LYCOMING

Air Safety Investigation ✈

Single Engine Examination Report

Mishap Date:	Sept 8, 2012	**Mishap Time (24 hr.):**	1235 PDT
Aircraft Registration:	N21MX	**Air Safety Investigator:**	Mark W. Platt
Aircraft Manufacturer:	Moore Edward R 2009	**Aircraft Model:**	MXS
Location:	Borrego Springs, CA	**Aircraft S/N:**	008
On Scene Examination:	No	**Aircraft Damage:**	Destroyed
Federal IIC:	Patrick Jones	**NTSB Report#:**	WPR12LA407

Engine:	**Engine**
Model	AEIO-540-EXP
Serial Number	L-52636-08E
Total Time	~350 Hours Since Field O/H
Crankshaft S/N	V537952975
Case Match #	K1027

Propeller:	**Manufacturer**	**Part Number**	**Serial Number**
	Hartzell	HC-C3YR-4AX	A90516B

Injuries:	**Number**	**Fatal**	**Serious**	**Minor**	**None**
Crew	1	1	0	0	0
Passengers	0	0	0	0	0
Ground		0	0	0	

Registered Owner: Moore Edward R
[redacted]
San Diego, CA 92109

Operator:

Pilot: Reinaldo Beyer
[redacted]
Del Mar, CA 92014

Medical, Date Issued: 3rd class, 04/12

Pilot Rating: Commercial, ASELI

Summary:

On September 8, 2012, about 1235 Pacific Daylight Time (PDT), an experimental Edward R. Moore MXS, registered as N21MX, departed controlled flight and impacted terrain near Borrego Valley Airport (L08), Borrego Springs, California. The commercial pilot was fatally injured; the airplane was destroyed by impact forces and there was no fire. The pilot was operating the airplane under the provisions of 14 Code of Federal Regulations (CFR) Part 91. The local personal aerobatic flight departed L08, about 1225. Visual meteorological conditions prevailed, and no flight plan had been filed.

Witnesses reported that during an aerobatic flight the airplane appeared to have departed controlled flight and the pilot was observed to leave the airplane followed by his parachute

deploying. The parachute did not fully deploy before the pilot impacted the ground. There were no reported engine anomalies.

Engine Data

Model	Serial Number	Total Time
AEIO-540-EXP	L-52636-08E	~350 Hours Since Field O/H

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

Case Match # K1027 Engine S/N on Case: L-52636-08E

Crankshaft S/N: V537952975

Last Annual Inspection by: I/A 2708500 Date 03/30/12

Last Overhaul by: Lycon Engines Date 2009

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

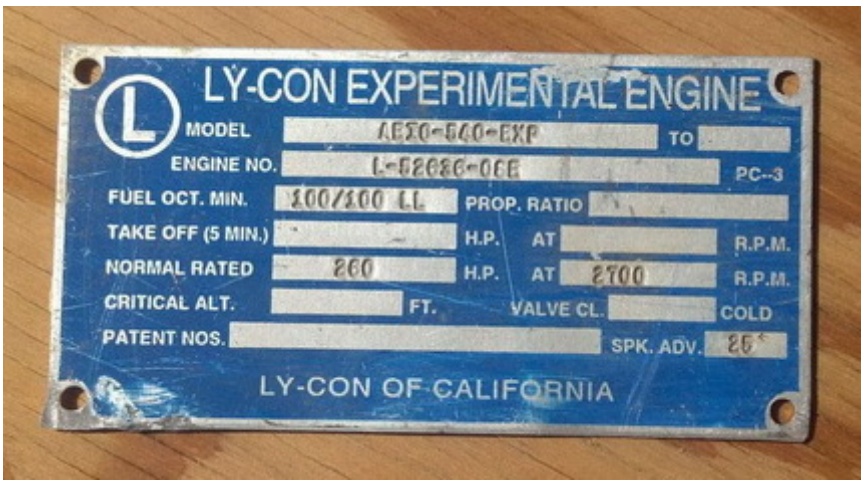
Evidence of Fire? ☐ Yes ☒ No

Comments:

There was no NTSB or Lycoming Engine travel to the accident site. On scene examination and documentation was performed by FAA inspectors and the airplane was recovered for further examination.

On September 18, 2012, Investigators from the NTSB, FAA, MXS Aircraft and Lycoming Engines convened at the facilities of Aircraft Recovery Service, Pearblossom, California where the aircraft was extensively examined.

According to the engine logbook and dataplate, the subject engine is a field overhauled experimental by Lycon of Visailia, California.



Reference the "Engine Observations" narrative for more information.

