems

Trailing Edge Flaps

The airplane was fitted with four Fowler-type trailing edge flaps, two on each wing; the outboard flaps were mounted between the aileron and engine nacelle, and the inboard flaps were fitted between the engine nacelle and the fuselage. Each flap section was mounted on roller bearing carriages which travel on curved I-beam tracks. The I-beams were attached to the wing rear spar and trailing edge structure.

The flap actuating system (extend and retract) was driven by the main hydraulic system. The system consisted of a hydraulic selector valve (solenoid-operated) and left and right hydraulic drive units, each driving a torque tube assembly which drove the flap cable-drum assemblies on each wing. The hydraulic drive units were a gear box driven by a hydraulic motor. A flap position transmitter is mounted on each drive unit provided a signal to the dual flap position indicator located on the pilots' flight deck instrument panel.

The flap operation was controlled with a toggle switch located on the flight deck pedestal. Operating this switch energized the flap selector valve solenoid, which positioned the flap selector valve to the selected flaps up or down position. When the switch is in the center (neutral) position, the flaps were hydraulically locked.

No evidence of the hydraulic flap control system components were identified in the wreckage.

Portions of the each of the four trailing edge flap surfaces were in the wreckage. Two sections of the flaps, one about eleven feet long and the other eight feet long, were located on the driveway of the property. Two flap carriage linkages were attached to the first segment and one flap carriage linkage was attached to the second. The second segment had attached extension/retraction cable. The cable was attached to a segment of flap control torque tube. Another section of torque tube was located nearby which appeared to connect to the first segment. When laid together, the two torque tube segments measured approximately eighty-eight inches in length. For each of the three attached flap carriage linkages, the turnbuckle was extended some length from the forward stop.

Two other trailing edge flap segments were noted in the left wing. The first segment was ~14.5 feet long and included two flap carriage linkages. The surface was bent and crushed in areas and evidence of fire damage, including some area of one "end" consumed by fire. For each of the two linkages, the turnbuckle was extended from the forward stop.

The second segment was five feet in length and partially consumed by fire; no flap carriage linkages were noted on this segment. The segment was fractured open and partially crushed.

The flap system design, fragmentation, and post-crash fire did not allow for a post-accident assessment of the flaps. The airplane's manufacturer indicated that an inspection of the airplane's flap drive modules might have provided an assessment of whether the trailing edge flaps were extended or retracted. However, the modules were not identified in the wreckage due to the post-crash fire.

E. Fuel

Two fuel quantity indicator assemblies were in the wreckage; each assembly was separated from their respective wing. The first assembly was located near the business office of the property, and was identified as follows:

Manufacturer:	Honeywell Tank Unit Fuel Quantity
Part Number:	J67039C-3
Serial Number:	0-787

The second assembly did not have readable identification.

F. Hydraulic Power

Segments of hydraulic tubing were noted throughout the wreckage site.

Two hydraulic aircraft brake valves and attached hydraulic lines were in the wreckage field, in an area that was not subjected to fire.

G. Indicating and Recording Systems

1.0 Flight Deck Instrument Panel Switch Position Assessment

The instrument console sustained buckling and compression damage consistent with impact damage. The following instruments panels were found in the debris pile with the windscreen wreckage (outside of the main wreckage and post-crash fire location) and the following as-found indication/switch position were noted:

1.1 Fuel Panel (See Figure 1)

- Emergency Power Off switch intact, in NORMAL setting
- Cross Feed and Shutoff Valves circuit breakers intact and not tripped
- Fuel Shutoff Valves switch for left and right tank intact in the OPEN position
- Cross Feed intact, in the CLOSED position



Figure 1 - Fuel Panel

1.2 Landing Light and Pitot Heat Panels (See Figure 2)

- Left landing light switch was intact
- The right landing light switch was not found
- Pitot Heat and Prop De-Ice Percent Load gauge appeared intact
- Heat Anti-Ice in the PULL OFF position
- Load Master Selector Switch Knob separated
- Prop De-Ice right hand switch intact, in the OFF position
- The Left Prop De-Ice switch was separated
- Left- and Right-hand Pitot Heater switches in the OFF position
- Tail Anti-Ice Valve switch armed in the NORMAL position
- Cockpit Heater selector knob in the OFF position



