

02/04/2021

CEN21LA107 - N325GC**Onsite and Follow-up Examination Report**

Onsite examination: Casey Love (Textron Aviation – Air Safety Investigator), Dan Dunn (FAA LIT FSDO – Operations Inspector), and Paul Centinaro (FAA LIT FSDO – Airworthiness Inspector) at the accident site in Weiner, AR, on 01/05/2021.

Follow-up examination: Casey Love (Textron Aviation – Air Safety Investigator), Les Doud (Hartzell Propeller – Air Safety Investigator), Dan Dunn (FAA LIT FSDO – Operations Inspector), and Paul Centinaro (FAA LIT FSDO – Airworthiness Inspector) at Dawson Aircraft in Clinton, AR, on 02/03/2021 and 02/04/2021.

- The airplane impacted terrain in an approximate 45°, nose-low, right wing-low attitude south of transmission lines on an approximate 235° heading.
- The airplane came to rest in a muddy field, on private property.
- Wire strike signatures were observed on the lower side of the left horizontal stabilizer. The left elevator balance weight was found approximately 200' from the wreckage with similar wire striations.
- Most of the airframe was consumed by fire.
- The nose section forward of the baggage compartment, which contained the combustion heater, remained intact but sustained compression damage. The empennage remained intact. The right horizontal stabilizer was fire damaged.

Flight Control System Information		
Control lock: Undetermined		
Flight Control Cable Continuity		
Ailerons: See below	Elevators: See below	Rudder: See below
Aileron tab: Not established	Elevator tab: Not established	Rudder tab: Not established
Flap and Trim Positions		
Flaps:	Indicator: Undt	Handle: Undt
	Left actuator: See Below	Right actuator: See Below
Elevator trim:	Indicator: Undetermined	
	Left actuator: 1.3 ~ 15° tab trailing edge down	Right actuator: See Below
Rudder trim:	Indicator: Undetermined	Actuator: 3.65 ~ 7° tab trailing edge right
Aileron trim:	Indicator: Undetermined	Actuator: 1.45 ~ tab neutral

- Flight control cable continuity was confirmed from each flight control to the center section of the fuselage. Continuity to the cockpit could not be established due to the extent of thermal

damage. The rudder pedal interconnect torque tube was observed loose in the wreckage. The pilot's rudder pedals were separated from the torque tube and thermally damaged. The pilot side rudder linkages were impact separated and thermally damaged.

- The cockpit elevator torque tube and bellcrank was partially consumed by fire. One elevator control cable was observed connected to the remaining portion of the bellcrank. Aileron and aileron trim cables were connected to their respective wing bellcranks. The elevator and rudder cables were continuous through the aft fuselage section and were connected to the bellcranks at the control surface. The flap actuator bodies were consumed by fire, only the screw portion remained. The flap position was undetermined due to the thermal and impact damage.

Airframe Fuel System Condition, Controls, and Read Outs					
Fuel strainer screen:		Left: See below		Right: Clean	
Fuel strainer bowl:		Left: See below		Right: See below	
Main fuel tank gauge:		Left: Destroyed by fire		Right: Destroyed by fire	
Auxiliary fuel gauge:		Left: Destroyed by fire		Right: Destroyed by fire	
Locker fuel gauge:		Left: NA		Right: NA	
Locker transfer:		Left: Not applicable		Right: Not applicable	
Fuel selector handle:	Left: Left	Fuel selector valve:	Left: Left	Fuel boost pump:	Left: Undetermined
	Right: Right		Right: Right		Right: Undetermined
Crossfeed shutoff: Not applicable					

- The left fuel strainer was not observed. The right fuel strainer was heavily fire damaged and the strainer screen was found lying outside the strainer bowl free of debris.
- During the on-scene examination the left fuel selector cable was cut by the investigation team to preserve its position during recovery. The right selector valve remained attached to the control cable, but the cable was liberated from the wreckage. The left fuel selector valve was heavily fire damaged having the fuel outlet port consumed by fire.
- During the wreckage exam the fuel selectors were disassembled and inspected. Each valve contained light debris but did not appear obstructed. Each selector valve was observed selected to its respective engine.

