



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

February 11-12, 2022

EXAMINATION SUMMARY

ERA22FA114

A. ACCIDENT

Location: Danville, Virginia
Date: February 1, 2022
Time: 1006 EST
Airplane: Cessna 310R, N622QT

B. INVESTIGATION PARTICIPANTS

Lynn Spencer - IIC
Eastern Region Aviation (ERA)
National Transportation Safety Board
Ashburn, VA

Winston Chelf
Aviation Safety Inspector
Federal Aviation Administration
Richmond, VA

Rick Roper
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Peter Makredes
President/Owner
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C. SUMMARY

On February 1, 2022, about 1006 eastern standard time, a Cessna 310R airplane, N622QT, was destroyed when it was involved in an accident near Danville, Virginia. The commercial pilot was fatally injured. The airplane was operated by Sol Aerial Surveys as a Title 14 *Code of Federal Regulations* Part 91 aerial surveying flight.

The pilot had previously flown aerial surveying in the same make and model of the accident airplane. The accident flight was his first solo aerial surveying flight for the company following several observation flights with the company's owner. The airplane departed the Danville Regional Airport (DAN), Danville, Virginia, about 1003. A witness reported that the departure looked normal and that he heard nothing other than standard radio transmissions during the airplane's taxi, takeoff, and departure from the airport area.

According to preliminary Automatic Dependent Surveillance-Broadcast (ADS-B) data, the airplane turned toward the southeast and climbed to an altitude of about 2,300 ft mean sea level (msl) before beginning a descent about two minutes into the flight. The last data point showed the airplane at 1,100 ft msl about 1,150 ft from the accident site with a groundspeed of 168 knots. A nearby landowner who got a brief glimpse of the airplane while on his tractor reported that it "came in flat" and was "not turning or spinning."

The airplane impacted a wooded area about 4 nautical miles southeast (104°) of DAN. Severed treetops indicated that the airplane entered the wooded area banked to the right about 30°. The wreckage was highly fragmented along the 382-foot debris path oriented on a true heading of 246°. There was a strong fuel odor but no evidence of fire.

The wreckage was recovered to Anglins Aircraft Recovery, where the examination took place.



Photo 1 - Wreckage before layout

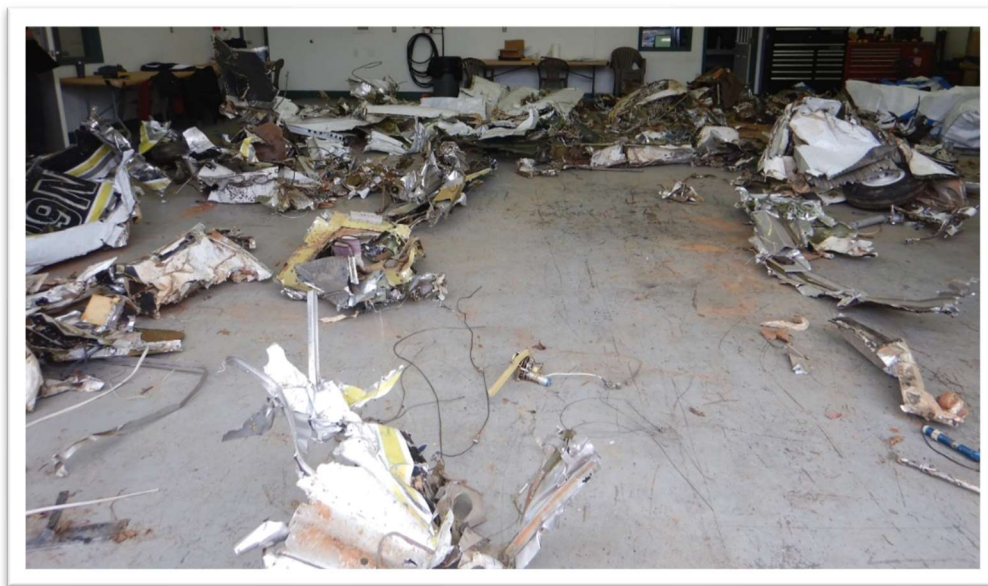


Photo 2 - Wreckage after layout (scrap pieces not shown)