Figure 2 - Landing Light and Pitot Heat Panels

1.3 Inverter Panel Section (See Figure 3)

- Inverter switches set to #1 INV (Inverter) and #2 INV (Inverter)
- Volt AC gauge intact, indicated zero
- AC Voltmeter selector switch in the CAPT FLT INST 115v PH-B (Captain Flight Instrument) position
- Alternator selector knob separated, missing



Figure 3 - Inverter Panel Section

1.4 ADF Section of Panel (See Figure 4)

- GAIN and TUNE dial knobs intact
- ADF Frequency #1 set to 68
- Steward Emergency Call Switch, missing and not found



Figure 4 - ADF Panel

1.5 Generator Section (See Figure 5)

- Left- and Right-hand generator gauges intact
- DC Volt gauge separated from panel
- DC Selector Switch in the 6 o'clock position
- Battery Switch ON
- Left Hand Generator switch separated from panel
- Right Hand Generator switch in the ON position
- Captain Flight Instrument Normal switch in EMERG position
- DC Power in the NORMAL position
- 1st Officer Flight Instrument Normal switch in the EMERG position



Figure 5 – Generator Section of Panel

1.6 Engine and Oil Cooler Section (See Figure 6)

- Engine Selector Switch in the LEFT position
- Primer, Start, Boost switches all in the OFF position
- Oil Cooler Controls Left and Right switches in the OPEN position
- Left Hand Fuel Boost Pump switch in the ON position; Right Hand Fuel Boost Pump in the OFF position
- Start Safe Switch in OFF position



Figure 6 - Engine Starting Selector and Oil Cooler Portion of Panel

1.7 Engine Cooling Controls Section (See Figure 7)

- Primer Selector Switch in the OFF position with red switch guard fractured, portion missing
- Engine Cooling Controls Cowl Flaps - Left Hand Switch in the OFF position; Right Hand Switch separated and missing
- Augmentor Vane Position, Left and Right-hand switches were fractured and separated
- Left Hand Augmentor Vane Position gauge intact with the needle positioned to about 14°
- Right Hand Augmentor Vane Position gauge with broken glass face, needle positioned to about 14°



Figure 7 - Engine Cooling Controls Section of Panel

1.8 Engine Fire Control Panel (See Figure 8)

- Left Hand (No. 1) Engine Fire switch and guard intact, noted in the down position
- Right Hand (No. 2) Engine Fire switch and guard missing
- No. 1 and No. 2 Engine Fluid Shutoff handle in the stowed position
- CB (Chlorobromomethane) Supply Select switch dislodged, missing from panel



Figure 8 - Engine Fire Control Panel

1.9 Instrument Lights Panel (See Figure 9)

- Pedestal, Pilot, and Copilot Map light intensity dial knobs intact



Figure 9 - Instrument Lights Panel

1.10 Center Control Pedestal

The center control pedestal was identified in the main wreckage. The pedestal exhibited impact and fire damage. The following assessment was made of the pedestal lever and switch positions, starting from the captain's (left) side of the pedestal:

- Elevator trim tab wheel on side of pedestal – the wheel was broken off. Three spokes from the center arm remained. No assessment possible
- Elevator trim position window – the plastic window cover was removed. No arrow or pointer were present, but center of the window was about seven-eighths “Up”
- Pilot gust lock – broken off
- Pilot's Throttle – both levers were bent over to the left. The bottom of the left lever aligns with word “order” on marking next to lever. The right lever is slightly forward of the left. The right lever is twisted
- Autopilot OFF/ON – handle is missing
- Auto Feather Test Switches – Left and Right – both switches are missing
- Prop Pitch Limit Lights – broken loose
- Auto Prop Feather Arming Switch – Covered, down position
- Blower Shift Switches – Left hand: Switch Low, Right hand: Switch High
- Carb Alt Air Door Levers – Bent to the left, both full forward
- Mixture Control (Red Handles) – Left handle at bottom of range, Right handle at top of range
- Copilot Throttle Levers – Both bent over to the left. Both handles were about the same position as the captain's levers
- Copilot's Elevator trim wheel – wheel is missing, no assessment
- Manual throttle Locks – Left handle was loose, no indication. The right handle was missing

One of the flight instrument panels was in the wreckage. The panel was loose but had three instruments still installed. A digital chronometer was noted in the upper left position of the panel. None of the other instruments exhibited a discernable indication.

