



Continental Motors

ENGINE EXAMINATION REPORT

ENGINE MODEL	TSIO-520-NB1A
ENGINE SERIAL NUMBER	521183
AIRCRAFT MAKE & MODEL	Cessna 340
AIRCRAFT SERIAL NUMBER	340-0214
AIRCRAFT REGISTRATION	N247AT
FILE NUMBER	17-361

NAME	SIGNATURE	DATE
Nicole L. Charnon		01/24/2018

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EXAMINATION		ACCIDENT DATA	
DATE	01/09-10/2018	NTSB ACCIDENT #	CEN18FA061
FACILITY	Florida Air Recovery LLC	NTSB INVESTIGATOR	Joshua Lindberg
ADDRESS	455 Tresca Road Jacksonville, FL 32225	FAA INVESTIGATOR	Michael Corrigan
		ACCIDENT DATE	12/24/2017
		ACCIDENT LOCATION	Bartow, Florida

ENGINE INFORMATION

ENGINE POSITION	Right Engine
TOTAL TIME	Unknown
TIME SOH	Unknown
TYPE & TIME SLI	Unknown [Last Annual Inspection took place 01/02/2017 at a Hobbs time of 1,582.9 hours]
BUILD DATE	05/13/1981
IN SERVICE DATE	Unknown

Significant logbook information:

Maintenance records were obtained by the FAA and copies were provided to the investigative team. According to those records, the right engine was overhauled by RAM Aircraft on November 29, 2006 at an engine total time of 1,237 hours. On July 3, 2007, at a TSOH of 116.8 hours, the engine was removed and returned to RAM for a prop strike inspection where it underwent inspection and repairs before being returned to service. On November 22, 2011, at a Hobbs time of 1,471 hours (515.5 hours SOH), the right engine turbocharger was overhauled. The engine then underwent a series of annual inspections the last of which took place on January 2, 2017 at a Hobbs time of 1,582.9 hours.

Report Summary:

Search Code(s):

15-12-68

No pre-accident anomalies were noted with the engine, or engine-related systems that would have precluded the its ability to produce full, rated power.

Disposition of engine following exam:

None of the engine or engine-related system components were retained for further examination by the NTSB. The wreckage will be stored at Florida Air Recovery until final release by the NTSB.

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NAME	Nicole L. Charnon	NAME	Joshua Lindberg
ADDRESS	Washington, DC	ADDRESS	Dallas, Texas
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB – Central Region
PHONE	[REDACTED]	PHONE	[REDACTED]
NAME	Andrew Hall	NAME	Rick Roper
ADDRESS	Wichita, Kansas	ADDRESS	Waco, Texas
ORGANIZATION	Textron Aviation	ORGANIZATION	RAM Aircraft, L.P.
PHONE	[REDACTED]	PHONE	[REDACTED]

EXTERNAL ENGINE CONDITION

The engine was separated from the airframe and was labeled as the right engine based on the data plate and the aircraft maintenance records. The crankshaft was fractured at the nose oil seal and the propeller flange remained attached to the propeller hub. The crankshaft fracture surface displayed tearing, shear lips, and discoloration features consistent with overload. The engine sustained thermal and impact-related damage.



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ENGINE COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition: The exhaust system sustained impact-related deformation and separation damage. There were no pre-accident anomalies noted with the v-band clamps, bolted couplings, or slip joints. The waste gate actuator linkage did not display and pre-accident anomalies. The aft exhaust risers were displaced forward.



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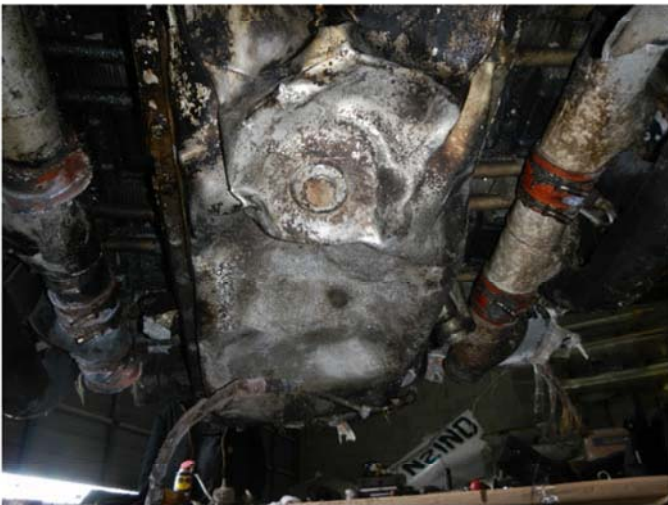
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INDUCTION SYSTEM

