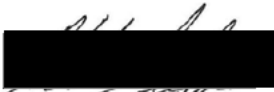




Continental Motors

ENGINE FIELD INSPECTION REPORT

ENGINE MODEL	TSIO-520-R
ENGINE SERIAL NUMBER	269863-R
AIRCRAFT MAKE & MODEL	Cessna T210M
AIRCRAFT SERIAL NUMBER	21062493
AIRCRAFT REGISTRATION	N761SZ
FILE NUMBER	16-317

NAME	SIGNATURE	DATE
Kurt Gibson		02/03/2017

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 2 of 27

GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	01/18/2017	NTSB ACCIDENT #	WPR17LA036
FACILITY	Air Transport	NTSB INVESTIGATOR	Howard Plagens
ADDRESS	3011 W Buckeye Rd Phoenix, AZ 85009	FAA INVESTIGATOR	Alonso Ontiveros
		ACCIDENT DATE	12/11/2016
		ACCIDENT LOCATION	Mecca, California

ENGINE INFORMATION

ENGINE POSITION	Single Engine
TOTAL TIME	1286.57
TIME SOH	N/A
TYPE & TIME SLI	17.96 since the last annual inspection
BUILD DATE	09/18/1992
IN SERVICE DATE	Unknown

Significant logbook information:

The last annual inspection was performed on November 12, 2016 at a tach time of 3978.61.

Report Summary:

Search Code(s):

15-12-68

There were no anomalies noted that would have prevented normal operation or production of rated horsepower.

Disposition of engine following exam:

The engine remained at Air Transport in Phoenix, Arizona

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 3 of 27

INSPECTION WITNESSES

NAME	Kurt Gibson	NAME	Howard Plagens
ADDRESS	Mobile, Alabama	ADDRESS	NTSB Western Pacific Region
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB
PHONE		PHONE	
NAME	Henry Soderlund	NAME	
ADDRESS	Wichita, Kansas	ADDRESS	
ORGANIZATION	Textron Aviation	ORGANIZATION	
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

ENGINE FIELD INSPECTION REPORT**FILE NUMBER:**

16-317

ENGINE S/N:

269863-R

PAGE 4 of 27**EXTERNAL INSPECTION OF ENGINE**

The engine had been removed from the airframe prior to the investigators' arrival. The engine displayed impact damage signatures. All six cylinders remained attached to their cylinder bays and were undamaged. The crankcase remained intact and displayed minor impact damage signatures. The three blade, variable pitch propeller had broken free from the propeller flange; the propeller studs remained attached to the crankshaft propeller flange. All three propeller blades remained within the propeller hub and displayed impact damage signatures.

The fuel pump remained attached to its installation point and was undamaged. The throttle and metering assembly remained attached to the induction system and to its installation point; the assembly was undamaged. The fuel manifold valve remained attached to its installation point and was undamaged. All of the fuel nozzles remained installed in their cylinders and the nozzles were undamaged.

Both of the magnetos remained attached to their installation points and were undamaged. The ignition harness remained secured to the magnetos as well as the spark plugs. The ignition harness was undamaged. All of the spark plugs remained installed in their cylinders and all of the spark plugs were undamaged.

The turbocharger remained attached to the exhaust and to the installation bracket; however, the induction outlet had broken free from the turbocharger which was consistent with impact damage. The wastegate remained attached to its installation point and was undamaged. The turbocharger controller had broken free from its installation point and remained attached to the engine through hoses; the controller displayed minor impact damage signatures. The overboost valve remained attached to its installation point and displayed minor impact damage signatures.

The exhaust system displayed impact damage signatures in the form of bending with the exhaust tailpipe displaying the most impact damage. The induction system displayed impact damage signatures with the most damage occurring to the induction components attached to the turbocharger.

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 5 of 27



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 6 of 27

ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition:

The exhaust system remained attached to the engine and displayed impact damage signatures with the most impact damage displayed at the exhaust tailpipe. The damage to the tailpipe included bending, crushing and tearing. There were no anomalies noted with the exhaust system.



INDUCTION SYSTEM

Condition:

The induction system displayed impact damage signatures with the most impact damage occurring to the components attached to the turbocharger. There were no signs of induction leaks and the induction system displayed normal operating signatures. There were no anomalies noted.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 7 of 27

IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: Slick

P/N: 6320

S/N: 13030195

Condition:

The magneto remained attached to its installation point and was undamaged. It was noted that during crankshaft rotation the impulse coupling would operate normally. The spark plugs were removed from their cylinders and reinstalled on their ignition leads. It was noted that during impulse coupling operation the magneto was capable of producing a spark that reached each individual spark plug and it would produce a spark in sync with the right magneto. There were no anomalies noted with the magneto.