2.0 Flight Instrument Photographs and Indication Assessment

Loose flight instruments were found near and in the main wreckage location. Some of the instruments exhibited fire damage and no assessments could be made. Several of the instrument faces were broken and separated from their casings. The instruments and faces that could provide some indication or assessment were retained by the NTSB for further examination.

At the NTSB, the glass front of the instruments was removed, if possible, and the instrument photographed. An assessment of the instrument indication was attempted.

The instruments were documented as follows:

2.1 Fuel Quantity Instruments

Two fuel quantity gauges were found in the wreckage. Since both were dislodged from their panel, it could not be determined for which tank each gauge was from.

10. The first gauge had no indicator needle and no indication assessment possible. See Figure



Figure 10 - Fuel Quantity Indicator

The second fuel quantity indication was about two hundred pounds (lbs.). See Figure 11.



Figure 11 - Second Fuel Quantity Indicator

2.2 Airspeed Indicators

The instrument face from two airspeed indicators were found in the wreckage. Since both were dislodged from their panel, it could not be determined for pilot position each gauge was from. Both instrument faces were separated from their respective instruments, and neither had indicator needles.



Figure 12 - Airspeed Indicator

No indication assessment was possible, due to impact damage.



Figure 13 - Second Airspeed Indicator

No indication assessment was possible, due to impact damage.

2.3 Altitude Indicators

The instrument face from two altimeters were found in the wreckage. Since both were dislodged from their panel, it could not be determined which pilot position each gauge was from. Both instrument faces were separated from their respective instruments, and one of the two still had an indicator needle.



Figure 14 - Altimeter Face

No indication assessment was possible, due to impact damage.



Figure 15 - Second Altimeter

No indication assessment was possible.

2.4 Flap Indicator

A flap indicator was found in the wreckage. The glass face was cracked, and the white indicator needle would not move when the instrument was rotated. See Figure 16.



Figure 16 - Flap Indicator, Before Glass Removal

After the glass face was removed, the white indicator moved freely, and no indication assessment possible. See Figure 17.



Figure 17 - Flap Indicator, After Glass Face Removed

2.5 Fuel Flow Indicator

A Fuel Flow Indicator was found in the wreckage. When the instrument's glass face was removed, the white indicator labelled "2" was free to move when the instrument was rotated. The white indicator labelled "1" however, was stationary and indicated about 1100 lbs. of fuel per hour. See Figure 18.

