

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

Airworthiness Group Chairman's Factual Report

February 25, 2022

A. ACCIDENT

ANC21FA069

Location: Ketchikan, Alaska
Date: August 5, 2021
Time: 1050 Local Time (ADT)
Aircraft: Southeast Aviation de Havilland DHC-2 MK.1, registration N1249K

B. GROUP

Chairman: Tom Jacky
National Transportation Safety Board
Washington, D.C.

Member: Thomas P. Johnson
Federal Aviation Administration
Anchorage, Alaska

C. SUMMARY

On August 5, 2021, about 1050 Alaska daylight time, a DeHavilland DHC-2, N1249K, was destroyed when it was involved in an accident near Ketchikan, Alaska. The airline transport pilot and five passengers were fatally injured. The airplane was operated by Southeast Aviation, LLC, as a Title 14 Code of Federal Regulations Part 135 sightseeing flight.

The group met in Ketchikan, Alaska from August 6-15, 2021, to document the airworthiness aspects of the airplane. The group documented the airplane's systems, structures, and powerplant. The group also reviewed the available maintenance records.

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

1. Flight Deck Fuel Selector

2. Mini iPad (shipped to NTSB Recorders Lab with personal cell phones)
3. Flight Deck Fuel Quantity Indicator
Manufacturer: General Electric
Part Number: 8DJ54-GAF
Serial Number: T54867
4. Forward Tank Fuel Quantity Sensor (Fuel Content Transmitter)
Manufacturer: General Electric
Part Number: TJ-13
Serial Number: B-15398
5. Center Tank Fuel Quantity Sensor (Liquid Level Transmitter)
Manufacturer: General Electric
Part Number: 8TJ13L
Serial Number: 10586A

No evidence of a pre-impact airworthiness failure was identified during the examination of the airplane. All pertinent documentation and photographs were provided to each of the parties.

D. DETAILS OF INVESTIGATION

The group met from August 6-15, 2021, to document the airworthiness (systems, structures, powerplants, and maintenance) aspects of the airplane. From August 6th - August 11th, the group reviewed the available maintenance records. The airplane was recovered from the accident site on August 12th and moved into a hangar at the airplane recovery facility in Ketchikan, Alaska. The group then documented the relevant airplane airworthiness elements from August 12 - 15, 2021.

The airplane was identified by the manufacturer as:

Manufacturer's Designation:	DHC-2 Mk. 1
Manufacturer's Serial Number:	1594
Type Approval/Specification Number:	22
Date of Manufacture:	June 1965

The recovery team cut the airplane to facilitate its removal from the accident site. The recovery personnel notified the NTSB of the areas of the airplane that were cut for

documentation.

1.0 AIRPLANE SYSTEMS

The group documented the relevant systems of the airplane. Several system components were retained for further examination. The relevant airplane systems were documented according to the following categories:

1.1 Communications

A King KY196 and Garmin GTR200 radio control panels were mounted in the airplane's radio panel.

1.2 Equipment & Furnishings

Rescue personnel indicated that, when extracted from the airplane, the pilot and each passenger were wearing seat belts. The rescue personnel cut several of the airplane seats, at the cabin floor, to facilitate removal of the bodies.

The flight compartment and cabin seats were documented by the group. The right middle seat was cut. All other seats were either separated from the airplane floor by impact forces or remained attached to the airplane. The seats were documented as follows:

- Pilot Seat - was not cut from the cabin floor. The rescue personnel cut the pilot's shoulder belt/strap.
- Co-pilot Seat - did not appear to be cut, but the shoulder belt/strap was cut.
- Second row - the left seat frame was not cut. The seat was bent forward. The right seat was cut at least twice. Both second-row seats were attached into the cabin floor seat track hardware.
- Third Row - both third row seats were connected to their respective side cabin walls, and the inboard seat leg rests on the cabin floor. The left seat was still attached to the side wall structure, but the right seat was separated. The right seat appeared fractured, and not cut.
- Rear Bench - the frame was attached to aft cabin structure and not cut. The two bench seat cushions (bottom and back) were located and identified in the wreckage.

The seats were deformed in a forward direction.

The airplane's third row and rear bench cabin seats were installed via supplemental type certificate (STC) number ST01380NY¹. The company that developed the STC also performed the STC seat installation work on N1249K.

According to the STC holder, the third-row seats were considered "jumpseats" that were installed at Fuselage Station (FS) -62. The rear bench seat was installed at FS -92.

