



Douglass Brazy
Air Safety Investigator
Eastern Region Aviation

March 13, 2020

Subject: NTSB investigation ERA20FA124, Cessna 177RG, N1572H, Sterling, Massachusetts, March 11, 2020, Wreckage Examination

1.0 Accident Site

The airplane impacted a wooded bog area and came to rest largely intact in a 60° nose down attitude. The horizontal stabilizer was resting against trees, the engine and lower forward section of the cockpit were immersed in water. Trees and branches were damaged, all within about a wingspan distance from the wreckage. There were no groundscars or tree damage found leading to the main wreckage. There was no indication of fuel spillage on the ground/water.

- GPS location of main impact: 42.430278 -71.797500
- Direction and bearing from nearest airport: from 3B3: 322° 0.5 mi
- magnetic bearing of airplane, tail-nose direction: about 170°

2.0 Airframe Examination

1975 Cessna 177RG S/N 177RG0746

3911.65 Hobbs time. Electronic Tachometer: unable to read tach time.

Per Maintenance Records: Most recent 100 hr inspection 10/15/19 total (tach) time 6840

2.1 Fuselage

Fuselage bent upward and buckled aft of the baggage door.

2.2 Empennage

Vertical and horizontal stabilizers had leading edge damage and buckling.

2.3 Wings

Both wing tips were fractured and separated.

Left wing – flat leading edge crush damage from root to aileron. Round (tree like) aft crushing near the damaged pitot tube and stall warning switch/vane. The stall switch was tested and functioned normally.

Right wing – leading edge crush damage from root to wing strut.

Both fuel caps were in place and undamaged. Both fuel tanks were relatively intact and appeared unbreeched. The access panels holding the fuel caps were removed and inspection holes cut at the low sides of the tanks on the top skin. About 2-3 oz fuel found in each tank against the leading edge. Screens and drains were clear/unobstructed. No staining noted near either drain on underside of wing. Due to the orientation of the airplane (about 50° nose down) the fuel tank pickups, located in the lower rear section of the wings near their roots, were elevated above the fuel found near the leading edge of the tanks.



Figure 1 – Inside of Left Wing Fuel Tank - Lowest Corner



Figure 2 Inside of Right Wing Fuel Tank - Lowest Corner

2.4 Landing Gear

The landing gear handle was up, the main landing gear was found partially extended and undamaged. The FAA inspector reported that both main gear were fully up/retracted upon his arrival on accident day. Nose gear area/cowling was crush damaged.

2.5 Cockpit

Control yokes about mid travel in pitch, rotated slightly right, remained connect to each other, elevator and ailerons (could move slightly in all directions, with binding).

Altimeter Kollsman setting: 30.05

Electric fuel pump switch: ON

Navigation lights and rotating beacon switches: ON

All other rocker switches: OFF

Circuit breakers: all appeared IN

Landing gear handle: UP

Flaps handle: UP

Fuel selector valve: BOTH

Throttle, propeller, and mixture knobs: all full forward or nearly so.

Pitch trim wheel: fractured into many pieces, position could not be determined

2.6 Flight Controls

Flight control continuity was confirmed from the pilot controls to surfaces for aileron, elevator and rudder, with movement slightly on each, with binding.

The Flaps up were found up, and the flap actuator jackscrew position was consistent with flaps up.

2.7 Survivability

Document seats and restraints, 2-point, 3-point, 4-point, 5-point, inertia reels, cuts or frayed.

All four seats were equipped with 3-point restraints. The pilot's shoulder harness was cut by first responders. It was found detached from its ceiling mount and unspooled (fully or nearly so) from the reel/retractor mechanism. Examination of the pilot's side harness reel/retractor in the NTSB laboratory revealed that the belt retraction spring was not installed correctly and would not recoil the belt. After manually winding the belt onto the reel, the locking mechanism functioned as intended when the belt was pulled sharply.

The pilot's seat was equipped with the airframe manufacturer's recommended Secondary Seat Stop Kit, Part Number SK210-174B. The assembly was intact and operated normally.

2.8 Weight & Balance

Fuel load near 0 lbs

Estimated 20 lbs of aircraft covers, sunshades, oil, towbar, survival kit, and extra headset found in in rear seat / baggage area.

2.9 Fuel/Fuel System

About 2-3 oz found in each wing tank.

About 2 oz found in fuel strainer.

The fuel line between the fuel flow instrument and the engine flow divider contained fuel

No fuel was found in the inlet or outlet lines on the fuel strainer.