1.0 Airframe

Major Repairs and Alterations

A review of the Federal Aviation Administration (FAA) Airworthiness file and FAA form 337 records indicated the following major repairs and alterations:

- 01-17-77 Avionics upgrade, installed Bendix 810 autopilot and flight director system IAW STC SA471SO
- 06-27-83 Installed II Morrow Inc. "Apollo" Loran C
- 02-22-91 Replaced lower nose skin
- 01-29-19 Installed Garmin GTX-345 ADS-B system IAW STC SA01714WI
- 04-16-19 Replaced left elevator skins, replaced right elevator skins and ribs, replaced elevator trim tab skin, replaced left and right aileron skins, replaced aileron trim tab skin, replaced left and right horizontal stabilizer upper skins
- 07-17-19 Installed camera modification wiring (socket/circuit breaker)
- 07-19-19 Installed left and right wing locker auxiliary fuel tanks IAW STC SA2513CE
- 07-19-19 Relocated elevator cable autopilot servo originally installed with S-TEC autopilot STC SA7781SW-D, deviated from FS 69 to FS177, change made IAW PlaneDen Aircraft Structures LLC Report #15271-1 Rev IR dated 07-09-19 and drawing #15271101 Rev IR dated 07-09-19, Replaced left elevator cable with cable that is 7 inches longer than original
- 07-19-19 Installed Camera Provisions Modification IAW Cessna drawing 12310-1042
- 08-05-19 ** Revised Form 337 ** Installed Camera Provisions Modification IAW Cessna drawing 12310-1042 Rev G dated 09-08-72 and Halvorson Engineering Document R192141 Rev A dated 08-04-19. Approved by FAA form 8110-3 dated 08-04-19, Robert M. Halvorson DERT-605221-NM
- 01-13-21 Removed existing S-TEC autopilot gyro, Honeywell HSI, and flux detector, installed Garmin GI-275 electronic flight instrument with GMU 11 IAW STC SA02658SE

Airframe Examination

Wreckage Description

The forward cabin was found crushed and the instrument panel was fragmented. Several loose instruments were observed and photographed. The pedestal section, with throttle quadrant attached, and the lower forward floor assembly, consisting of the forward wing spar and fuel selector handles, remained partially attached. The nose section, consisting of wire bundles and fractured structure, was observed in a pile.

The left wing had separated from the aircraft and was fragmented. The outboard left wing (about 3 ft x 5 ft) was one of the largest pieces of wreckage that remained intact. The left aileron was impact separated and fractured in half. The left inboard and outboard flaps were impact separated. The majority of the inboard left wing structure located forward of the aft wing spar was highly fragmented.

The right wing had separated from the aircraft and was fragmented. The right aileron was impact separated and fractured in half. The right inboard and outboard flaps were impact separated. The majority of the right wing structure located forward of the aft wing spar was highly fragmented. Only one large piece of right wing skin, approximately 15 inches x 24 inches, was identified in the wreckage.

The fuselage was fragmented into multiple pieces which consisted of the roof, aft floor assembly/camera mount, and tail cone pieces with registration markings.

The empennage was separated into pieces. The vertical stabilizer and rudder remained attached. The left horizontal stabilizer and elevator were separated. The left elevator was fractured near midspan. The left elevator balance weight was identified. The right horizontal stabilizer and elevator were separated. The right elevator was fractured midspan. The right elevator balance weight was identified. The elevator trim tab remained attached to the inboard portion of the separated right elevator. The elevator trim tab push/pull rod remained attached to the actuator and to the trim tab; the hardware appeared new in accordance with the Airworthiness Directive. The elevator trim rod was impact fractured near the forward portion of the elevator. The pitch trim actuator indicated the elevator trim tab trailing edge was approximately 10 degrees tab up.

Flight Control System

Flight control cable continuity was partially established due to numerous impact-related cable separations and recovery cable cuts. The aileron cables and chains were observed inside the control column fragments. Portions of the aileron sector located in the center floor assembly were found impact separated. The left and right aileron cables remained attached at the wing bellcranks.