A decal affixed to the rear bench seat indicated a maximum occupied weight of 195 pounds. The STC indicated that, due to structural limitations, a maximum weight restriction of the occupant of the rear bench seat was 195 pounds².

According to the STC, the third row jumpseats installed at FS -62 had no weight limitation.

1.3.0 Flight Controls

The flight deck control column and wheel were identified in the flight compartment. The flight control input uses a "throw-over" system in which the lower portion of the control column is located in between the pilot and co-pilots seats, aft of the center flight instrument panel. The upper portion of the control column, including the control wheel, can be rotated (thrown over) between the pilot and co-pilot seats. The control column was deformed forward and interfered with the center (engine) instrument panel when the column was thrown over the co-pilot's position.

Control cable continuity was confirmed for each primary flight control system to the extent possible, given the fragmentation of the airplane from impact forces and subsequent cutting of the airplane during recovery. The control continuity components were traced from the flightdeck input (control column, control wheel, and rudder pedal) through the associated structure, into the fuselage, and then to the flight control surface. For each control surface, the cable runs were continuous except in areas of structure break.

1.3.1.0 Primary Flight Control Systems

1.3.1.1 Roll Control (Ailerons)

Both aileron control surfaces were identified in the wreckage. Aileron control continuity was confirmed from the control wheel through cables and pulleys out of the fuselage at the wing mount. In each wing segment, control cables were noted in the wing structure to the aileron connection juncture.

¹ Also Transport Canada STC Number SA01-074, approved June 27, 2001.

² The information is also provided in Flight Manual Supplement (FMS) 7967-3, "Installation of Sealand Jump Seats".

The left aileron was still partially connected to the outer segment of left wing. The right aileron was fractured but the outer portion of the aileron was still connected to the wing via the middle connection point.

1.3.1.2 Pitch Control (Elevator)

Both elevator control surfaces were identified in the wreckage.

Elevator control continuity was established from the control column, back through the fuselage, to the empennage. The elevator surfaces were separated from the tail and horizontal stabilizer, but the control torque tube and linkage were noted, and the cables to the flight control surfaces were identified.

1.3.1.3 Yaw Control (Rudder)

The yaw flight control surface (rudder) was identified in the wreckage. The rudder was detached from the vertical stabilizer.

The rudder control cable continuity was confirmed from the flight deck pedals to the aft end of the fuselage, at the break of the rudder cables at the rudder bellcrank.

The captain's rudder pedals were damaged. The left pedal was crushed towards the right pedal. The right pedal moved, but the left did not.

1.3.2.0 Secondary Flight Control Systems

1.3.2.1 Trailing Edge Flaps

The airplane was fitted with two trailing edge flaps, one on the aft of each wing.

The flight compartment flap handle and pump were noted and were removed to facilitate the inspection of the airplane. The hydraulic flap actuator, located in the fuselage above the captain's seat, was noted to be extended approximately one inch.

Both flap control surfaces were identified in the wreckage, but due to impact damage, no assessment of position could be made.

1.3.2.2 Elevator Trim

The elevator trim servo was noted in the aft fuselage, with several cable loops still attached. Rotation of the flight compartment elevator trim resulted in cable movement at the servo.

1.3.2.3 Rudder Trim

The rudder trim servo access panel was opened, and the rudder servo was noted in the aft fuselage, with several cable loops still attached. Rotation of the flight compartment rudder trim resulted in cable movement at the servo.

1.4.0 Fuel

The airplane's fuel access panel, located on the left side of the fuselage, just aft of the pilot's door, was damaged. All three filler necks were crushed and separated from their respective fueling lines to the fuel tanks.

1.4.1 Fuel Selector Examination

The flight compartment Fuel Selector was noted in the "OFF" position in photographs taken on scene and after the airplane was recovered.

During the on-scene examination, the fuel selector's red handle was rotated to the other selection positions (Front, Centre, and Rear fuel tanks) and the fuel selector valve, located in the fuselage belly, aft of the fuel tanks, was noted to move. The fuel selector could be moved to each of the positions, with the valve moving with each selection. The fuel selector was then removed for further examination for witness marks. See Figure 1.