Landing Gear System Condition and Controls			
Gear position:	Nose: Retracted	Left: Retracted	Right: Retracted
Actuator position:	Nose: Retracted	Left: Retracted	Right: Retracted
Landing gear selector: Undetermined		Aux gear control: Undt	
Environmental System Controls and Read Outs			
Cabin heater: On	Cabin vent: Undt		Defrost: Undt
Air conditioner: Undt	Oxygen system: Undetermined		Oxygen quantity: Undt
Icing System Information and Switches			
Certified into known icing? Yes		De-ice boots installed? See below	
Pitot heat: Undetermined		Stall heat: Undetermined	
De-ice:	Surface: Undetermined	Propeller: Undetermined	Windshield: Undetermined
Anti-ice:	Surface: Undetermined	Propeller: Undetermined	Windshield: Undetermined
ELT Information			
Installed? Undt	Manufacturer: Undetermined		Type: Undetermined
Serial number: Undt	Battery due date: Undetermined	Armed: Undetermined	Activated: Undetermined

- The deice boots were observed on the empennage and propellers.
- The combustion heater was removed from the airplane and examined. The combustion blower fan and housing did not exhibit signs of rotation at impact. The cabin heater blower fan did not exhibit signs of rotation at impact. The iris valve was observed fully open. The cabin heat handle was in the full open position. The heater control wiring did not exhibit evidence of melting or burning. Masking tape indicating wire position was observed on the wires and were not consumed by fire. The fuel supply line from the left-wing tank to the combustion heater fuel pump was thermally damaged and separated from the fuel pump flare fitting.

Restraint System Information						
Seat	Occupied	Restraint type	Restraint used	Condition	Manufacturer	2nd seat stop
1	Yes	Undetermined	Undt	Destroyed by fire	Undetermined	Not applicable
2	Yes	Undetermined	Undt	Destroyed by fire	Undetermined	Not applicable
3	No	Undetermined	N/A	Destroyed by fire	Undetermined	Not applicable
4	No	Undetermined	N/A	Destroyed by fire	Undetermined	Not applicable
5	No	Undetermined	N/A	Destroyed by fire	Undetermined	Not applicable
6	No	Undetermined	N/A	Destroyed by fire	Undetermined	Not applicable

Seat Condition Information					
Seat	Orientation	Feet intact	Back intact	Base intact	Rail intact
1	Forward facing	Undetermined	No	No	Partially
2	Forward facing	Undetermined	No	No	Partially
3	Undetermined	Undetermined	No	No	Undetermined
4	Undetermined	Undetermined	No	No	Undetermined
5	Undetermined	Undetermined	No	No	Undetermined
6	Undetermined	Undetermined	No	No	Undetermined

Navigation Instruments							
Analog primary instruments				Autopilot type: Undetermined			
Suction gage: Undetermined		Magnetic compass: Undetermined		Clock: Undetermined			
	Left side	Right side		Left side	Right side		
Airspeed:	Undt	Undt	Turn coordinator (airplane):	Undt	Undt		
Attitude (pitch):	Undt	Undt	Turn coordinator (ball):	Undt	Undt		
Attitude (roll):	Undt	Undt	Heading indicator:	Undt	Undt		
Altimeter:	Undt	Undt	Heading "bug":	Undt	Undt		
Altimeter setting:	Undt	Undt	Vertical speed indicator:	Undt	Undt		
Stand-by:	Airspeed: Undt		Attitude (pitch): Undt		Attitude (roll): Undt		
	Altimeter: Undt		Altimeter setting: Undt				
Communication and Navigation Radios							
Radio	Control	Active frequency	Stand-by frequency	Radio	Control	Active frequency	Stand-by frequency
Com 1:	Undt	Undetermined	Undetermined	Com 2:	Undt	Undetermined	Undetermined
Nav 1:	Undt	Undetermined	Undetermined	Nav 2:	Undt	Undetermined	Undetermined
Obs 1:	Undetermined			Obs 2:	Undetermined		
Transponder:	Mode: Undetermined		Active code: Undetermined		Stand-by code: Undetermined		
Electrical Switch Positions							
Master battery: Undetermined				Stand-by battery: Undetermined			
Left alternator: Undetermined				Right alternator: Undetermined			
Avionics 1: Undetermined				Avionics 2: Undetermined			
Lighting Switch Positions							
Navigation: Undetermined		Rotating beacon: Undetermined		Landing: Undetermined			
Taxi: Undetermined		Strobe: Undetermined		Instrument: Undetermined			
Wing Ice: Undetermined							
Ignition Switch Positions							
Left engine:	Left magneto: Undetermined			Right magneto: Undetermined			
Right engine:	Left magneto: Undetermined			Right magneto: Undetermined			

- The instrument panel and avionics were consumed by fire. The Garmin G1000 SD cards were not observed in the wreckage.