RIGHT MAGNETO

Manufacturer: Slick

P/N: 6320

S/N: 13030194

Condition:

The magneto remained attached to its installation point and was undamaged. It was noted that during crankshaft rotation the impulse coupling would operate normally. The spark plugs were removed from their cylinders and reinstalled on their ignition leads. It was noted that during impulse coupling operation the magneto was capable of producing a spark that reached each individual spark plug and it would produce a spark in sync with the left magneto. There were no anomalies noted with the magneto.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 8 of 27

IGNITION HARNESS

Manufacturer: Slick

P/N: LH: M-2783 RH: M-2784

S/N: Not observed

Condition:

The ignition harness remained attached to both magnetos and to each of the spark plugs. It was noted that the ignition harness was capable of conducting a spark from the magneto to each of the spark plugs. There were no anomalies noted with the ignition harness.



SPARK PLUGS

Manufacturer: Champion

P/N: RHB-32E

Condition:

All of the spark plugs remained installed in their cylinders and were undamaged. The spark plugs were removed and it was noted that all of the spark plugs displayed normal wear signatures when compared to Champion Aviation Service Manual AV6-R. The bottom even number spark plugs were oil soaked which was consistent with post-accident accumulation. All of the spark plugs displayed normal operating signatures. There were no anomalies noted.



#1 top and bottom spark plugs



#3 top and bottom spark plugs

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 9 of 27



#5 top and bottom spark plugs



#2 top and bottom spark plugs



#4 top and bottom spark plugs



#6 top and bottom spark plugs

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 10 of 27

FUEL SYSTEM

FUEL PUMP

Manufacturer: CMI

P/N: 642650-1

S/N: M078110B

Condition:

The fuel pump remained attached to its installation point and was undamaged. All of the fuel AN fittings were secured to the fuel pump; however, the fuel inlet fuel line was cut by the recovery crew. The fuel pump was removed and it was noted that the drive coupling remained intact. The fuel pump was rotated by hand and it was noted to rotated normally. The fuel pump was disassembled and the internal components were visually inspected; the internal components displayed normal operating signatures. There were no anomalies noted with the fuel pump.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 11 of 27

THROTTLE BODY METERING UNIT

Manufacturer: CMI

P/N: 629703-11

S/N: H159111AR

Condition:

The throttle and metering unit remained attached to its installation point and to the induction system. The assembly was undamaged and all of the fuel lines remained secured to the metering unit. The throttle and mixture control arms remained secured to their control shafts. The throttle and metering unit was disassembled and the internal components were visually inspected. All of the internal components displayed normal operating signatures. The fuel inlet screen was removed and it was noted there was a significant amount of debris on the fuel screen; however, the screen was not blocked.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 12 of 27

FUEL MANIFOLD
VALVE

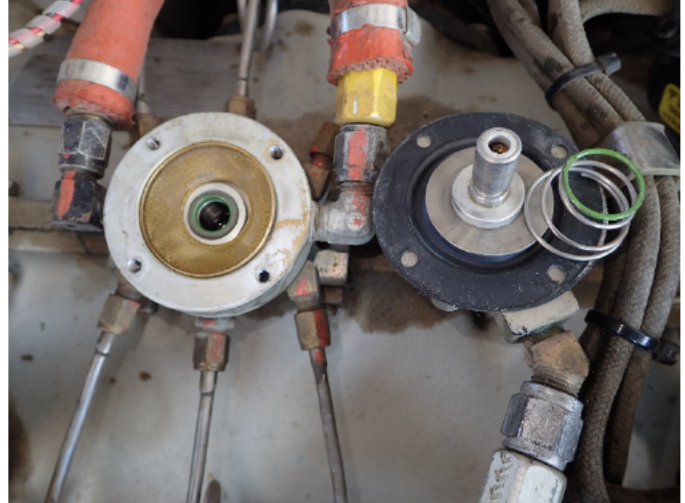
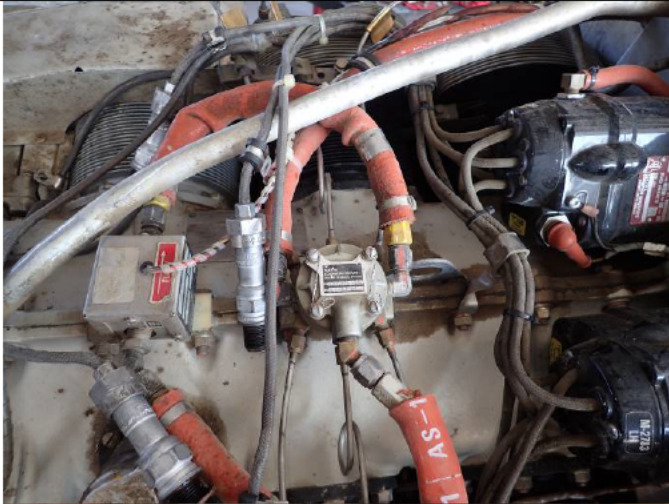
Manufacturer: CMI