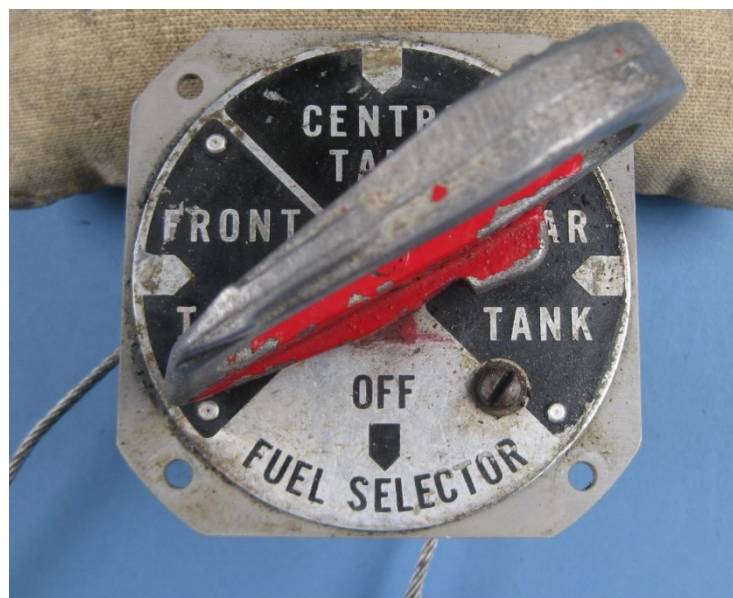


Figure 1 - Airplane's Fuel Selector

The fuel selector was further examined for witness marks (predominantly from the tab at the bottom of the handle) that indicated the handle's position at impact. Each of the four sectors on the selector's face were photographed and examined.

For the FRONT TANK area, see Figure 2.



Figure 2 - Fuel Selector Panel, FRONT TANK Selection Area. Note the selector handle tab circled in red.

The CENTRE TANK area was also examined. There was an area of marks noted in the sector. See Figure 3.

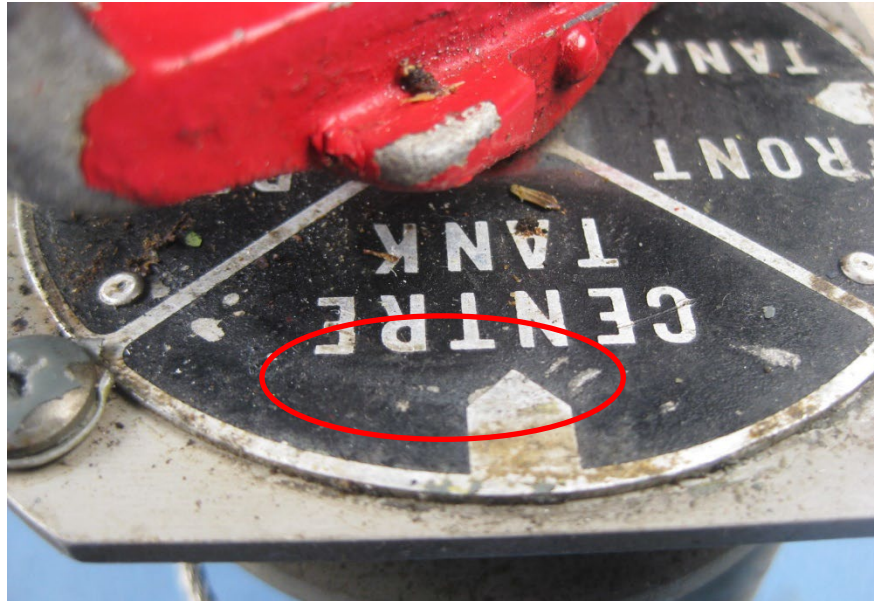


Figure 3 - CENTRE TANK sector of Fuel Selector. Note marking in area of red circle.

The OFF sector was also examined. See Figure 4.



Figure 4 - The Fuel Selector OFF area.

Finally, the REAR TANK sector was also examined. See Figure 5.



Figure 5 - The REAR TANK sector of the fuel selector.

No definitive impact witness marks were noted on the selector. The markings on the CENTRE TANK sector were the only marks noted during the examination.

1.4.2 Fuel Tank Examination

The airplane was equipped with 3 separate, metal fuel tanks - Front, Center, and Rear. Each tank was located beneath the cabin floorboards.

The airplane's cabin flooring was removed to expose each of the fuel tanks. The Front and Center Tanks were noted as intact, while the Rear Tank was breached.