The fuel strainer screen was unobstructed.

The electric fuel pump operated when electrical power was applied, no fuel was expelled from the pump.

Wing Tanks placarded: 30.5 gallons

2.10 Other Systems

The electronic tachometer powered up when electrical power was supplied, however the display was full of water, and none of the numerical numbers were legible.

Fuel level transmitters:

Both fuel level transmitters were tested in place inside the wings, using a multimeter to test the resistance between the wiring connections.

Left Transmitter (P/N C668002-0102): measured 87 ohms in the empty position, and 31 ohms in the full position.

Right Transmitter (P/N C668002-0102): measured 238 ohms in the empty position, and 20 ohms in the full position.

The specification drawing for the fuel transmitter indicated that the empty value should be between 240 and 260 ohms, and the full value should be between 31.5 and 35.5 ohms.

A review of the maintenance records revealed that the left fuel transmitter was removed and replaced with an overhauled unit, during a 100-hour inspection on 10/15/19.

Both fuel transmitters were removed from the wings. The left transmitter had a sticker on it which read "Air Parts of Lock Haven" and a date of 7/25/19. The right transmitter had no markings and appeared to be the originally installed unit.

When the center post screw of the left transmitter was rotated, the resistor mount rotated as well. When the left transmitter center post screw was removed, the resistor mount fell into the transmitter body. The right transmitter resistor mount did not rotate with the center post screw, and the resistor mount remained in place when its center post screw was removed.

The left transmitter was reassembled and re-tested. After reassembly, the resistance was measured at 262 ohms in the empty position, and 54 ohms in the full position.

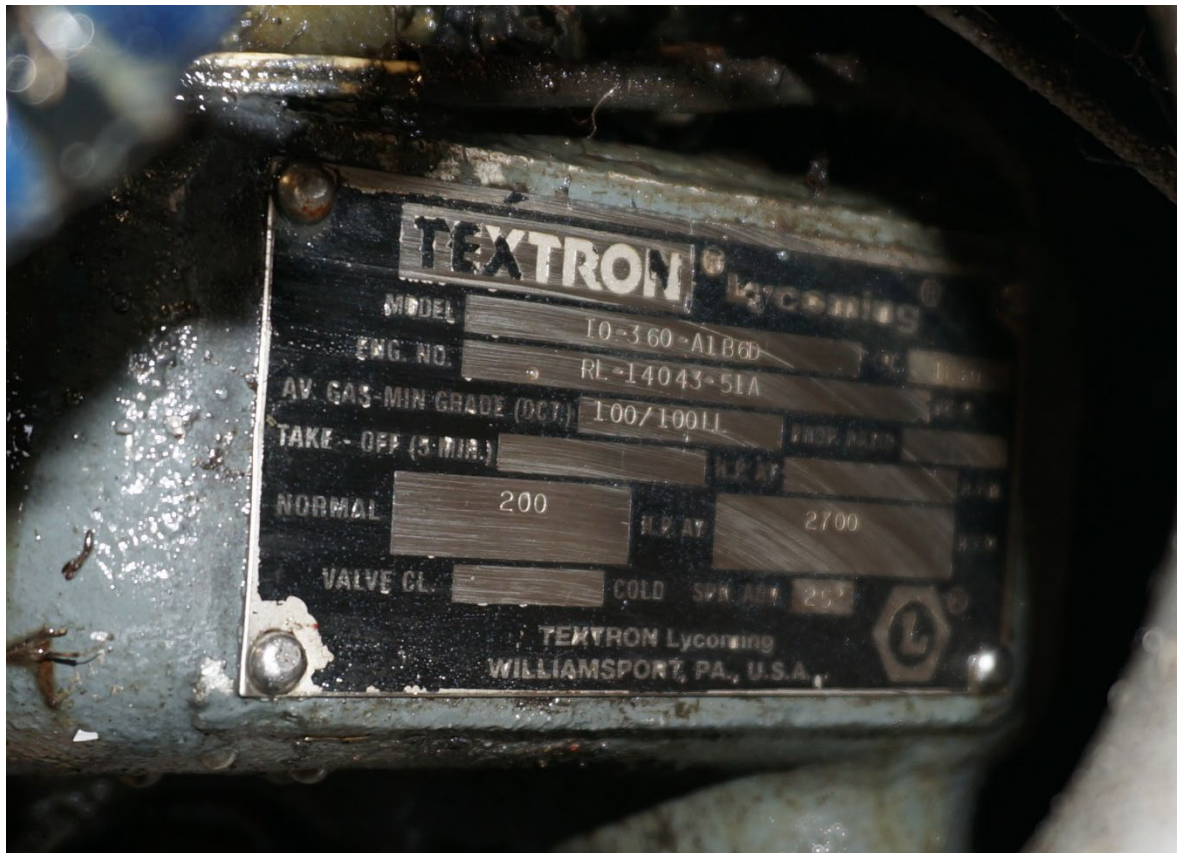
Based on the on-wing testing of the fuel transmitters, with both the fuel tanks at or near empty, the left fuel gauge should have indicated more fuel than actually present in the fuel tank. The right fuel gauge should have indicated at or near empty. With full or nearly full tanks, the left fuel gauge should have properly indicated a full tank, the right fuel gauge should have indicated at/near a full tank.