P/N: 634326-4A16

S/N: I108116C

Condition:

The fuel manifold valve remained attached to its installation point and was undamaged. All of the fuel lines remained secured to the manifold valve and there were no signs of fuel leaks. The manifold valve was disassembled and the internal components were visually inspected. The internal components displayed normal operating signatures and the manifold valve screen contained only a miniscule amount of lint like material. There was a small amount of fuel contained within the manifold valve. There were no anomalies noted with the manifold valve.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 13 of 27

FUEL NOZZLES AND LINES

Manufacturer: GAMI

Position	#1	#3	#5	#2	#4	#6
Size	GA205	GM191	GF181	GA205	GM191	GF181
Condition:	All of the fuel nozzles remained installed in their cylinders and were undamaged. The fuel nozzles were removed and it was noted that all of the nozzles were clear of obstructions. There were no anomalies noted with the fuel nozzles.					



#1 Fuel Nozzle



#3 Fuel Nozzle



#5 Fuel Nozzle



#2 Fuel Nozzle

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 14 of 27



#4 Fuel Nozzle



#6 Fuel Nozzle

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 15 of 27

LUBRICATION SYSTEM

OIL SUMP

Condition:

The oil sump remained attached to the crankcase and displayed impact damage signatures; however, the oil sump was not breached. There were no anomalies noted with the oil sump.



OIL PICK-UP TUBE & SCREEN

Condition:

Due to the type of inspection performed the oil pick-up tube and screen was not observed.

OIL PUMP

Condition:

The oil pump housing remained intact and undamaged. There were no anomalies noted with the oil pump.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 16 of 27

OIL FILTER

Manufacturer: Champion

P/N: CH48109-1

Condition:

The oil filter remained attached to the oil filter adapter and was undamaged. The oil filter was removed and the housing was cut open. The filter pleats were inspected and there were no anomalies noted with the oil filter inspection.



OIL COOLER

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The oil cooler remained attached to the oil cooler adapter and displayed minor impact damage signatures. There were no anomalies noted with the oil cooler.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 17 of 27

CYLINDERS

CYLINDERS

Condition:

All of the cylinders remained attached to their cylinder bays and were undamaged. The internal portions of the cylinders were inspected using a lighted borescope. The cylinder bore, piston faces, and valve heads displayed normal operating and combustion signatures as well as some oxidation consistent with post-accident accumulation. The overhead components (rocker arms, valve springs, valves, and push rods) displayed normal operating and lubrication signatures. During crankshaft rotation all six cylinders displayed good thumb compression and suction. During crankshaft rotation all of the overhead components operated normally. There were no anomalies noted with the cylinders.



#1 Cylinder



#3 Cylinder



#5 Cylinder



#2 Cylinder

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 18 of 27



#4 Cylinder



#6 Cylinder

VALVES AND GUIDES

Condition:

The valve heads were inspected using a lighted borescope; the valve heads displayed normal operating and lubrication signatures. During crankshaft rotation all of the valves operated normally.

ROCKER ARMS AND SHAFTS

Condition:

All of the rocker arms were intact and undamaged. The rocker arms displayed normal operating and lubrication signatures; during crankshaft rotation all of the rocker arms operated normally.



PISTONS

Piston P/N: Inaccessible

Condition:

The piston faces were inspected using a lighted borescope; the pistons displayed normal operating and combustion signatures. There were no signs of detonation or pre-ignition noted. During crankshaft rotation all of the pistons operated normally. There were no anomalies noted.