Condition: The induction system was impact and thermally damaged. The turbocharger intake was unobstructed. The intercooler was separated from the engine nacelle (it should be noted that the intercooler for both the left and right engines were separated and it was not clear as to which one belonged to which engine. Regardless, they displayed similar impact-related damage with no pre-accident anomalies noted). The intake system sustained impact and thermal damage with no pre-accident anomalies noted.



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IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: Slick

P/N: 6320

S/N: 0G101058

Condition: The magneto was separated from the mounting pad and was located within the wreckage. The magneto drive shaft was manually rotated and it produced a spark from each lead in firing order when an audible snap of the impulse coupling was heard (the left ignition harness cap was removed for the testing due to damage sustained in the accident sequence, and the right engine's right magneto's ignition harness cap was utilized for testing).



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RIGHT MAGNETO

Manufacturer: Slick

P/N: 6320

S/N: 06101059

Condition: The right magneto remained secured to the top side of the engine with its ignition harness attached. The magneto was removed from the engine and the drive shaft was manually rotated. It produced a spark from each lead in firing order when an audible snap of the impulse coupling was heard.



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HARNESS**

Manufacturer: Slick

S/N: LH M2783, RH Not Legible

Condition:

The ignition harnesses caps remained attached to the magnetos, and all terminal remained attached to their respective sparkplugs. However, all of the left magneto's leads were pulled from the cap and many of the leads sustained thermal damage. The leads were cut from the right magneto harness cap for the functional testing of the right magneto. No pre-accident anomalies were noted with either harness/cap.

**SPARK
PLUGS**Manufacturer: Autolite
Unison

P/N: URHB32S

Condition:

All of the sparkplugs remained secured to their respective cylinders with no pre-accident anomalies noted. The top sparkplugs were removed from the cylinders. All displayed a normal worn appearance with no signs of lead or carbon fouling. The bottom sparkplugs were examined via a lighted borescope with no pre-accident anomalies noted with the electrodes.



1T



1B

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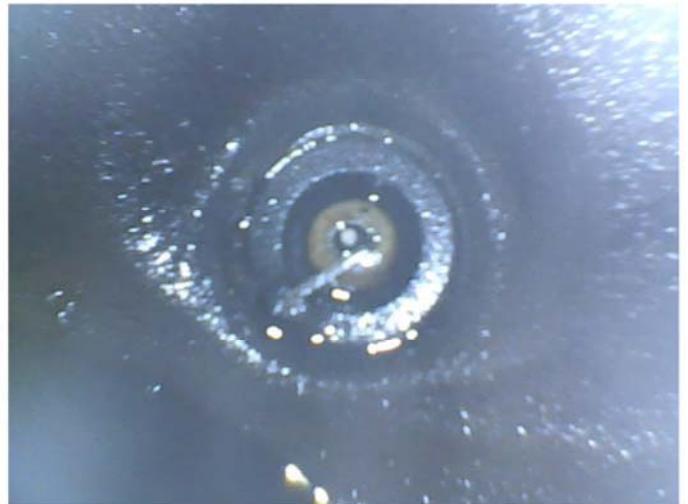
3T