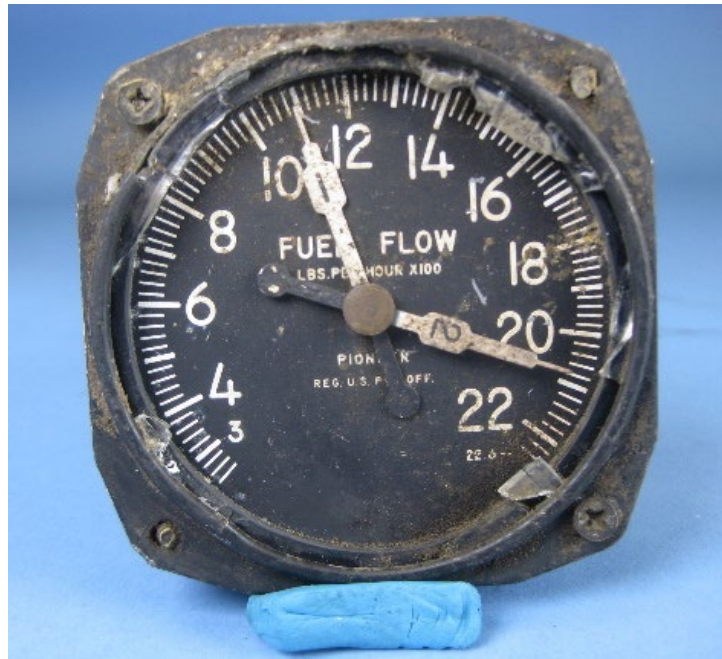


Figure 18 - Fuel Flow Indicator

2.6 Engine Tachometer

An Engine Tachometer Indicator was found in the wreckage. The glass face was removed, and moisture was noted inside the glass of the instrument.

Two indicator needles were observed – one was labelled "1" and the other "2". The "1" indicator was noted directly behind "2". Both indicators were off scale; both were at a value greater than 35x100 Revolutions Per Minute (rpm). See Figure 19.



Figure 19 - Engine Tachometer, with Glass Face Removed

2.7 Artificial Horizon

An artificial horizon indicator was found in the wreckage. The instrument was crushed and no indication assessment available.

The horizon face from the second artificial horizon was found in the wreckage. No indication assessment was possible.

2.8 Other Miscellaneous Instruments

The following other miscellaneous instruments were found in the wreckage:

- B.M.E.P. Gauge – needle indication of about 160 lbs. per square inch.
- Cylinder Head Temperature Gauge – two indicator needles, both at the top of the scale range, about 300° Celsius.
- Two Oil Quantity Indicators – One with no indication, the second with indicator needle at about 10.5 Gallons.
- Unknown Pressure Gauge – needle indicated about 40 (4,000 lbs. per square inch)
- Unknown Temperature Gauge – needle indicated about 85° Celsius.
- Water Pressure Gauge – with left and right scales, the left indicator was off the scale high, while the right indicator needle indicated about 120 lbs. per square inch.
- Water Quantity Gauge – the needle was off scale, no indication available.

H. Landing Gear

The airplane was fitted with a nose landing gear and two main landing gear systems. All three landing gears were located at the accident site.

The assessment of the position of all three gears was down. This assessment was made by examination of the landing gear components in the wreckage.

NOSE LANDING GEAR

The lower nose landing gear structure and tires were located near the business office on the property; an outer wall near the structure indicated evidence of impact damage. At least one of the tires was deflated and the associated wheel showed impact damage and was bent.

The upper nose landing gear structure was in the main wreckage section. The structure was subjected to fire. The steering cylinder was visible, but all hydraulic lines were consumed by fire.

LEFT MAIN LANDING GEAR

The left main landing gear was found near the left-wing structure, on top of a tractor-trailer. The gear structure was fire damaged, and the tires and wheels were missing. The associated actuator attached to the gear leg was in an extended position.

RIGHT MAIN LANDING GEAR

The right main landing gear was found in the main wreckage area, in the right-wing structure. The gear structure was fire damaged, and the tires and wheels were missing. The associated actuator attached to the gear leg was in an extended position.

I. Lights

The left- and right-wingtip lights were located at the tips of their respective wings.

The light on top of the vertical stabilizer was noted.

The left and right extendable landing lights were noted on their respective wings; the left landing light was damaged by post-crash fire while the right landing light was crushed in a segment of wing that was impinged with dirt and vegetation.

J. Navigation

The VHF Navigation (Omni) antenna was identified in the wreckage field. The antenna was fractured into several pieces.

The airplane's Appareo Stratus 2S Portable ADS-B Receiver and associated hardware were in the wreckage debris field. The unit was retained for further examination. The receiver did not have nonvolatile memory. No further examination of the component was accomplished.

The airplane's whiskey compass was noted in debris field. The compass was still attached to the airplane's window frame.

An ACK Technologies A-30 Digital Altitude Encoder (part number A30.02.00) was in the debris field. See Figure 20.



Figure 20 - ACK Technologies A-30

A King KX 155 and a King KX 165 Navigation/Communication units were identified in the wreckage.