Engine Instruments					
Hour meter: Undetermined					
	Left engine	Right engine		Left engine	Right engine
Tach RPM:	Undt	Undt	CHT:	Undt	Undt
Manifold press:	Undt	Undt	Fuel press:	Undt	Undt
Oil press:	Undt	Undt	Fuel flow:	Undt	Undt
Oil temp:	Undt	Undt	Ammeter:	Undt	Undt
EGT:	Undt	Undt	Voltmeter:	Undt	Undt
Left Engine Control Positions					
	Cockpit	Engine		Cockpit	Engine
Throttle:	Undetermined	Undetermined	Cowl flaps:	Undetermined	Undetermined
Mixture:	Undetermined	Undetermined	Carb heat:	Undetermined	Undetermined
Propeller:	Undetermined	Undetermined	Primer:	Undetermined	
Right Engine Control Positions					
	Cockpit	Engine		Cockpit	Engine
Throttle:	Undetermined	Undetermined	Cowl flaps:	Undetermined	Undetermined
Mixture:	Undetermined	Undetermined	Carb heat:	Undetermined	Undetermined
Propeller:	Undetermined	Undetermined	Primer:	Undetermined	
Engine Condition					
	Left engine		Right engine		
Engine attached to airframe:	Partially		Partially		
Propeller attached to engine:	No		Yes		
Engine compression:	Undetermined		Undetermined		
Vacuum pump drive shaft:	Undetermined		Undetermined		
Valve train continuity:	Undetermined		Undetermined		
Engine Fuel System Condition					
	Left engine		Right engine		
Fuel pump drive shaft:	Undetermined		Undetermined		
Fuel injectors:	Undetermined		Undetermined		
Fuel control inlet screen:	Debris found		Undetermined		
Distribution valve screen:	Clean		Clean		

Engine Magneto Condition						
	Left engine			Right engine		
Left magneto attached:	Yes			Yes		
Left magneto spark:	Undetermined			Undetermined		
Right magneto attached:	No			Yes		
Right magneto spark:	Undetermined			Undetermined		
Left Engine Spark Plug Condition (per Champion Check-A-Plug Card)						
	1	2	3	4	5	6
Top	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
Bottom	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
Right Engine Spark Plug Condition (per Champion Check-A-Plug Card)						
	1	2	3	4	5	6
Top	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
Bottom	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined

- The engines were not examined at the accident site. The engines were partially examined during the follow-up wreckage exam. The left engine fuel control inlet screen and fuel distribution valve screens were examined. The fuel distribution valve was clean and free of debris. The right fuel distribution valve diaphragm was thermally damaged but otherwise free of debris.
- The left propeller was fracture separated from the engine at the crankshaft propeller flange.
- Blade A was fracture separated at the root of the blade approximately 6" outboard of the hub. The separated portion of the blade was not observed.
- Blade B and C were straight and unremarkable. The leading edges were unremarkable.
- Hartzell stated the left propeller was against the start lock, approximately 18 degrees of pitch, at impact.
- The right propeller remained attached to the engine.
- Blade A was curved opposite the direction of rotation. Its leading edge was unremarkable.
- Blade B was bent aft midspan. There was an area of leading edge deformation approximately 4" in length near the tip that had signatures similar to wire striations.
- Blade C exhibited S bending midspan to the tip. The leading edge of the blade was unremarkable.
- Both propeller spinners exhibited similar compression damage. The compression signatures did not spiral about the propeller hub.

10/27/2021

CEN21LA107 - N325GC Engine Examination Report

Present: Mike Hodges (NTSB – Investigator-In-Charge), Casey Love (Textron Aviation – Air Safety Investigator), Dan Dunn (FAA LIT FSDO – Operations Inspector), and Paul Centinaro (FAA LIT FSDO – Airworthiness Inspector) at Dawson Aircraft in Clinton, AR, on 10/26/2021 and 10/27/2021.

Left Engine (Continental Motors IO-550-C, Serial Number 1034905)

- The engine was documented as recovered from the accident site. The engine was power washed before the examination to remove large amounts of mud that encapsulated the engine. Side and front dressings were removed.
- For the magnetos, the left magneto was found attached and the right magneto was found detached from the engine.
- The top leads for both sides of the magnetos produced spark when the magnetos were rotated using a drill.
- All spark plugs were removed and examined. All spark plugs showed signs consistent with the normal operating indications per the Champion Aerospace Aviation-Check-A-Plug chart.
- The propeller governor was removed, and the screen was clear, continuity was established (the driveshaft was rotated), and no abnormalities were noted.
- Thumb compression as established on all six cylinders. Equal intake and exhaust valve rocker arm movement was established in correct firing order.
- All six cylinders were photographed using an electronic borescope. All intake and exhaust valve faces showed signatures consistent with normal operation per the AOPA Air Safety Institute Anatomy of a Value failure chart.
- The fuel pump, fuel servo, and engine oil pump were removed, disassembled, and examined. No abnormalities were noted.
- The vacuum pump was removed and examined. The pump's internal components were destroyed from the post impact fire.
- The 6 fuel injector lines were examined and found to be clear of obstructions. The 6 fuel injector nozzles were removed and examined, and no issues were noted.
- The oil filter can was removed and cut open. The filter material was laid out and examined. No signs of debris were noted in the filter material.
- The exhaust tubing on both sides was heavily impact damaged. Exhaust tubing was cut at various areas to facilitate removal of the bottom spark plugs.
- No signs of fuel samples were found in the engine.