The Front and Center Tanks were removed from the fuselage. The fuel tank support structure underneath the tanks was ripped on the left side where the sensor unit extended below the support structure.

Each of the airplane's fuel tanks were examined, and the following observations made:

- Front Tank: The tank-retaining straps were intact. When the access panel on the top of the tank was removed, and the tank opened, a trace amount of fluid was noted at the bottom. The fluid (and tank) and had an odor like aviation fuel. The trace amount of fluid was noted in the tank around the tank sump/intake area and around the left (pilot's side) of the tank. The fluid did not cover the entire bottom of the tank, just around the lower areas.

The tank also exhibited visual indications of hydraulic deformation around the left (pilot) side of the top and bottom sides. The tank was pushed out such that it interfered with hose fitting for the Front Tank's ventilation tube.

The filler neck was crushed, but the neck remained open. See Figure 6.



Figure 6 - Front Fuel Tank (Area of hydraulic deformation in red circle)

- Center Tank: When exposed, both Center Tank restraining straps were found broken. The straps were broken on the aft side of the Center Tank. When the access panel on the top was removed and the tank opened, a small amount of fluid was noted in the tank around the tank sump/intake area of the tank. The fluid did not cover the entire bottom of the tank, just around the lower areas.

The Center Tank also exhibited hydraulic deformation around the left side of the tank. The tank was pushed out on the bottom, left side of the tank, and appeared to be compressed on the right side of the tank. The filler neck remained intact. See Figure 7.



Figure 7 - Center Fuel Tank (Area of hydraulic deformation in red circle)

- Aft Tank: The tank was empty, and no liquid was noted in the tank³. No hydraulic deformation was noted on the tank exterior. The operator indicated that the aft tank was not typically used. The straps on the aft tank were not broken. The tank was perforated on the bottom of the tank.

1.4.3 Fuel Quantity Sensors

The fuel quantity sensors from the Front and Center Tanks were removed and retained by the NTSB.

The sensors were visually examined and photographed. The sensor removed from the Front Tank was examined. No visual anomalies were noted. See Figure 8.

³ The operator indicated that they typically only used the Front and Center Fuel Tanks and left the Rear Fuel Tank empty.



Figure 8 - Fuel Quantity Sensor removed from the Front Fuel Tank.

The sensor removed from the Center Tank was also examined. No visual anomalies were noted. See Figure 9.



Figure 9 - Fuel Quantity Sensor removed from the Center Fuel Tank.

1.5.0 Indicating and Recording Systems

The flight compartment instrument panels were damaged by impact; the flight instrument, fuel selector panel, flap indicator, and engine control quadrant all exhibited crush and impact damage. Some of the instruments were fractured and switch positions unreliable. Some instrument faces were broken with no indication assessment possible.

After the recovery of the airplane from the accident site, the flight compartment indication and switch positions were noted as follows:

The positions were noted in a general order from right (co-pilot's side) to left (captain's side), and from top to bottom:

- Top right: Instrument lights dimmer switch, noted in the 11 o'clock position, towards the "DIM" side.

- Circuit Breaker Panel - top row, left to right: TURN BANK, FUEL WARN and NAV LTS, all noted as in.
- Circuit Breaker Panel - bottom row, left to right: START RELAY and ALTERNATOR, both noted as in.
- Radio Panel (large panel): Communication radio on top, noted as a King KY196, switched off. The bottom unit is a Garmin communication radio GTR200, also switched off.

Also on Radio Panel, to the right of the radios was the ELT switch panel. The red button on top and the test button on bottom, was presumed armed.

On the Radio Panel, directly below the two radios, was a Cobham Intervox II Intercom control panel (noted as AA85). The red switch in the center of the panel found in the CREW (upper) position.

To the right of the intercom panel was the VH1/VH2 toggle switch, in the VHF1 (up) position, and the (empty) MUSIC audio jack.

Finally, on the bottom of the Radio Panel were five circuit breakers, labelled, from left to right, as USB, AA85, KY 196, GTR200, and 12V CONV. All the breakers were noted as in.