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

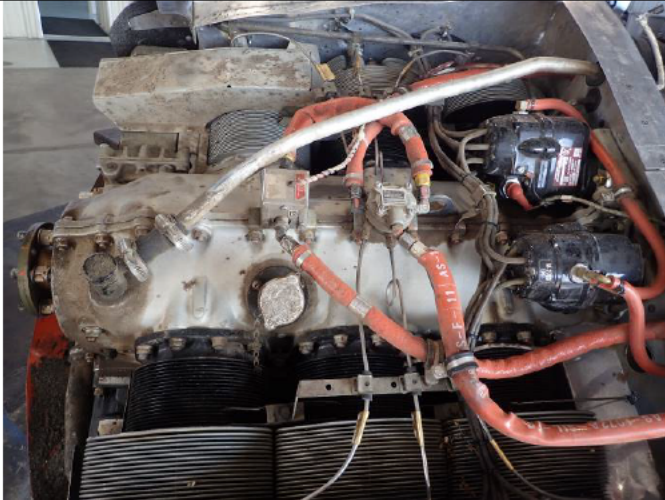
ENGINE S/N:

269863-R

PAGE 19 of 27

CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: 649043	2-4-6: 649042	S/N: Not observed
Condition:	The crankcase remained intact and displayed minor impact damage signatures. It was noted that there were signs of an oil seep along a portion of the crankcase backbone. There were no further anomalies noted with the crankcase.			



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 20 of 27

CRANKSHAFT ASSEMBLY

CRANKSHAFT

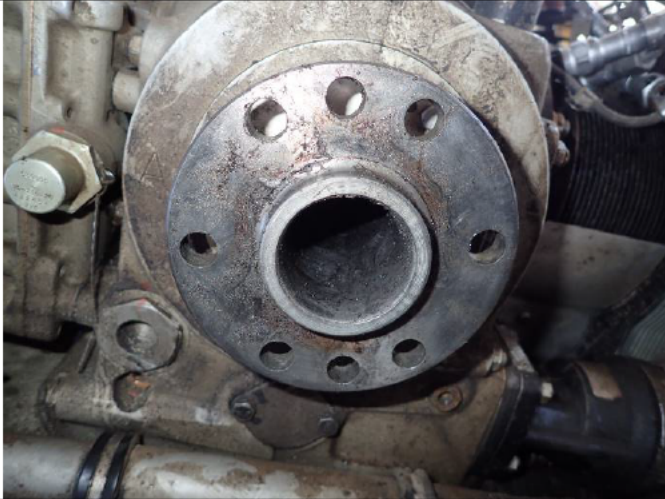
Forging Number:
Inaccessible

S/N: H179210N

Heat code: Inaccessible

Condition:

The propeller flange remained attached to the crankshaft; the crankshaft displayed impact damage signatures in the form of small cracks aft of the propeller flange. The crankshaft was rotated through the use of a hand tool and continuity was established between the crankshaft, camshaft, connecting rods and associated components. There were no anomalies noted with the crankshaft.



CONNECTING RODS

P/N: Inaccessible

Forging or Serial Number: Inaccessible

Condition:

Operation of the connecting rods was verified by rotating the crankshaft and observing piston movement. The connecting rods operated normally.

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 21 of 27

CAMSHAFT

CAMSHAFT	P/N: Inaccessible	S/N: Inaccessible
Condition:	Operation of the camshaft was verified by rotating the crankshaft and observing rocker arm movement. The camshaft operated normally.	
ACCESSORY GEARS		
Condition:	Operation of the magneto drive gears was verified by rotating the crankshaft and verifying impulse coupling operation. The magneto drive gears operated normally.	

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 22 of 27

ACCESSORIES

STARTER

Manufacturer: Electrosystems

P/N: ES646275-1

S/N: C110788

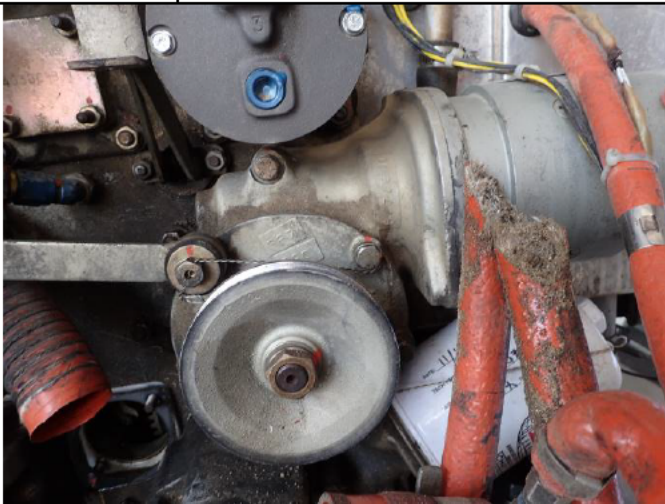
Condition:

The starter remained attached to the starter adapter and was undamaged. There were no anomalies noted with the starter.

