LYCOMING
A Textron Company

Air Safety Investigation

Final Engine Test Report

Mishap Date:	February 28, 2002	**Mishap Time (24 hr.):**	0950 UTC
Aircraft Registration:	N33584	**Air Safety Investigator:**	Aaron L. Spotts
Aircraft Manufacturer:	Piper 1975	**Aircraft Model:**	PA-32-300
Location:	Hamilton, GA	**Aircraft S/N:**	32-7540107
On Scene Examination:	Yes	**Aircraft Damage:**	Substantial
Federal IIC:	C.A. Smith	**NTSB Report#:**	ATL02FA057

Engine:	Engine
Model	IO-540-K1A5
Serial Number	L-12899-48
Total Time	24.3 Hours Since Field O/H
Crankshaft S/N	71804
Case Match #	2522

Propeller:	Manufacturer	Part Number	Serial Number
	Hartzell	HC-C2YR-1BF	CH34755B

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

Registered Owner: E&F Flying Club, LLC
995 La Salle St.
Waterford, MI 48328

Operator: John A. Frazer

Phone Investigation Supplement: ☐ Yes ☒ No

Phone Investigation Performed by:

Field Investigation Supplement: ☒ Yes ☐ No

Field Investigation Performed by: Edward Rogalski-Lycoming

Engine Test Requested by: C.A. Smith-NTSB

Engine Test Conducted by: Paul Cox-NTSB/ Aaron Spotts-Lycoming

Engine Test Date: June 11, 2002

Test Location: Lycoming/ 652 Oliver St. Williamsport, PA 17701

Engine As Received or First Viewed

- Right magneto harness leads displayed heavy sealant at the attachment point to the magneto harness cap all leads.
- Right magneto observed to have sealant at magneto flange and magneto adapter attachment point.
- Right magneto flange broken at upper magneto clamp attachment point.
- Alternator damaged.
- Light damage to starter (accessory attachment boss broken.)
- Starter support assembly not returned with the engine.
- Bottoms of exhaust pipes observed to be cut separated.
- Light damage to #2 cylinder front cooling fins.
- Oil cooler displayed light damage.
- Both lower engine mounts broken and the top right engine mount was broken.
- Oil filter adapter broken and separate from engine as received.

Engine Data

Model	Serial Number	Total Time
IO-540-K1A5	L-12899-48	24.3 Hours Since Field O/H

Above engine Information taken from: Data Plate

Case Match # 2522 Engine S/N on Case: L-12899-48

Crankshaft S/N: 71804

Last Annual Inspection by: (See Field Report) Date (See Field Report)

Last Overhaul by: (See Field Report) Date (See Field Report)

Maintenance Records Attached? ☐ Yes ☒ No

Comments:

Engine Data

Propeller

Manufacturer	Part Number	Serial Number
Hartzell	HC-C2YR-1BF	CH34755B

Propeller Type ☒ Metal ☐ Wood ☐ Composite ☐ Unknown
Propeller Blade Serial Numbers: Unk
Blade 1 Unk Blade 2 Unk
Blade 3 Unk Blade 4 Unk

Propeller Governor

Manufacturer	Part Number	Serial Number
Unk	Unk	Unk

Gasket Screen Condition: Unk
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:
(See Field Report)

Engine Data

Fuel System ☒ Injection ☐ Carburetor
Manufacturer: Precision Model: RSA-10ED1 Setting: 2524273-12
Serial. No.: 43042 Floats: ☐ Metal ☐ Composite

Fuel Screens
Carburetor/Injector Inlet: ☐ Clean ☒ Contaminated ☐ Unknown
Aircraft Main Fuel Strainer: ☐ Clean ☐ Contaminated ☒ Unknown

Flow Divider
Manufacturer: Bendix Part No.: 78924 Serial No.: C412
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: Romec Part No.: RG17980D/M Serial No.: B-7838

Fuel System Comments: Upon removal of the servo fuel inlet screen, water was observed. Water was also observed upon removal of the fuel line at the pump outlet to the servo inlet. Approximately one ounce of water was captured. Water paste was used, (see digital photo's).