- Below the Radio Panel was a small panel that contained a row of four circuit breakers. The breakers were labelled, from left to right, as no label, Spidertracks, Wi-Fi, and ADS-B. Each of the breakers were found in.
- Below that was the suction gauge (SUCTION), indicating 0" Hg, with the normal range 4-5 marked with red tape.
- To the right of the suction gauge was a panel with the following items, including: four electrical toggle switches, noted as, from left to right, ENGINE INST (switch was in up position), FLIGHT INST (switch was in up position), PITOT (switch was in down position), and CABIN LTS (switch was in down position).
- To the right of the four toggle switches was a Voltmeter/Ammeter, with the needle noted at zero.
- Below the toggle switches was the FreeFlight ADS-B control unit. The display screen was blank and the knob on the lower left portion of the unit was in the ALT position. The knob on the lower right portion of the unit

was bent to the left.

- The Oil Tank Filler cap was missing, and not recovered in the wreckage.
- The Emergency Fuel/Oil cutoff lever was safety wired and in the down position.
- The ALT AIR red handle was straight up and down.
- The CARB HEAT lever was all the way up (COLD).
- The Wobble Pump lever was in a middle setting.
- Below the Wobble Pump, the CABIN HEAT Control lever was in the down position, did not move. Stuck in OFF.
- Throttle quadrant: The Throttle Lever was all the way forward, the Propeller Lever was in a middle position, and the Mixture Lever was in the idle cutoff position.
- The Airplane Compass, located above the throttle quadrant on the center windscreen frame, was loosened from its normal position and dangling. The compass moved freely when handled.
- Above the airplane compass was the Free Flight transceiver mount.
- On Captain's upper center panel, the Flap Indicator was crushed upwards and gave no reliable indication.
- To the left of Flap Indicator was the red Fuel Pressure Indicator Warning Light. When the low fuel pressure indicator light bulb was removed, the filament was noted as not stretched or broken.
- Captain's Main Flight Instrument Panel: the panel exhibited impact damage, as part of the panel was crushed forward in the upper panel area.

The Datcon Hobbs Meter was crushed. When the instrument glass and face were removed, a value of 2037.5 hours was indicated.

Airspeed Indicator: indicated zero.

Attitude Indicator: Indicated Left Wing approximately 25 degrees down and nose down attitude of approximately 18 degrees. A photograph

taken at the accident location showed the indicator in a different attitude than after the airplane was moved to the hangar. See Figure 10.



Figure 10 - Attitude Indicator, as noted after airplane recovery.

Altimeter: Indicated 538 feet, Barometric Pressure 29.90 inches Hg.

Vertical Speed Indicator: Indicated 100 feet per minute climb.

Heading Indicator: Indicated 354 degrees.

Turn coordinator: a left wing down past standard rate turn. The ball is to the left because of how the wreckage was resting on hangar floor. See Figure 11.



Figure 11 - Airplane Turn Coordinator, left wing down indication.

The airplane clock was at 10:50.

The Hobbs switch was broken and in the off position.

- The Fuel Selector Panel: the red handle was at the 6:30 position in OFF. See Section 1.4.1.
- To the right of the Fuel Selector was the Starter Panel:

Ignition Switch: Jos. Pollack Corp, AN3212-1. Switch knob tip was broken off but was in the "BOTH" position.

To right of Ignition Switch is a 2-position toggle switch, labeled MASTER ON, and was in the up position.

- To right of the switch was a phone mount.
- Below the Ignition Switch was a guarded STARTER ON switch, noted in the down position. The switch guard was crushed and broken off.
- To right of the Starter switch were six circuit breakers. All the breakers were missing: the breakers were labelled as (left -right), RADIO MASTER, ADSB/SPIDER, LAND LTS, NAV LTS, INST LTS, and ALT/FLD with sticker that reads, "LEAVE ON".
- Below the panel is a black box, with rocker switch in the white dot position. This was the Spidertracks processing unit.
- The Flap Hydraulic Handle was detached from floor but was connected to the hydraulic lines. During the examination, the hydraulic lines were cut, and the unit removed from the airplane.
- The captain's seat was removed from the airplane during the recovery.
- The engine primer appeared to be in the "ON" position.
- The airplane's Spidertracks transmitter was in the flight compartment, in the front windscreen area.
- The airplane's Freeflight GPS Wi-Fi antenna and control unit were noted on the top of the fuselage and in the flight compartment, respectively. The Freeflight system provide the airplane with ADS-B data in/out and Wi-Fi to a display (iPad).
- Engine Instrument Panel, below the throttle quadrant: Manifold Pressure (MAN), needle indicated 30.5" Hg (green band).