- All fuel lines were found to be thermally damaged.
- The induction system sustained impact damage but was clear of any pre-impact debris. The intakes were consumed by the postimpact fire. No air filters were observed.
- The left fuel servo was disassembled, and the fuel servo screen was found to be about halfway obstructed and contaminated with an unknown black material.

Right Engine (Continental Motors IO-550-C, Serial Number 1034934)

- The engine was documented as recovered from the accident site. The engine was power washed before the examination to remove large amounts of mud that encapsulated the engine. Side and front dressings were removed.
- For the magnetos, both magnetos were found attached to the engine.
- The leads for all the magnetos were fire damaged. Both magnetos were disassembled. Both condensers inside each magneto were melted onto the respective points.
- All spark plugs were removed and examined. All spark plugs showed signs consistent with the normal operating indications per the Champion Aerospace Aviation-Check-A-Plug chart.
- The propeller governor was removed, and the screen was clear, continuity was established (the driveshaft was rotated), and no abnormalities were noted.
- Thumb compression as established on all six cylinders. Equal intake and exhaust valve rocker arm movement was established in correct firing order.
- All six cylinders were photographed using an electronic borescope. All intake and exhaust valve faces showed signatures consistent with normal operation per the AOPA Air Safety Institute Anatomy of a Value failure chart.
- The fuel pump, fuel servo, and engine oil pump were removed, disassembled, and examined. No abnormalities were noted.
- The vacuum pump was removed and examined. The pump's internal components were destroyed from the post impact fire.
- The 6 fuel injector lines were examined and found to be clear of obstructions. The 6 fuel injector nozzles were removed and examined, and no issues were noted.
- The oil filter can was removed and cut open. The filter material was laid out and examined. No signs of debris were noted in the filter material.
- The exhaust tubing on both sides was heavily impact damaged. Exhaust tubing was cut at various areas to facilitate removal of the bottom spark plugs.
- No signs of fuel samples were found in the engine.
- All fuel lines were found to be thermally damaged.
- The right fuel servo was disassembled, and the fuel servo screen was found to be clear.
- The induction system sustained impact damage but was clear of any pre-impact debris. The intakes were consumed by the postimpact fire. No air filters were observed.
- No signs of preimpact mechanical malfunctions or failures were noted with the right engine.

Other

- The various maintenance records, for the airframe, two engines, and the two propellers were documented.
- The left fuel servo with the contaminated screen and the right fuel servo with the normal looking screen were shipped to the NTSB Materials Laboratory for further examination.

From: [REDACTED]
To: [REDACTED]
Cc: [REDACTED]
Subject: Email report-CEN21LA107 fuel servo screens
Date: Monday, April 18, 2022 1:46:47 PM

Michael,

The left and right fuel servos from the accident aircraft were submitted to the Materials Laboratory for examination. The filter screens had been removed from each servo prior to receipt in the Materials Laboratory. The left and right fuel servo filter screen were swabbed with a cotton swab to remove any surface residue. The residue on each swab was examined using a Fourier Transform Infrared (FTIR) spectrometer with a diamond attenuated total reflectance (ATR) accessory in accordance with ASTM E1252-98 (American Society for Testing Materials E1252-98: *Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis*). The spectrometer was used to collect and process infrared wavelength absorbance spectrum of the unknown material.

The spectrum for the left servo screen sample contained spectral peaks that corresponded to specific functional groups found within molecular structure of the material. A peak at $\sim 1208\text{ cm}^{-1}$ is indicative of a carbon-fluorene (C-F_2) asymmetric stretching bond. A peak at $\sim 1151\text{ cm}^{-1}$ is indicative of a carbon-fluorene (C-F_2) symmetric stretching bond. A weak single peak at $\sim 630\text{ cm}^{-1}$ is indicative of a carbon-fluorene (C-F_2) wagging deformation bond. This spectrum had several characteristics of a fluorocarbon material.

A spectral library search was performed using the unknown spectrum. There were no strong matches to one material. However, the unknown spectrum had similarities to several fluorocarbon materials/polymers including polytetrafluorethylene (PTFE) which is a common polymer used in aircraft fuel system components, particularly hoses.

The spectrum for the right servo screen swab sample contained no significant peaks indicating there was no residue on the screen or the residue was not organic (hydrocarbon) material.

If you have any questions, please let me know.

Nancy B McAtee
Senior Chemist
RE-30