The elevator push/pull rod at the base of the control column was fractured. The forward elevator bellcrank was observed with impact fractured segments of cables attached. The aft elevator bellcrank was also observed with cable fragments attached. The left elevator cable had been

rerouted around the camera installation in accordance with the supplement type certificate installation instructions. Several portions of the impact damaged cables and pieces of floor assembly with pulleys were observed. All pulleys displayed impact related signatures which indicated cables were present at the time of impact. The rudder torque tubes were found with cable fragments attached. The aft rudder horn also had cable fragments attached. Two approximately 8 ft long sections of the aft rudder cables with springs attached, which would have been located in the aft tailcone, were observed; they appeared to have been cut by recovery personnel. The rudder trim actuator indicated the rudder trim tab was approximately 14 degrees right.

The flap actuator was impact separated from the aircraft. The flap drive sprockets remained attached to the gear box and electric motor. The chains were impact separated and fractured. Two sections of flaps cables with portions of chain links attached were identified in the wreckage. Flap position was undetermined.

The flaps were placed on the floor in their relative positions and examined. Portions of cables remained attached to the inboard flap bellcranks. The push/pull tubes and additional bellcranks that operated the flaps were fractured at multiple locations. One push/pull rod that connected the inboard right flap to the outboard right flap was not identified in the wreckage.

Airframe Fuel System

Debris was observed in the left and right fuel strainer screens. Left and right fuel strainer bowls were clean. The left fuel selector handle was found in the off position. The right fuel selector handle was found in the left main position. The left and right fuel selector valves were impact separated and had tumbled through the trees. The left fuel selector valve displayed a witness mark indicating it had been forced from the off position toward the auxiliary tank position. The right fuel selector valve lever was bent up at both ends and the position could not be determined. The left and right fuel strainers were examined. Minor debris was observed on the screens. The fuel strainer bowls were clean.

Landing Gear

Examination of the impact separated landing gear actuator indicated the landing gear were in the retracted position at impact.

Seats and Seatbelts

The front seats were detached from their rails, and the seat bases were detached from their backs. The left and right shoulder harnesses were found attached to the roof section. Both shoulder harnesses had nylon attachment bushings installed. The shoulder harness webbing and attachment latches appeared undamaged.

Instrument Panel/Cockpit Controls/Switches

The instrument panel sustained significant impact damage. Instrument readings were obtained from the left side airspeed indicator (~196), Hobbs meter (558.7) and tachometer rpm (left engine: 2,100; right engine: 2,650). Switch positions were either undetermined or unreliable.

The control quadrant was impact crushed left to right. Left engine control levers indicated: Throttle, near idle; propeller, near feather; mixture, full rich. Right engine control levers indicated: Throttle, full forward; propeller, low pitch, mixture, full rich.

