Engine Data

Model	Serial Number	Total Time
IO-360-L2A	L-30896-51A	1889.1 Hours Since Field O/H

Above engine Information taken from: Engine dataplate and maitenance logbooks.

Case Match # K2878 Engine S/N on Case: L-30896-51A

Crankshaft S/N: unknown

Last Annual Inspection by: A/P2747693I/A Date Jan 15, 2013

Last Overhaul by: Teledyne Mattituck CRS T10R507Y Date April 29, 2008

Maintenance Records Attached?	☒ Yes ☐ No		
On-Scene Exam?	☐ Yes ☒ No	Propeller Attached?	☐ Yes ☒ No
Was Engine Disturbed Prior to Your Arrival?	☒ Yes ☐ No	Does Engine Appear to be run able?	☐ Yes ☒ No
Does Crankshaft Rotate?	☒ Yes ☐ No	Evidence of Fire?	☐ Yes ☒ No

Comments:

There was no Lycoming Engines travel to the mishap site. Investigators from the National Transportation Safety Board (NTSB), Cessna Aircraft Company and the Federal Aviation Administration, Flight Standards District Office (FAA-FSDO) responded and documented the mishap site.

The aircraft was subsequently removed from the site and transported to the facilities of Plain Parts, Pleasant Grove, California, where a subsequent examination was conducted February 11, 2013. Reference the report narrative for additional information.

Engine Data

Propeller

Manufacturer	Part Number	Serial Number
McCauley	1A170E-7660	TF023

Propeller Type ☒ Metal ☐ Wood ☐ Composite ☐ Unknown

Propeller Blade Serial Numbers:

Blade 1 n/a Blade 2 n/a

Blade 3 n/a Blade 4 n/a

Propeller Governor

Manufacturer	Part Number	Serial Number
n/a	n/a	n/a

Gasket Screen Condition: n/a

Governor Oil Line:

Properly Secured? ☐ Yes ☐ No ☐ Unknown ☒ N/A

Correct Line Nuts? ☐ Yes ☐ No ☐ Unknown ☒ N/A

Correct Fittings? ☐ Yes ☐ No ☐ Unknown ☒ N/A

Propeller Comments:

The two bladed fixed pitch propeller, along with the attached crankshaft flange were displaced from the engine. The crankshaft fracture surface exhibited signatures consistent with *torsional* overload due to the absorption of rotational energy.

The propeller blades were marked “A” & “B” for narrative purposes.

The propeller blade marked as “A” displayed moderate leading edge gouging, torsional twisting, chordwise striations across the cambered surface and trailing edge “S” Bending.

The propeller blade marked as “B” was separated from the hub area near the root of the blade due to the absorption of impact energy. The propeller displayed leading edge gouging, torsional twisting, chordwise striations across the cambered surface and trailing edge “S” Bending.

The propeller damage signatures were consistent with the absorption of rotational forces applied at the crankshaft at the time of impact.

Engine Data

Fuel System ☒ Injection ☐ Carburetor

Manufacturer: Precision Model: RSA-5AD1 Setting: 2576536-2

Serial. No.: 70286801 Floats: ☐ Metal ☐ Composite ☐ Plastic

Fuel Screens

Carburetor/Injector Inlet: ☒ Clean ☐ Contaminated ☐ Unknown

Aircraft Main Fuel Strainer: ☒ Clean ☐ Contaminated ☐ Unknown

Flow Divider ☐ N/A

Manufacturer: Precision Part No.: unknown Serial No.: 0284723

Evidence of Fuel Found? ☒ Yes ☐ No ☐ Unknown

Injector Nozzles: ☐ N/A

Type: ☐ One Piece ☒ Two Piece ☐ Unknown

Condition: ☒ Open ☐ Plugged ☐ Unknown

Fuel Pump: ☒ Diaphragm ☐ Geared ☐ Unknown ☐ None

Manufacturer: Lycoming Part No.: unknown Serial # / Date Code: unknown

Fuel System Comments:

The fuel injection servo remained securely attached at the mounting flange. The throttle/mixture controls were found securely attached at their respective control arms of the servo. The fuel injection servo and induction system were examined and observed to be free of obstruction. The throttle/mixture controls were found securely attached at their respective control arm of the servo. The plug on the side of the injector body was secure with the safety wire in place. The servo fuel inlet screen was found free of contamination.