Engine Data

Propeller

Manufacturer	Part Number	Serial Number
Hartzell	HC-C3YR-4AX	peened over

Propeller Type ☐ Metal ☒ Wood ☒ Composite ☐ Unknown

Propeller Blade Serial Numbers:

Blade 1 unknown Blade 2 unknown

Blade 3 unknown Blade 4 n/a

Propeller Governor

Manufacturer	Part Number	Serial Number
unknown	unknown	unknown

Gasket Screen Condition: unknown

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 three bladed constant speed composite propeller remained attached at the crankshaft flange. The spinner was displaced from the propeller hub. The propeller blades were displaced near the root at the propeller hub due to the absorption of impact energy. Of the three propeller blades, only two were recovered.

The propeller governor was securely attached at the mounting pad with the pitch control rod securely attached at the control wheel. The governor was not removed for examination.

Engine Data

Fuel System ☒ Injection ☐ Carburetor

Manufacturer: Airflow Performance Model: FM-300A Setting: 5030050

Serial. No.: 20831657 Floats: ☐ Metal ☐ Composite ☐ Plastic

Fuel Screens

Carburetor/Injector Inlet: ☐ Clean ☐ Contaminated ☒ Unknown

Aircraft Main Fuel Strainer: ☐ Clean ☐ Contaminated ☒ Unknown

Flow Divider

Manufacturer: unknown Part No.: unknown Serial No.: unknown

Evidence of Fuel Found? ☐ Yes ☒ No ☐ Unknown

Injector Nozzles:

Type: ☐ One Piece ☒ Two Piece ☐ Unknown

Condition: ☒ Open ☐ Plugged ☐ Unknown

Fuel Pump: ☒ Diaphragm ☐ Geared ☐ Unknown ☐ None

Manufacturer: Lycoming Part No.: LW-15473 Serial # / Date Code: 2408

Fuel System Comments:

The fuel injection servo sustained moderate impact energy damage and 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 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 attached to the engine at the mounting pad. The fuel inlet line had been displaced from the pump due to the absorption of impact energy. The output fuel line remained secure at the fitting. The fuel pump was removed for examination and disassembled. The fuel pump remained free of internal mechanical malfunction and obstruction to flow. The diaphragm remained intact.

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. There was no fuel observed.

Engine Data

Ignition System:

Magnetos:

☒ **Left or** ☐ **Dual Magneto**

Manufacturer: Slick Model: 6355 P/N S/N 08051442
Impulse Coupling? ☒ Yes ☐ No Functioning? ☒ Yes ☐ No ☐ Unknown
Timing Checked? ☐ Yes ☒ No Results:
Damage: minor

Right Magneto

Manufacturer: Slick Model: 6355 P/N S/N 08103226
Impulse Coupling? ☒ Yes ☐ No Functioning? ☒ Yes ☐ No ☐ Unknown
Timing Checked? ☐ Yes ☒ No Results:
Damage: substantial

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, normal color	1 Bottom	not removed
2 Top	Undamaged electrode, oil soaked	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	Undamaged electrode, normal color	5 Bottom	not removed
6 Top	Undamaged electrode, normal color	6 Bottom	not removed
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: Not recorded
Part No.: Not recorded Serial No.: Not recorded
Comments:

Alternator:
Manufacturer: Not recorded
Part No.: Not recorded Serial No.: Not recorded
Comments:

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

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

☐ Stand-by Pump or ☐ Aux. Pump:
Manufacturer:
Part No.: Serial No.:

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 filter was secure at the mounting pad and was not removed for examination. The oil suction screen was free of contaminates when removed for examination. There was no evidence of pre-mishap metal contamination observed at the rocker box areas when opened for examination.

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 wreckage and engine were examined on September 18, 2012, at the facilities of Aircraft Recovery Service of Littlerock, California, under the auspices of the National Transportation Safety Board, Investigator in charge (NTSB-IIC).

The powerplant is a six cylinder, air cooled, direct drive, horizontally opposed, normally aspirated (fuel injected), internal combustion engine rated at an undetermined power.

The subject engine is a field overhauled experimental by Lycon of Visailia, California.

The engine remained attached to the airframe by the engine mount. The engine had sustained moderate impact energy damage at the forward lower section, which deformed the exhaust system and various induction system components. The rear cylinder pushrod tubes were displaced from impact of the engine mount. 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 crankshaft was rotated by hand utilizing the propeller hub. The crankshaft was free and easy to rotate in both directions. "Thumb" compression was observed in proper order on all six cylinders. The undamaged sections of valve train were 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 six 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 exhaust system was found free of obstructions.

The right 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 six leads during hand rotation the drive.

The left magneto was found securely clamped at the mounting pad. The impulse coupling was heard clicking during rotation of the crankshaft. Magneto to engine timing could not be ascertained, due to the destruction of the flywheel. The magneto was observed to produce spark at all six plug leads during hand rotation. The drive was observed to be intact and properly safetied.

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