The RPM instrument, the needle just below 3 (values in hundreds), and the Tachometer hours reading in center of instrument was 5387.0.

Below the RPM was the Fuel Quantity indicator, three small indications on one instrument: Top is REAR, bottom left is FRONT, bottom right is MIDDLE. Each needle pointed down, off-scale, to between the E (Empty) and F (Full). The indicator was removed for further examination. See Section 1.5.1.

The Oil Pressure gauge face was broken. Oil pressure indicated was 5 psi, the Fuel Pressure indicated was 1 psi. The Oil Temperature indicator pointed to 23 deg C.

Below the Oil Pressure Gauge was the Carb Temperature Gauge, with the indicator off scale bottom left, near 6:30 position, non-powered position (note: zero value is at 9 o'clock position).

To the right is CYL (cylinder) Temperature Gauge, indication at zero.

1.5.1 Further Examination of Fuel Quantity Indicator

The Fuel Quantity Indicator (See Figure 12) was further examined for witness marks, from the indicator needles onto the instrument face, that indicated the needle's position at impact. The needle position at impact would indicate the amount of fuel in the fuel tanks at impact.

Since the operator did not use the Rear Tank, only the Front and Middle sections of the instrument were photographed and examined.



Figure 12 - The Fuel Quantity Indicator, as recovered.

The area of the FRONT Tank was examined. No needle impact marks were noted, and the needle did not appear bent or damaged. See Figure 13.



Figure 13 - The indication area of the FRONT fuel tank, with no impact marks noted.

The area of the MIDDLE Tank was also examined. No needle impact marks were noted, and the needle did not appear bent or damaged. See Figure 14.



Figure 14 -The indication area of the MIDDLE fuel tank, with no impact marks noted.

No definitive impact witness marks were noted on the indicator.

1.6 Landing Gear

The airplane was fitted with twin fixed, straight floats. The airplane's wooden oar was found in the wreckage. For more information on the floats, please see Section 2.3, Landing Gear (Floats).

1.7 Lights

The left-wing light, positioned approximately mid-span of the wing, was noted during the examination.

Each of the wing tip lights were noted on the end of the wings. The red lens of the left-wing light appeared intact, while the lens and bulb from the right-wing light were broken and missing.

1.8 Navigation

A small black bag with a Garmin 396 unit was recovered from the airplane. The unit was not being used at the time of the accident.

A "mini" iPad was recovered from the wreckage. The NTSB took possession of the unit. According to the operator, software was installed on the iPad to display ADS-B data.

A flight deck iPad mount was recovered from the wreckage. See Figure 15. The mount was found disconnected from the airplane flight deck instrument panels.



Figure 15 - iPad Flight Deck Mount

The airplane was not equipped with a Terrain Awareness and Warning System (TAWS) system, nor was it required to be.

2.0 AIRPLANE STRUCTURE

The airplane was an all-metal, high-wing monoplane. The airplane was used as a seaplane and was fitted with two floats rather than landing gear. The floats were connected to the fuselage by struts.

The aircraft wreckage was found impacted on a mountain with steep terrain and covered with trees. The left wing and portions of the right wing were separated from the airplane during the accident sequence. The aircraft recovery team indicated that all the airplane wreckage was in one area of the mountain and that there was no evidence of a pre-impact, in-flight breakup.

The aircraft recovery team cut the airplane to facilitate its removal from the accident site. The recovery team indicated the following cuts were made:

- The left-hand side of airplane, aft of the passenger door, cut through fuselage and floor to extract a passenger in the middle row (forward of the bench seat). The side structure was then peeled aft.
- The rudder was cut off at the base of torque tube (bottom).
- The right horizontal stabilizer and the right elevator may have been cut at the torque tube into the control surface.
- The forward right-wing attachment bolt was removed (the aft connection already fractured).
- The eyebrow (forward roof on each side) was cut and peeled the skin/structure back to reduce wear on the hoisting straps.

The airplane structure was examined and documented after recovery to the hangar.

As part of the airplane examination, each of the airplane's "4 corners" were identified as follows:

- Wingtip lights from the left and right wings.
- The propellor blades from the front of the airplane.
- The rudder flight surface was identified.

2.1 Doors

The captain's door was separated from the airplane.

The co-pilot's door was connected but, due to impact damage, was jammed shut.

Both airplane passenger doors, on the left and right side of the fuselage, were separated from the airplane.