The various fuel supply lines at the engine and firewall were subjected to the forces of impact energy and had become displaced at their respective fittings when the engine seperated from the airframe, thus comprimising the fuel system. Fluid consistent with the appearance and odor of aviation fuel was found within the fuel line connected at the output side of the fuel servo to the inlet fitting of the fuel flow divider.

The fuel flow divider (aka: spider) remained secure at the mounting bracket situated at the top of the engine. The fuel lines remained secure at each flow divider fitting and fuel injector at each cylinder. The flow divider was disassembled. There was no evidence of internal mechanical malfunction or obstruction to fuel flow. The diaphragm remained intact and undamaged.

The fuel injection nozzles remained secure at each cylinder with the respective fuel line attached. The nozzles were removed and examined. The nozzles remained free of visible contamination or obtruction to flow.

The fuel pump was displaced from the engine. The portion of mounting flange remained secure at the mounting pad. The fracture surfaces exhibited signatures consistent with overload. The fuel pump was opened for examination. The fuel pump remained free of internal mechanical malfunction and obstruction to flow. The diaphragm remained intact.

Engine Data

Ignition System:

Magnetos:

☒ **Left or** ☐ **Dual Magneto**

Manufacturer: Slick Model: 4371 P/N: S/N 08122601

Impulse Coupling? ☒ Yes ☐ No Functioning? ☒ Yes ☐ No ☐ Unknown

Timing Checked? ☐ Yes ☒ No Results:

Damage: Substantial

Right Magneto

Manufacturer: Slick Model: 4371 P/N: S/N 06111728

Impulse Coupling? ☒ Yes ☐ No Functioning? ☒ Yes ☐ No ☐ Unknown

Timing Checked? ☐ Yes ☒ No Results:

Damage: Destroyed

Magneto Comments:

Reference the “Engine Observations” narrative for more information.

Spark Plugs

Manufacturer: Champion Type: REM-38E SI 1042 Approved? ☒ Yes ☐ No

1 Top	Undamaged electrode, oil soaked	1 Bottom	Not removed
2 Top	Undamaged electrode, normal color	2 Bottom	Not removed
3 Top	Undamaged electrode, oil soaked	3 Bottom	Not removed
4 Top	Undamaged electrode, normal color	4 Bottom	Not removed
5 Top		5 Bottom	
6 Top		6 Bottom	
7 Top		7 Bottom	
8 Top		8 Bottom	

Spark Plug Comments:

The spark plugs were secure at each position with their respective spark plug lead attached. The spark plugs (as noted) were removed, examined and photographed. The spark plug electrodes remained mechanically undamaged, and according to the Champion Spark Plugs “Check-A-Plug” chart AV-27, the spark plug electrodes displayed coloration consistent with normal operation. The static oil soaking of the spark plugs (as noted) was attributed to the engine positioning at the mishap site and post recovery.

Ignition Harness

Tested: ☐ Yes ☒ No Condition: Destroyed

Comments:

The ignition harness had sustained varying degrees of damage by impact energy and was not tested. The ignition harness was attached at each magneto and respective spark plug.

Engine Data

Starter:

Manufacturer: unknown
Part No.: unknown Serial No.: unknown
Comments: The starter was displaced from the engine and destroyed. The subject starter was not examined.

Alternator:

Manufacturer: unknown
Part No.: unknown Serial No.: unknown
Comments: The alternator was detached from the engine and destroyed. The subject alternator was not examined.

Generator:

Manufacturer: n/a
Part No.: n/a Serial No.: n/a
Comments:

Vacuum Pump:

Manufacturer: Airborne
Part No.: 215CC Serial No.: 62613
Comments:

☒ Stand-by Pump or ☐ Aux. Pump:

Manufacturer: Tempest
Part No.: AA32116CW Serial No.: unknown

Lubrication System:

Oil Suction Screen:	☒ Clean	☐ Contaminated	☐ Unknown	
Oil Pressure Screen:	☐ Clean	☐ Contaminated	☐ Unknown	☒ N/A
Oil Filter:	☐ Clean	☐ Contaminated	☒ Unknown	☐ N/A
Oil Cooler Integrity:	☐ Secure	☐ Leaking	☒ Unknown	☐ N/A
Oil Cooler Hoses:	☐ Tight	☐ Leaking	☒ Unknown	☐ N/A

Oil System Comments:

The oil suction screen was found secure and uncontaminated by any pre-mishap debris. The oil filter was detached and crushed. There was no evidence of any pre-mishap lubrication system contamination.