2. AIRPLANE STRUCTURE

The main section of airplane structure was in the parking lot of a heavy truck maintenance facility, adjoining an area of trees to the east. The east edge of the tree area was adjacent to a parking lot of an Army Reserve Armory. The structure was located on top of and within 8-10 semi-trucks and associated trailers. In addition, pieces of the airplane's structure were found in the wooded tree area, adjacent to the trucking company parking lot.

After the impact with trees, at the edge of the wooded tree area, the aircraft left a ground scar that was consistent with the airplane impacting the ground in a right wing down attitude. Airplane wreckage from the right wing was identified in the ground scar. See Figure 21.



Figure 21 - Airplane ground scar leaving the wooded area.

The ground scar covered the area from the wooded area to the parking lot. See Figure 22.



Figure 22 - Ground scar from the wooded area to the truck parking lot.

Further in the direction of flight in the impact area, the side of a parked tractor-trailer showed evidence of blue and white paint transfer, consistent with the airplane's paint scheme. The top of the trailer also showed impact marks consistent with propeller strikes. See Figure 23.



Figure 23 - Side of trailer showing impact strikes and airplane wreckage.

The main section of wreckage, located in the parking among the parked trucks and trailers, was mostly consumed by post-crash fire. The main fuselage and cargo area (including the cargo), portions of the right and left wings, main landing gears, nose landing gear structure, flight deck, engine nacelles, and left engine, were found in the burned area of the parking lot. Wreckage was also found on top of the parked trailers. See Figure 24.



Figure 24 - Portion of Main Section of Wreckage

For more information regarding the airplane's flightpath, wreckage orientation, and wreckage distribution survey, please refer to the [UAS Aerial Imagery Report](#) located in the public docket for this investigation.

No evidence of a pre-impact structural failure was noted in the recovered wreckage.

A. Doors

The bottom sill of the main cabin door was located on a section of fuselage. The door was not located in the wreckage.

The main cargo door was identified in the wreckage. The door, located on the left side of the fuselage, was partially consumed by post-crash fire, in the upper left section of the door. The supporting fuselage and framing were also consumed by fire; most of the upper hinge of the door remained but was bent from partial melting and fire damage. The door was bent over at the approximate middle. See Figure 25.



Figure 25 - Main Cargo Door, bent over but still in fuselage doorway.

On the aft (right-hand) side of the door, two “dead-bolt” locks were noted; the lower dead bolt was in the locked (actuated) position but was not inserted into the mating (fuselage) side of the lock; the upper lock was missing the “bolt” and the frame for the bolt was bent. See Figure 26.



Figure 26 - Side View of Main Cargo Door, with bolt-style latch in red circle.

The cargo door opening actuator, assembly, and associated frame were noted on the inside fuselage near the door. No assessment of the mechanism was made; the actuator was in an extended position.

B. Fuselage

Most of the fuselage was consumed by post-crash fire. A section of the left side of the fuselage remained: aft of the main cargo door, a section of fuselage was noted, from the area the height of the cargo door top hinge line, down to underneath the door, for approximately three feet aft of the door. The section continued for another about nine feet aft, from about the blue/white paint intersection, to the ground. Forward of the cargo door, a narrow, three-foot-wide band of fuselage remained but was bent back at the forward cargo door frame. Another small section of fuselage remained just forward of the left horizontal stabilizer. All segments exhibited impact damage and fire damage, either melting, scorching, or was consumed.

A portion of the forward fuselage near the nose, radome and upper fuselage above the forward wind screens was recovered. The pieces were identified by comparing to a recent photograph of the airplane showing a white/blue paint scheme. These portions were crushed, fragmented, and exhibited scraping consistent with impact damage.

C. Nacelles and Pylons

Most of the engine nacelle material was consumed by the post-crash fire. Portions of the left engine nacelle were found on top of or next to the engine but were crushed and exhibited fire damage.

D. Stabilizers

Except for the outboard portion of the right stabilizer, the empennage (horizontal and vertical stabilizers) remained attached to each other but separated from the fuselage. The empennage was found upright, just aft of the fuselage segments and sitting on the parking lot. The empennage was facing opposite the direction of flight. See Figure 27.