Figure 3 Left and Right Fuel Level Transmitters

3.0 Engine Examination

Dataplate:



Most recent 100-hr inspection:

10/15/19

Tach 6840

Engine 560 SMOH

Engine largely undamaged

3.1 Exhaust System

Headers/Pipes

Mufflers:

Attached and intact

Heat Exchangers

3.2 Induction system

Air Cleaner:

Crush damaged

3.3 Magnetos

The single drive dual magneto produced spark on all leads when crankshaft rotated by hand at propeller.

3.4 Ignition system

Harness:

Intact and in place

Spark Plugs-condition/appearance:

The top spark plugs were removed. The electrodes were dry, grey/black in color, and appeared “worn normal” when compared to a Champion Check-a-Plug Chart.

3.5 Fuel System

(Fuel Injected)

Engine Driven Fuel Pump:

No was found in the inlet or outlet lines to engine driven fuel pump.

Throttle Body/Metering Unit

Not removed

3.6 Lubrication System

Oil Sump:

Oil level on the dipstick was above the 8 qt mark

3.7 Cylinders

Compression:

Thumb compression and suction observed on all cylinders when rotating crankshaft by hand via propeller.

3.8 Crankcase

Intact relatively undamaged

3.9 Starter

In place, undamaged

3.10 Alternator/Generator

Displaced aft, minor impact damage on pulley, belt separated

4.0 Propeller Examination

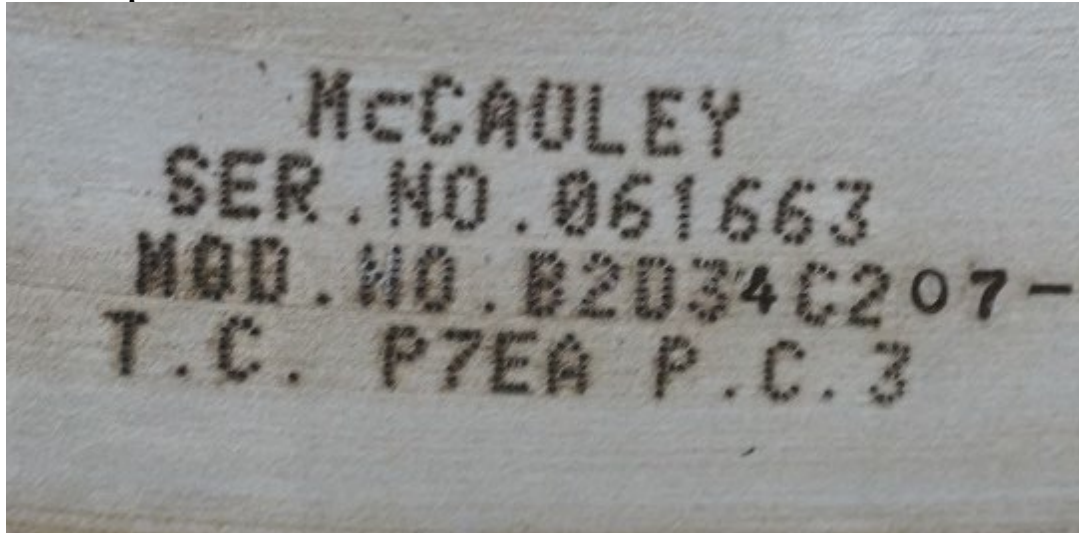


Figure 4 – Propeller Hub Markings

(2 blades Controllable pitch)

4.1 Hub

Undamaged

4.2 Blade 1

No damage

4.3 Blade 2

Slight aft bend about 1/3 span from hub. No other damage

4.4 Spinner:

No Damage