3B



5T



5B



2T



2B

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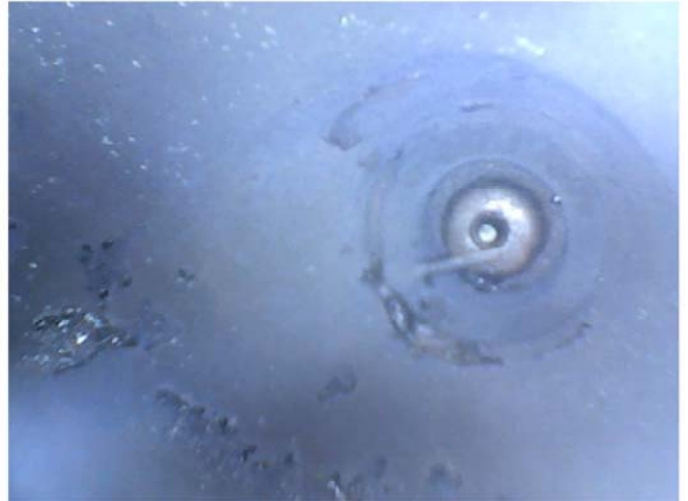
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4T



4B



6T



6B

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FUEL SYSTEM

FUEL PUMP

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition:

The engine-driven fuel pump was separated from the backside of the engine and the mounting flange and drive coupling were displaced to one side and the metal was smeared in the same direction. The pump remained attached to the engine nacelle via the fuel inlet line. The fuel pump was thermally damaged to such an extent that much of the components were destroyed and the housing could not be disassembled.



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THROTTLE BODY METERING UNIT

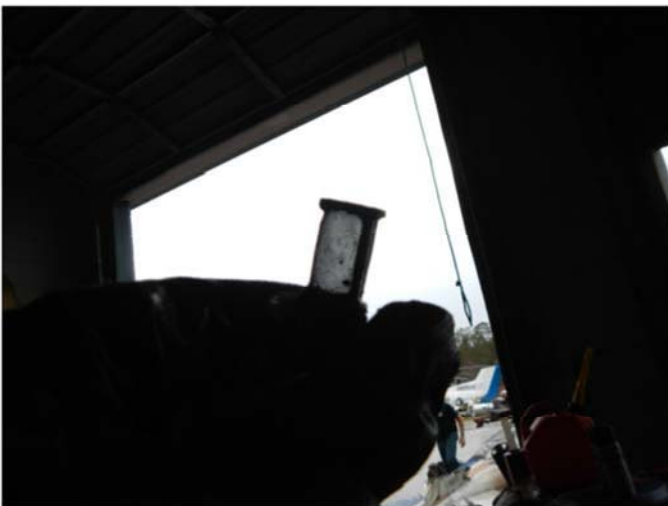
Manufacturer: Continental
Motors (overhauled)

P/N: Not Recorded

S/N: Not Recorded

Condition:

The throttle body/fuel metering unit remained attached to the right engine nacelle and was fractured. The mixture and throttle control cables remained attached to their respective control levers, both of which sustained deformation damage. The throttle valve was found in a near idle position. The interconnect link between the throttle and the turbo wastegate controller was deformed and fractured. The mixture control shaft could be manually manipulated with no binding noted. All of the fittings were fractured on the fuel metering unit. The inlet fuel screen was removed and no obstructions were noted.



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FUEL MANIFOLD VALVE

Manufacturer: Continental Motors (overhauled)

P/N: 63826-4A8

S/N: B134509CR

Condition:

The fuel manifold valve remained secured to the topside of the engine and the fuel lines remained attached to the housing except for the #2. The fuel manifold valve cap was removed and the screen was free from obstructions. Residual fuel was observed in the housing.



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FUEL NOZZLES AND LINES

Condition:

The fuel lines and upper deck reference lines remained secured to their nozzles. Removal of the nozzles revealed they were clear and unobstructed.



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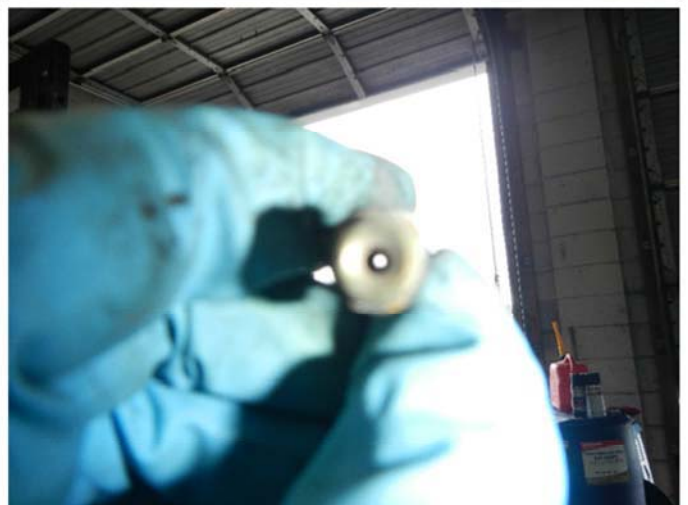
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LUBRICATION SYSTEM

OIL SUMP

Condition: The oil sump was displaced up around the bottom of the engine, but did not display any external pre-accident anomalies.