2.2 Fuselage

The fuselage remained intact but exhibited impact damage on the left side of the airplane. The left side of the fuselage, aft of the passenger cabin back to the area

of the vertical stabilizer fairing, was crushed inwards. As part of the airplane recovery, the tail section of the fuselage was folded forward towards the forward section of the airplane. See Figure 16.



Figure 16 - Left Side of Fuselage, during examination. (Photograph courtesy of the FAA)

In addition, around the left side of the front portion of the fuselage, near the pilot's door, was crushed inwards, deforming the left passenger door frame and fuel access panel.

2.3 Landing Gear (Floats)

Both landing floats were separated from the airplane fuselage. Both floats were separated into two sections at the location of the rear spreader bar. The rear spreader bar was separated from both floats, while the forward spreader bar was separated from the left float but still attached to the right float.

The forward section of the left float was crushed and breached, from the nose to approximately the area of the forward spreader bar. The forward and rear segments of the left float were twisted relative to each other, at the area of the connection of the rear spreader bar. The left water rudder was separated from the float.

The floats were arranged in their approximate configuration. See Figure 17.



Figure 17 - Approximate configuration of airplane floats.

2.4 Stabilizers

The right horizontal stabilizer was separated from the airplane, but the end plate remained attached. It was cut by recovery personnel.

The left stabilizer was separated from the airplane.

The vertical stabilizer remained connected to the airplane but was crushed aft. The forward fairing was partially detached from the fuselage. The middle rudder connection (trim) and top (pivot) were fractured. The rudder cap was separated from the rudder surface and the forward area of the cap was crushed aft. See Figure 18.



Figure 18 - Tail Section of Airplane, showing right horizontal stabilizer, vertical stabilizer, and rudder (separated, circled in red). (Photo courtesy of the FAA)

2.5 Windows

The flight deck windscreen was broken and missing.

The aft passenger windows were intact.

2.6 Wings

Both wings were separated from the airplane during the accident impact sequence. Both wings were fractured in the outboard areas into two segments.

For the left wing, the outer segment of wing was measured at 112 inches in length. The left-wing cap and red light were noted on the piece. The entire aileron was connected to the segment. At the area of the fracture, the leading edge and wing were crushed aft. See Figure 19.



Figure 19 - The Airplane's Left Wing, during examination.

The larger segment of left wing was complete to the wing root, approximately 146" in length. The area of fracture was crushed at the leading edge, with pieces of tree noted in the piece. In this segment of wing wreckage, impact marks were noted that were angled from a wings level perspective. See Figure 20.



Figure 20 - Left wing. Note the angled impact marks.

The entire right wing was recovered, but it was separated into two pieces. The outer piece was approximately 5 feet in length and included the wing cap. The fracture point was the area of the trailing edge flap and aileron junction. The area of the fracture was crushed from the leading edge aft. See Figure 21.



**Figure 21 - Right Wing and right side of fuselage, during the airplane examination.
(Photograph courtesy of the FAA)**

The larger segment of right wing was from the wing root outboard, to approximately 16 feet, 8 inches in length. There was a crushed area in the wing root.

3.0 AIRPLANE POWERPLANT

The airplane was fitted with one engine. The engine was mounted on the front of the fuselage. See Figure 22.



Figure 22 - Airplane Engine and Forward Fuselage, during examination.

According to the airplane's engine logbook, the powerplant was documented as follows:

Manufacturer:	Pratt & Whitney
Model:	R-985 AN-14B
Engine Serial Number:	217661
Type Certificate:	5E-1

According to the engine logbook, the engine was installed on the airplane on August 22, 2017, with the following information:

Hobbs Meter:	928
ESOH:	0 (zero)
ETT:	8753

3.1 Examination of the Powerplant

The engine was found attached to the airframe even though several of the engine mounts were separated. The propeller could not be rotated by hand. The oil sump was damaged and had a hole in it.

The engine's nine cylinders were examined. The engine's Number 6-cylinder head was separated from the engine. The cylinder barrel remained attached to the engine case. The piston remained in the cylinder and no anomalies were noted. The No. 7 cylinder exhaust valve cover was impact separated and the spring was visible. All other cylinders remained attached to the case and appeared undamaged.

While removing the engine from the airplane, fuel was noted in the line from the fuselage at the firewall to the engine. The oil lines were removed, and oil was

present. The throttle was noted as separated from the engine (due to impact damage), but the mixture remained attached.