Airframe Examination Photos



Photo 1 - Left engine fuel selector



Photo 2 - Left fuel selector valve



Photo 3 - Right engine fuel selector

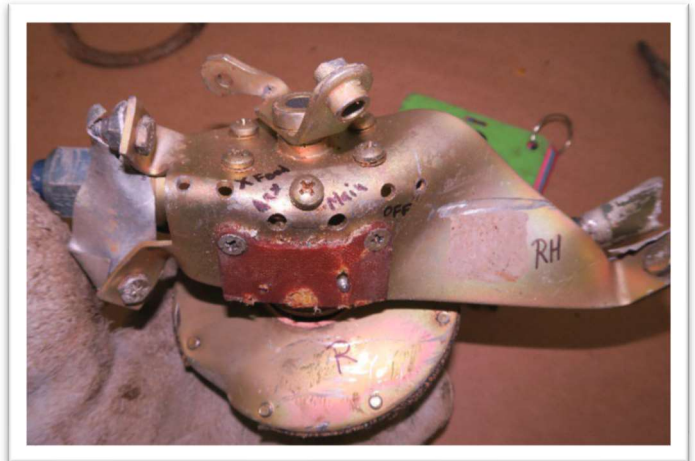


Photo 4 - Right fuel selector valve

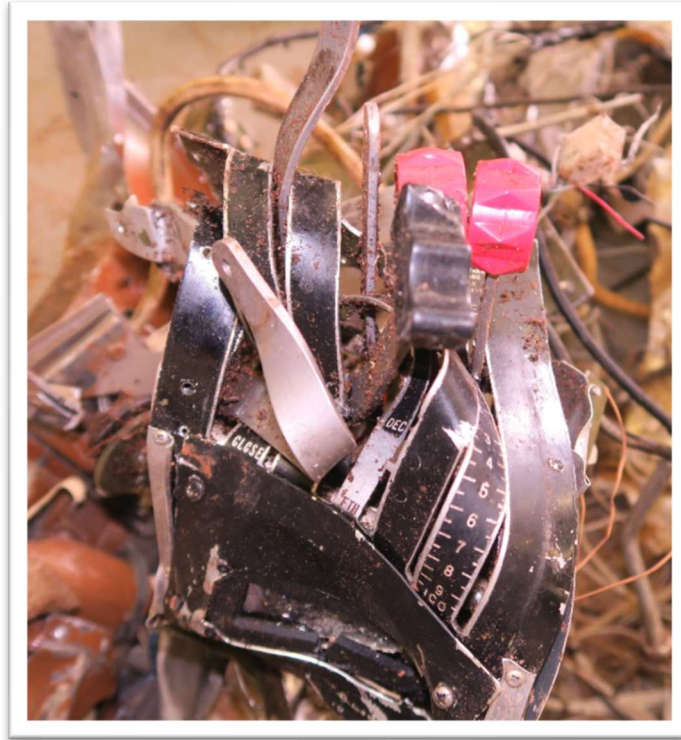


Photo 5 - Throttle control quadrant

2.0 Engines

The left and right engines were overhauled by RAM Aircraft, LP on December 15, 2021. The left and right propellers were resealed by H & S Propeller Shop, Inc. on January 13, 2022, and overhauled one year prior by Johnson Propeller Services. The engines and propellers were installed on the aircraft during the annual inspection completed on January 19, 2022. The overhauled engines and propellers accumulated 18.6 hours of operation prior to the accident.

Left engine: Continental IO-520-M (X) MB

Right engine: Continental IO-520-MB (X)

Propellers: McCauley 3AF32C504-C

Left engine TTSN: 1,244.3 hours Left engine TSMO: 18.6 hours

Right engine TTSN: 1,880.0 hours Left engine TSMO: 18.6 hours

Left Engine:

- Cylinder Nos. 3,5 and 6 were impact damaged and pushrod/tubes were impact damaged on both the intake and exhaust for cylinder No.5 and for the exhaust on cylinder No. 6
- The right air intake assembly was fractured off.
- The left air intake was fractured off cylinder No. 2
- Left magneto was fractured off; right magneto screw had fractured and was hanging out and partially under the rubber boot covering the magneto capacitor.

- Pushrods and tubes removed from both intake and exhaust for cylinder No. 5 and for the exhaust rod on cylinder No. 6.
- Removed rocker covers and oil pan
- Removed spark plugs; the top spark plug for cylinder No. 5 was fractured off/missing
- Borescoped all cylinders; no anomalies noted except for some dirt/debris in those cylinders that had impact damage
- Visual continuity of crankshaft & camshaft with no obvious separations or fractures
- Lifters moved normally where rods were intact; camshaft lobes visually inspected and showed no anomalies.
- Spark plugs, top – normal; Nos. 3 and 5 fractured and missing electrodes; No. 2 with carbon deposits
- Spark plugs, bottom – Nos. 1, 2, 4 and 6 normal; no electrode gap on No. 3; No. 5 fractured/missing electrode.
- Engine driven fuel pump removed; drive coupling intact, and fuel pump rotated; screen clean; no fuel noted.
- Fuel screens of left and right throttle assemblies free from debris.
- Fuel manifold assembly was intact with no anomalies noted. Diaphragm appeared in good condition; fuel manifold screen clear of debris
- Oil pump removed and disassembled; no anomalies noted.
- Right magneto: Spark produced on all leads when magneto rotated by hand
- Left magneto: Magneto impact separated from engine; all but one ignition lead impact separated from magneto; harness caps removed; partially disassembled; paperclip inserted into magneto cap posts; spark observed from paperclip to the cap housing on each post.
- The fuel injector was fractured off cylinder No.4; injectors for cylinder Nos. 2,3,5, and 6 showed clear orifices; injector for cylinder No. 5 was clogged
- Lobes of camshaft observed when engine was rotated on stand; no anomalies noted.
- Oil filter cut open, no debris or metal noted