The edges of empennage section appeared consumed by fire. The empennage section separated about four feet forward of the aft pressure bulkhead on the left side of the fuselage.



Figure 27 - Airplane Empennage, facing opposite direction of flight. Note missing section of right-hand stabilizer.

The vertical stabilizer was still connected to the empennage and appeared intact. The rudder was still attached to the stabilizer.

The left horizontal stabilizer was still connected to the empennage and appeared intact. The leading edge had one impact point where it was touching a parked trailer.

The following was noted about the identified portions of the right horizontal stabilizer (See Figure 28):

- The most outboard piece of the stabilizer was found in the wooded tree area, below the flight path, near the outboard section of right wing.
- The piece measured thirty inches in length at the leading edge and thirty-nine inches of elevator at the aft edge.
- The tip of the leading edge was crushed aft.
- A tree branch was noted in the piece.



Figure 28 - Outboard Section of Right Horizontal Stabilizer and Elevator

- Another section of the right stabilizer was in the wreckage path, standing on edge. See Figure 29.
- The segment was 140 inches in length, measured along the midspan of the stabilizer.
- A section of elevator, between two linkages, measured at sixty inches in length. The inboard linkage was still attached; the outboard linkage was separated/broken.
- The leading edge is crushed aft starting at about thirty-eight inches from the outboard edge.
- A piece of elevator and elevator trim tab were found near the piece of right horizontal stabilizer, near the ground scar mark.
- The length of the elevator and tab was measured at 43 inches and contained two intact linkages to the tab.
- One of the edges of the trim tab near the elevator was separated along its length.



Figure 29 - Section of Right Horizontal Stabilizer and Elevator, stuck in ground. The top of the stabilizer is facing the photographer.

E. Windows

The left and right center windscreen and sections of the instrument console was found in the area adjacent the main impact area. The windscreen sustained inboard and outboard crazing fractures consistent with impact damage.

One flight deck side window was found separated from the window structure. The window sustained crazing fractures throughout the window.

Another flight deck side window was found in the main wreckage area, in a section of window frame. The window also sustained crazing fractures and exhibited heat damage.

F. Wings

Both wings were fractured and separated from the fuselage.

LEFT WING

The portions of the left wing located in the wreckage was found in two sections. The first section, measured as the longer section of left wing, started from the left wingtip inboard. The section was measured at 17 feet, seven inches (211 inches) from the inboard side of the wingtip cap to the inboard end of the section. See Figure 30.



Figure 30 - Outboard Section of Left Wing, found upside down on a truck and trailer.

The piece was found upside down, on top of a truck and trailer. Approximately ten feet of the furthest outboard section of aileron was still attached to the wing. The red wingtip light was noted on the end of the wing. Overall, the segment was bent, the underside was sooted, and a portion of the leading edge, near the outboard tip, was crushed aft.

The second, more inboard section of the left wing was located on the ground near the left engine. The section measured nine feet in length. The left landing light was noted on the leading edge. The section was found upside down. The outboard leading edge was crushed. The section was thermally damaged with melting and bending at the inboard end. An access panel with a window was noted at the inboard end. Four control cables were noted from the outboard wing piece to the inboard section, with one cable still connected to the inboard piece.

RIGHT WING

The following was noted regarding the identified pieces of the right wing:

- A 142-inch segment of the furthest outboard section of right wing was found in the woods, beneath the airplane's flight path, leaning against a tree. See Figure 31.
- A 147-inch section of aileron was connected to the wing section. Two aileron linkages were visible.
- A portion of the leading edge was crushed aft near the furthest outboard section.
- A wingtip light was noted at the end of the piece.



Figure 31 - Outboard Section of Right Wing, in wooded area. Note aileron attached to rear of wing section.

- Right wing debris was found in the burnt ground scar along the airplane's impact path.
- The right-wing landing light was found in the portion of wing leading edge noted in the ground scar area, with dirt, grass, and weeds impacted around the light.
- A fuel tank quantity gauge assembly was noted.
- An internal wing structure piece was found with the part number 340 1610217 "393" stamped on it.
- A wing access panel was found with a tree branch through it. See Figure 32.