The propeller governor control remained connected to the propeller governor, but the line was separated aft of the firewall.

The engine was removed and retained for further examination. See Figure 23.



Figure 23 - Airplane Engine

For further information regarding the examination of the airplane's powerplant, please refer to the [NTSB Examination Powerplant Report](#), dated September 22, 2021.

3.2.0 Examination of the Airplane Propeller

The airplane was equipped with a 3-bladed, controllable pitch propeller. All three blades remained attached to the hub. The spinner was removed, and a visual examination noted some visible impact damage. The propeller was then removed from the engine for further examination. See Figure 24.



Figure 24 - Propeller and hub, after removal from the airplane engine.

For the examination, the propeller blades were labelled A, B, and C.

3.2.1 Examination of Propeller Blade A

Blade A remained secured in the propeller hub grip. The red stripe remained aligned from the blade to the grip. The blade exhibited bending about midspan. The blade A link pin unit was separated from the hub. See Figure 25.



Figure 25 - Propeller Blade A

3.2.2 Examination of Propeller Blade B

Blade B remained secured in the propeller hub grip. The red stripe was not aligned from the blade grip to the blade, but the blade did not turn in the grip. Blade B exhibited bending about 8 inches from the tip of the blade. Chordwise scratching was noted on the back of Blade B. The Blade B link pin unit remained intact and attached to the hub. See Figure 26.



Figure 26 - Propeller Blade B

3.2.3 Examination of Propeller Blade C

Propeller Blade C remained secured in the propeller hub grip. The red stripe was aligned from the blade grip to the blade. The blade exhibited bending about midspan to the tip of the blade. In addition, the face and back of Blade C exhibited chordwise scratching. The link pin unit was separated from the hub. See Figure 27.



Figure 27 - Propeller Blade C

4.0 AIRPLANE MAINTENANCE RECORDS

4.1 Airframe Technical Log

The Aircraft Technical Log, Section 1 provided the following information for the airplane:

The three, most-recent entries in the technical log were the following:

- 1) Date: 8/22/2019
Hobbs: 1829
ACTT: 14820
Event: 100-hour Airframe Inspection
- 2) Date: 7/13/2020
Hobbs: 1891
ACTT: 14882
Event: Airframe Annual Inspection
- 3) Date: 7/22/2021
Hobbs: 1986
ACTT: 14977
Event: Airframe Annual Inspection

In addition, the following items were noted in the log:

The magneto (Part Number SB9RU3 (BG), Serial Number 851910) was overhauled on April 5, 2021.

The airplane 100-hour annual was completed on 7/22/2021. All items were initialed with no deficiencies noted.

The technical log included documentation that, on March 9, 2018, a Freeflight system transceiver for W/GPS was installed on the airplane, as well as a GPS antenna and TC978 Control Unit.

4.2 Engine Technical Log

The three, most recent entries in the engine logbook were as follows:

- 1) Date: 8/22/2019
Hobbs: 1829
ESOH: 901
ETT: 9654
Event: 100 Hour inspection
- 2) Date: 7/13/2020
Hobbs: 1891
ESOH: 963
ETT: 9716
Event: Annual Engine Inspection
- 3) Date: 7/22/2021
Hobbs: 1986
ESOH: 1058
ETT: 9811
ACTT: 14977
Event: Annual Engine Inspection
All items were initialed with no discrepancies noted.

4.3 Propeller Technical Log

The Aircraft Technical Log, Section 4, provided the following information for the airplane's propeller:

Manufacturer:	Hartzell
Model:	HC-B3R30-4B
Hub Serial Number:	EM 195
Propeller Blade Design Number:	R10152N-5.5
Propeller Blade Serial Numbers:	

- 1) L88016

- 2) L88018
- 3) L88021

The propeller was installed as follows:

Date: 7/26/2018
Hobbs: 1276
PSOH: 0
PTT: 7639

The three, most-recent entries in the technical log were the following:

- 1) Date: 8/22/2019
Hobbs: 1829
PSOH: 553
PTT: 8192
Event: Propeller 100-hour Inspection
- 2) Date: 7/13/2020
Hobbs: 1891
PSOH: 615
PTT: 8254
Event: Propeller Annual Inspection
- 3) Date: 7/22/2021
Hobbs: 1986
PSOH: 710
PTT: 8349
Event: Propeller Annual Inspection

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