STARTER
ADAPTER

Condition:

The starter adapter remained attached to its installation point and was undamaged. There were no anomalies noted with the starter adapter.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 23 of 27

ALTERNATOR

Manufacturer: Hartzell

P/N: D0FF10300BR

S/N: H-Q020358

Condition:

The alternator remained attached to its installation point and was undamaged. The alternator drive was capable of normal rotation. There were no anomalies noted with the alternator.



VACUUM PUMP

Manufacturer: Tempest

P/N: AA216CW

S/N: DAF113

Condition:

The vacuum pump remained attached to its installation point and displayed minor impact damage; the vacuum pump outlet pipe had broken free from the vacuum pump. There were no anomalies noted with the vacuum pump.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 24 of 27

TURBO

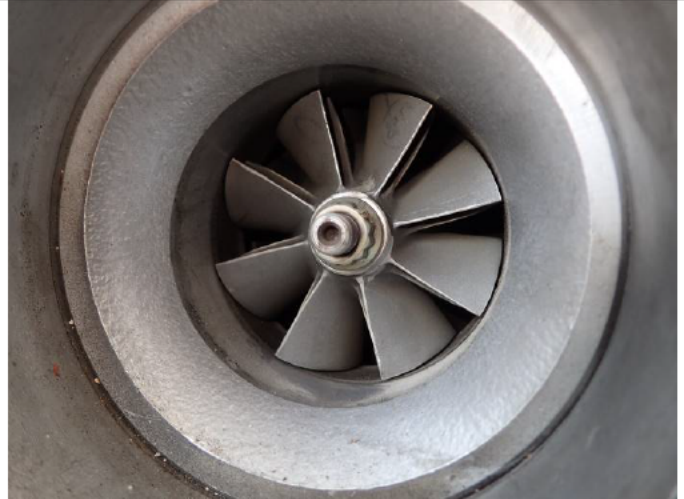
Manufacturer: Garrett

P/N: 406610-9005

S/N: NCR0112

Condition:

The turbocharger remained attached to the exhaust system and to its attach bracket; the majority of the induction system had broken free from the compressor section of the turbocharger. The compressor blades were visually inspected and were noted to be undamaged and capable of normal rotation. The tailpipe was removed and the turbine blades were noted to be undamaged and capable of normal rotation; continuity was established between the turbine and compressor blades. There were no anomalies noted with the turbocharger.



ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 25 of 27

**TURBO
CONTROLLER**

Manufacturer: Garrett

P/N: 470688-7

S/N: IB0245

Condition:

The turbocharger controller had broken free from its attachment and displayed minor impact damage signatures; the controller lines remained secure to the controller. There were no anomalies noted with the controller.

**WASTEGATE**

Manufacturer: Garrett

P/N: 470908-11X

S/N: HL0221

Condition:

The wastegate remained attached to its installation point and was undamaged. There were no anomalies noted with the wastegate.

**OVERBOOST
VALVE**

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The induction tube that the overboost valve attaches to had broken free from the rest of the induction system. The induction tube and the overboost valve were not observed at the time of the examination.

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 26 of 27

PROPELLER

PROPELLER GOVERNOR	Manufacturer: McCauley	P/N: C290D4-?/T?	S/N: 752407
Condition:	The propeller governor remained attached to its installation point and displayed minor impact damage signatures. The propeller control rod end remained attached to the governor control arm. There were no anomalies noted with the governor.		



PROPELLER	Manufacturer: McCauley	P/N: D3A34C402	S/N: 790914
Condition:	The three blade, variable pitch propeller had pulled free from the propeller flange; the propeller studs remained attached to the crankshaft propeller flange. All three propeller blades remained within the propeller hub and displayed impact damage signatures. Blade #1 displayed forward bending deformation, leading edge gouging, and minor tip curling. Blade #2 displayed aft bending deformation, leading edge gouging and polishing. Propeller blade #3 displayed aft bending deformation, leading edge gouging at the blade tip, and chordwise gouges at the blade tip. There were no anomalies noted with the propeller.		



Propeller



Propeller Hub

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

16-317

ENGINE S/N:

269863-R

PAGE 27 of 27



Blade #1



Blade #1



Blade #2



Blade #2



Blade #3



Blade #3