Figure 32 - Wing Access Panel from Right Wing, with tree branch.

- Another eighty-eight-inch section of the right wing was identified outside of the main wreckage area. Wing access panels were noted on the bottom side of the wreckage. The section was fractured on both ends.
- A wing access panel was noted in the main wreckage area. The panel was in a pool of reconstituted metal, no other identification noted.

G. Determination of Four Corners of Airplane

All four corners of the airplane were found at the site. See Figure 33.

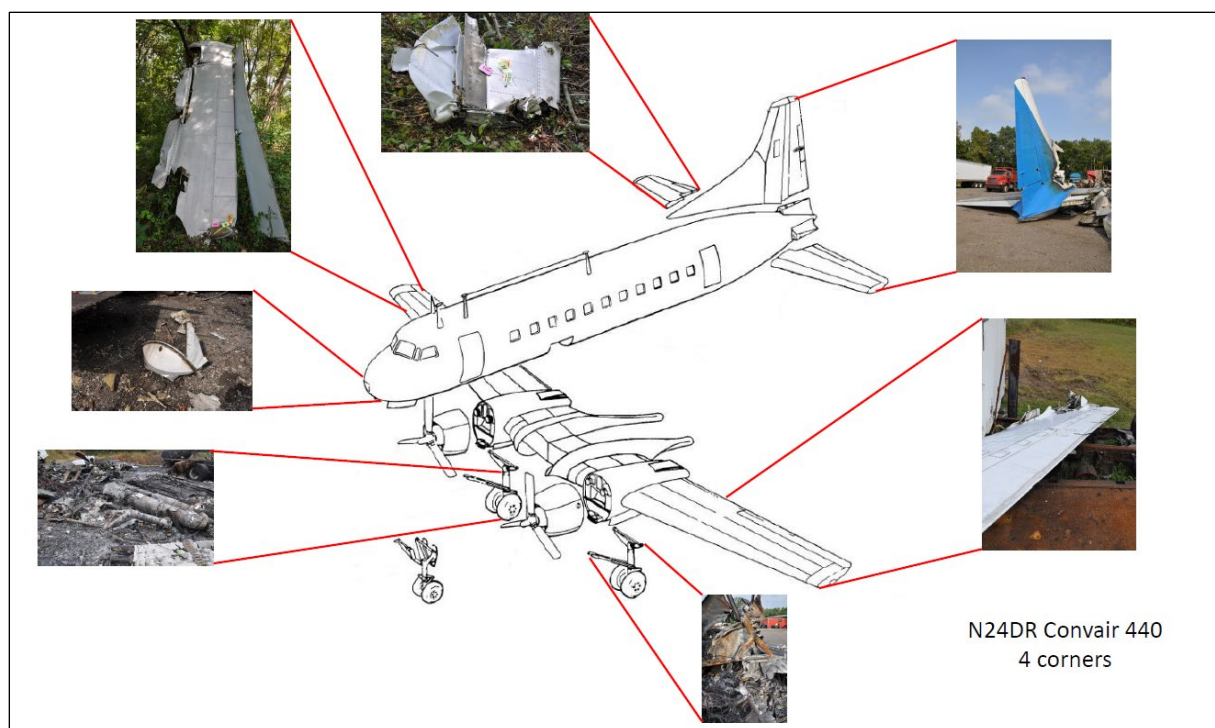


Figure 33 - "Four Corners Assessment" of Airplane

3. CARGO

Most of the cargo compartment was consumed by post-crash fire. Segments of cargo tie-down frames and “diamond” metal flooring were noted in the wreckage.

The cargo operator indicated that the cargo was pallets of automotive wiring harnesses. Several areas in the main wreckage were identified as cargo by melted plastic and copper wiring. See Figure 34.



Figure 34 - Mound of Copper Wiring and Melted Plastic from Airplane Cargo

Several pieces of cargo-securing hardware – latches and clips – were found around the cargo compartment and post-crash fire.

Tom Jacky
Aerospace Engineer