Left Engine Photos



Photo 8- Left engine propeller crankshaft mounting flange

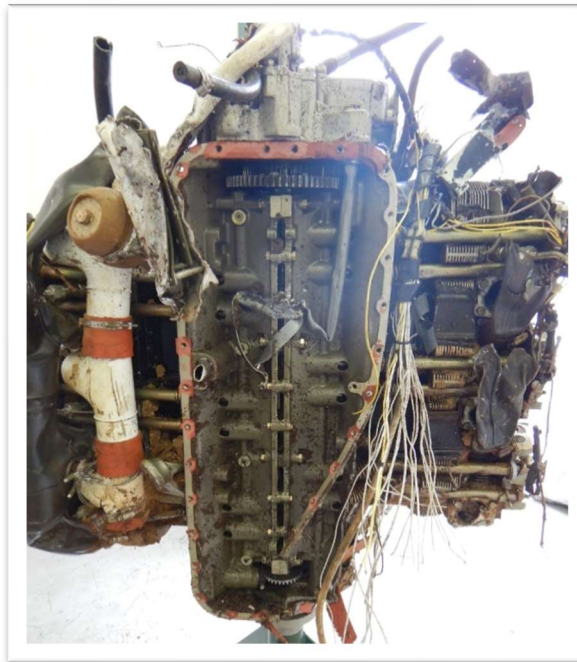


Photo 9 - Left engine on stand



Photo 10 - Damage of forward crankcase

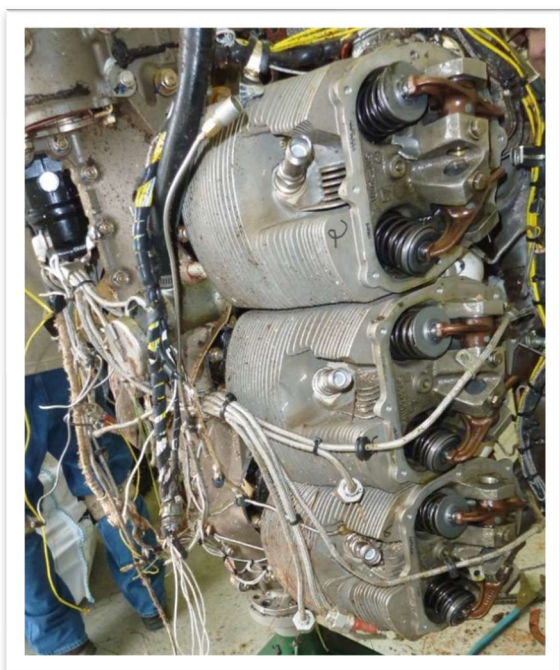


Photo 11 - Cylinder Nos. 2,4,6; rocker covers removed



Photo 12 - Cylinder Nos.1,3,5; rocker covers removed



Photo 13 - Left engine magnetos before testing



Photo 14 - Left engine sparkplugs

Right Engine:

- Cylinder No. 5 was impact damaged with no rocker cover present
- Pushrod/tubes were impact damaged on all cylinders except No. 5, and No. 6 exhaust tube and rod missing
- Crankcase fractured in multiple places/oil pickup tube impact crushed
- Small, front camshaft drive gear fractured
- All cylinder air induction tubes impact separated
- Cylinder Nos. 1, 2 and 3 exhaust tubes impact separated/fractured
- Starter/starter adapter drive impact separated
- Rocker covers removed; rocker arm on cylinder No. 5 fractured
- Engine-driven fuel pump fractured off; drive coupling fractured; fracture surface rough and angular
- Fuel pump would not rotate; disassembled with no anomalies noted other than some material consistent with rust; vanes intact.
- Fuel manifold assembly removed; spring and diaphragm appeared normal; smell consistent with fuel.
- All cylinders borescoped; all pistons and valves appeared normal.
- Upon removal of the aft bent part of front camshaft gear and cylinders Nos. 5 and 6 bent intake tubes and rods, continuity of the crankshaft and camshaft were observed
- Lobes of camshaft observed when engine was rotated on stand; no anomalies noted.
- Thumb suction and compression obtained on all cylinders except No. 5 which was impact damaged.
- Spark plugs look normal with the following exceptions: No. 5 bottom spark plug has no gap, and the top of the plug is missing; Top of No. 2 bottom spark plug is missing, and the gap is small; No. 3 bottom spark plug has broken porcelain and the gap is small.
- Right magneto: Magneto impact separated from engine; all but one ignition lead impact separated from magneto; harness caps removed; partially disassembled; paperclip inserted into magneto cap posts; spark observed from paperclip to the cap housing on each post.
- Left magneto: Magneto impact separated from engine; all but one ignition lead impact separated from magneto; harness caps removed; partially disassembled; paperclip

inserted into magneto cap posts; spark observed from paperclip to the cap housing on each post.

- Oil filter cut open, no debris or metal noted

Right Engine Photos:

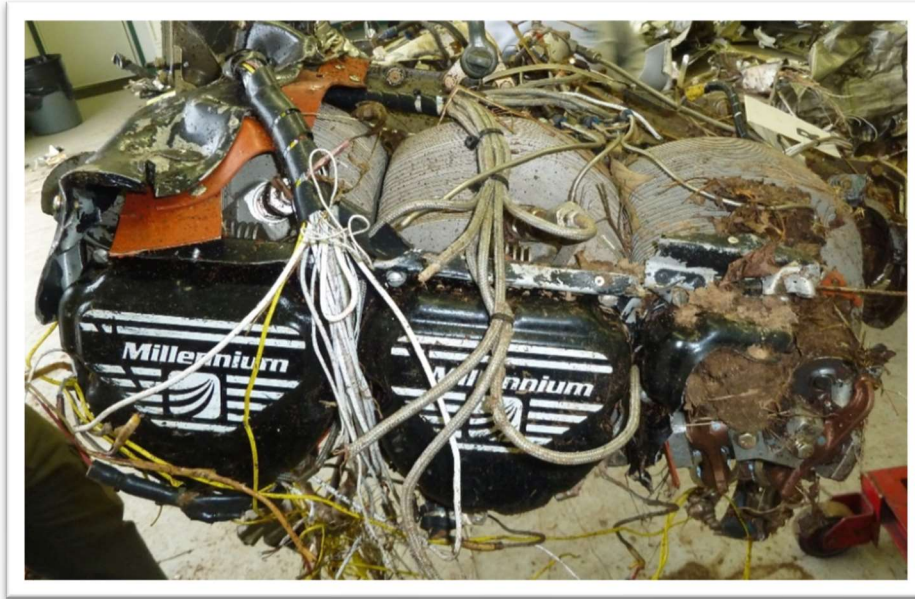


Photo 15 - Right engine (Cylinder Nos. 1, 3, 5) prior to examination



Photo 16 - Right engine (Cylinder Nos. 2, 4, 6) prior to examination



Photo 17 - Cylinder Nos. 1,3,5; rocker covers removed



Photo 18 - Cylinder Nos. 2,4,6; rocker covers removed



Photo 19 - Front camshaft drive gear impact damage



Photo 20 - Spark Plugs



Photo 21 - Disassembled oil filter

3.0 Propellers

Left Propellers:

- Blade 1 – Forward bend; leading edge polishing and chordwise abrasion
- Blade 2 – Leading edge gouging; span and chordwise abrasion; outer 9 inches of blade curled
- Blade 3 – Leading edge gouging and polishing; chordwise abrasion; blade twisted

Right Propellers:

- Blade 1 – bent aft about 70° aft near root; leading edge gouging/chordwise abrasion
- Blade 2 – Tip curled; spanwise and chordwise abrasion; leading edge polishing and gouging.
- Blade 3 – Chordwise abrasion; leading edge polishing; blade twisting



Photo 22 - Left engine propeller blades



Photo 23 - Right engine propeller blades



Photo 24 - Propeller blades