OIL PICKUP TUBE & SCREEN

Condition: The oil pickup tube and screen were not observed.

OIL PUMP

Condition: The oil pump and scavenge pump caps were removed. Residual oil was observed on the gears and in the gear housings. The oil pump housing displayed light circumferential scoring and signs of hard particle passage at some point in the life of the engine.



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OIL FILTER

Manufacturer: Not Legible

P/N: Not Legible

Condition:

The oil filter was separated from the engine, deformed and thermally damaged.



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OIL COOLER

Manufacturer: Not Recorded

P/N: Not Recorded

S/N: Not Recorded

Condition:

The oil cooler remained attached to the engine with no pre-accident anomalies noted with the exterior portion.



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CYLINDERS

NOTE: The photographs that follow the cylinder condition descriptions represent the cylinder overhead components, piston, intake valve and exhaust valve in that order unless otherwise noted.

CYLINDER #1

Condition: The cylinder remained attached to the crankcase with no external signs of operational distress. The rocker cover was removed and the valve springs remained intact. The cylinder was inspected and documented utilizing a lighted borescope. Oil was pooled at the bottom of the cylinder. The piston, valves, and valve seats were unremarkable.



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CYLINDER #3

Condition: The cylinder remained attached to the crankcase with no external signs of operational distress. The rocker cover was removed and the valve springs remained intact. The cylinder was inspected and documented utilizing a lighted borescope. Oil was pooled at the bottom of the cylinder. The piston, valves, and valve seats were unremarkable.



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CYLINDER #5

Condition: The cylinder remained attached to the crankcase with no external signs of operational distress. The rocker cover was removed and the valve springs remained intact. The cylinder was inspected and documented utilizing a lighted borescope. Oil was pooled at the bottom of the cylinder. The piston, valves, and valve seats were unremarkable.



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CYLINDER #2

Condition: The cylinder remained attached to the crankcase with no external signs of operational distress. The rocker cover was removed and the valve springs remained intact. The cylinder was inspected and documented utilizing a lighted borescope. Oil was pooled at the bottom of the cylinder. The piston, valves, and valve seats were unremarkable.



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CYLINDER #4

Condition: The cylinder remained attached to the crankcase with no external signs of operational distress. The rocker cover was removed and the valve springs remained intact. The cylinder was inspected and documented utilizing a lighted borescope. The piston, valves, and valve seats were unremarkable.



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CYLINDER #6

Condition: The cylinder remained attached to the crankcase with no external signs of operational distress. The rocker cover was removed and the valve springs remained intact. The cylinder was inspected and documented utilizing a lighted borescope. The piston, valves, and valve seats were unremarkable.



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CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: Not Recorded	2-4-6: Not Recorded	S/N: Not Recorded
Condition:	The crankcase remained intact with no signs of operational distress noted.			



CRANKSHAFT ASSEMBLY

CRANKSHAFT	Forging Number: Unknown	S/N: Unknown	Heat code: Unknown
Condition:	The propeller flange was separated from the crankshaft and the fracture surface displayed tearing, shear lips, and discoloration features consistent with overload. A tool was fitted to the backside of the crankshaft and partial rotation of the crankshaft was achieved with crankshaft continuity confirmed to the front of the engine and out to the connecting rods. Impingements on the crankshaft and camshaft were noted at the front of the crankcase and the oil sump respectively which prevented full crankshaft rotation.		



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S/N: Unknown

Condition:

The camshaft was not observed in its entirety. The bevel gear was observed through the alternator mounting pad and no pre-accident anomalies were noted. The camshaft gear was impinged upon by the deformed oil sump.