Engine Data

Turbo System: ☒ **Page Not Applicable on this engine model.**
☐ **Single or** ☐ **Left**

Manufacturer: _____
Part No.: _____ Serial No.: _____

Rotate? ☐ Yes ☐ No Functioning? ☐ Yes ☐ No ☐ Unknown

Damage: _____

☐ **Right**

Manufacturer: _____
Part No.: _____ Serial No.: _____

Rotate? ☐ Yes ☐ No Functioning? ☐ Yes ☐ No ☐ Unknown

Damage: _____

Density Controller ☐ **Not Applicable on this engine model.**
Manufacturer: _____
Part No.: _____ Serial No.: _____

Differential Control ☐ **Not Applicable on this engine model.**
Manufacturer: _____
Part No.: _____ Serial No.: _____

Variable Absolute Controller ☐ **Not Applicable on this engine model.**
Manufacturer: _____
Part No.: _____ Serial No.: _____

Slope Controller ☐ **Not Applicable on this engine model.**
Manufacturer: _____
Part No.: _____ Serial No.: _____

Manifold Pressure Relief Valve ☐ **Not Applicable on this engine model.**
Manufacturer: _____
Part No.: _____ Serial No.: _____

Exhaust Bypass Valve ☐ **Not Applicable on this engine model.**
Manufacturer: _____
Part No.: _____ Serial No.: _____

Comments:

Engine Observations

The subject engine was examined February 11, 2013, at the facilities of Plain Parts, Pleasant Grove, California, under the auspices of the National Transportation Safety Board, Investigator in charge (NTSB-IIC).

The powerplant is a four cylinder, air cooled, direct drive, horizontally opposed, normally aspirated (fuel-injected), internal combustion engine rated at 180hp @ 2700rpm.

The engine had been removed from the airframe at the engine mount to facilitate examination. The engine had sustained significant impact energy damage at the left forward area encompassing the number two cylinder assembly. The exhaust system was crushed aft. The starter and alternator had been displaced from the engine. Visual examination of the engine revealed no evidence of pre-impact catastrophic mechanical malfunction or fire.

The top spark plugs were removed, examined and photographed. The top vacuum pump had been displaced exposing the drive, and the crankshaft was rotated by hand through the drive utilizing a drive tool. The crankshaft was free and easy to rotate in both directions. "Thumb" compression was observed in proper order on all four cylinders. The valve train which had not been damaged by impact forces was observed to operate in proper order, and appeared to be free of any pre-mishap mechanical malfunction. Normal "lift action" was observed at each rocker assembly. Clean, uncontaminated oil was observed at all four rockerbox areas. Mechanical continuity was established throughout the rotating group, valve train and accessory section during hand rotation of the crankshaft. The bottom spark plugs were not removed. The combustion chamber of each cylinder was examined through the spark plug holes utilizing a lighted borescope. The combustion chambers remained mechanically undamaged, and there was no evidence of foreign object ingestion or detonation. The valves were intact and undamaged. There was no evidence of valve to piston face contact observed. The gas path and combustion signatures observed at the spark plugs, combustion chambers and exhaust system components displayed coloration consistent with normal operation. There was no oil residue observed in the exhaust system gas path. There was significant ductile bending of the exhaust system components.

The left magneto had sustained impact energy damage, and was displaced from the mounting pad. The fracture surface signatures at the magneto-mounting flange were consistent with overload forces. The pieces of magneto flange that remained at the mounting pad were securely clamped. Magneto to engine timing could not be ascertained. The impulse coupler drive was found intact and secure. The drive functioned normally during hand rotation of the drive. The magneto produced spark at the four leads during hand rotation the drive.

The right magneto had sustained impact energy damage, and was partially displaced from the mounting pad. The fracture surface signatures at the magneto-mounting flange were consistent with overload forces. The pieces of magneto flange that remained at the mounting pad were securely clamped. Magneto to engine timing could not be ascertained. The impulse coupler drive was found intact and secure. The magneto sustained varying degrees of damage that rendered the unit inoperative and therefore, could not be functionally tested.

There was no evidence of pre-impact mechanical malfunctions observed during the examination of the engine.