ACCESSORIES**STARTER**

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition:

The starter was separated from the adapter.

**STARTER
ADAPTER**

Condition:

The starter adapter remained attached to the backside of the engine but it was fractured at the motor flange. The scavenge pump remained in place on the adapter. No pre-accident anomalies were noted.



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ALTERNATOR

Manufacturer: Hartzell

P/N: ALV-9610

S/N: H-0120624

Condition: The alternator remained attached to the front right side of the engine; however, the alternator housing was fractured and the alternator was displaced from its mounting flange. The alternator was removed and the drive coupling remained intact with no pre-accident anomalies were noted with the unit.



VACUUM PUMP

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition: The vacuum pump was separated from the backside of the engine and fragments were noted in the wreckage. The vacuum pump drive coupling was thermally damaged and remained with the engine accessory pad. The pump housing, rotors, and vanes were fractured (the photo on the right shows the burnt remains of the drive coupling and mount).



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TURBO

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition:

The turbocharger remained with the right nacelle area. The intake filter was burned and the ash was found in the inlet area. The intake impeller blades displayed deformation damage and curling opposite the direction of normal rotation. The turbocharger turbine wheel/blades remained intact.



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TURBO CONTROLLER

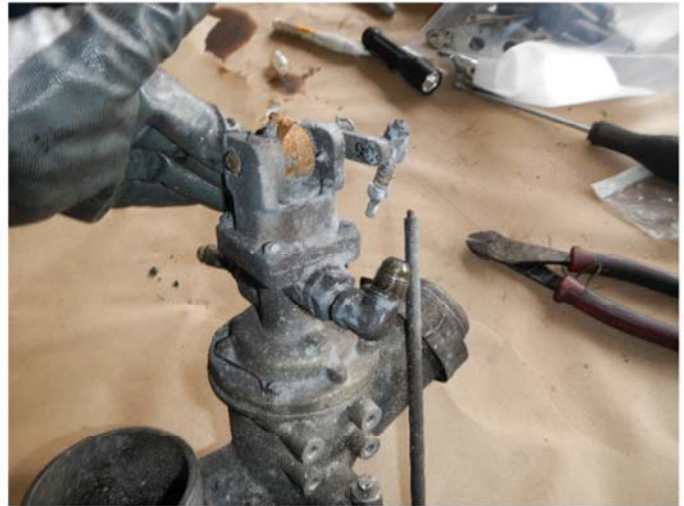
Manufacturer: RAM

P/N: 470836-18

S/N: RUR025R

Condition:

The turbo wastegate controller was thermally damaged and separated from the engine, but it remained attached to the throttle body which was attached to the nacelle.



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WASTEGATE

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition:

The waste gate actuator linkage remained intact and attached to the wastegate, though deformation and thermal damage were extensive. The oil lines to and from the wastegate actuator remained in place.



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OVERBOOST VALVE

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition:

The overboost valve was thermally damaged and separated from the induction system. Remnants of two overboost valves were identified in the wreckage and the bottom photograph displays those components.



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PROPELLER GOVERNOR	Manufacturer: Not Recorded	P/N: Not Recorded	S/N: Not Recorded
Condition:	The propeller governor remained attached to the engine and the drive gear was intact with no pre-accident anomalies noted.		
PROPELLER	Manufacturer: McCauley	P/N: Unknown	S/N: 971266
Condition:	The propeller remained attached to the propeller flange, which was separated from the crankshaft at the engine nose seal. The propeller hub remained intact and the spinner dome was crushed aft over the hub. All three blades remained attached to the hub, but they were free to rotate, indicative of a pitch change link fractures. The blades were labeled 1, 2, and 3 according to their hub location. Blade 1 was missing its counterweight and was bent aft slightly. The leading edge displayed some light gouging and the cambered and face sides displayed chord-wise scrapes and paint erosion. Blade 2 displayed a small twist toward low pitch, paint erosion on the cambered side and light leading edge gouges. Blade 3 was missing its counterweight. The blade displayed light chord-wise paint erosion aft of the deice boot, but was otherwise unremarkable.		



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