Engine Data

Ignition System:

Magnetos:

☒ **Left or** ☐ **Dual Magneto**

Manufacturer: Bendix Model: S6LN-1227 P/N 10-349370-4 S/N C179811GN
Impulse Coupling? ☒ Yes ☐ No Coupling Functioning? ☒ Yes ☐ No ☐ Unknown
Timing Checked? ☒ Yes ☐ No Results: as received 19 degrees B.T.D.C
Damage: None obsereved

Right Magneto

Manufacturer: TCM Model: S6LN-1209 P/N 10-349310-1 S/N A289842GN
Impulse Coupling? ☐ Yes ☒ No Coupling Functioning? ☐ Yes ☐ No ☐ Unknown
Timing Checked? ☒ Yes ☐ No Results: as received, unable to record a reading
Damage: Broken flange at magneto clamp attachment area.

Magneto Comments: Right magneto was slaved for the test run. Model: S6LN-1209, S/N: 8225202, P/N: 10-349310-1.

Spark Plugs

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

1 Top	Normal operation	1 Bottom	Not removed
2 Top	Normal operation	2 Bottom	Not removed
3 Top	Normal operation	3 Bottom	Not removed
4 Top	Normal operation	4 Bottom	Not removed
5 Top	Normal operation	5 Bottom	Not removed
6 Top	Normal operation	6 Bottom	Not removed
7 Top		7 Bottom	
8 Top		8 Bottom	

Spark Plug Comments: See Champion Aviation's Check-A-Plug chart (AV-27).

Ignition Harness

Tested: ☐ Yes ☐ No Condition: See engine run
Comments:

Compression Test:

☐ Engine Cold ☐ Engine Hot ☐ Thumb Method ☒ N/A
Comments:

Valve Action: Rotate Engine if possible to verify continuity through engine.

Comments: See engine run

Engine Data

Starter:

Manufacturer: Prestolite
Part No.: MZ-4222R Serial No.: L000072
Comments:

Alternator:

Manufacturer: Chrysler
Part No.: 4111810 Serial No.: 9902
Comments:

Generator:

Manufacturer: N/A
Part No.: N/A Serial No.: N/A
Comments:

Vacuum Pump:

Manufacturer: Airborne
Part No.: RA215CC Serial No.: A4028
Comments:

☐ Stand-by Pump or ☐ Aux. Pump:

Manufacturer: Unk
Part No.: Unk Serial No.: Unk

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: There is two oil coolers with this installation.

Engine Data

Turbo System: ☒ **Page Not Applicable on this engine model.** ☐ **No Turbo Supplied.**
☐ **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

Engine serial number L-12899-48 was removed from the secured shipping container and installed on a ring and skid.

The following was accomplished in order to prepare the engine for test:

- Removed all airframe baffling.
- Removed both oil coolers.
- Vacuum pump was removed and a cover plate was added at the mounting pad.
- Removed right magneto due to the broken flange.
- Installed front crankshaft plug.
- Installed slave starter ring gear support.
- Installed slave right magneto and timed at 20 degrees B.T.D.C.
- Installed prop governor cover plate.
- Installed slave oil filter adapter.
- Capped manifold pressure fitting at #5 cylinder.

The oil suction screen had been removed from the engine, as received, with no debris observed.

The oil filter element had been removed from the oil can, as received, with no debris observed.

The fuel inlet screen was removed and water was observed.

The fuel line from the engine driven pump to the fuel servo and water was observed.

The engine was transported to the test cell area and installed on test cell 2-3. All required test equipment was installed.

The engine was started without any problems. The engine was run at various test points for approximately 25 minutes. It was determined that the oil pressure was low for the given rpm value so a white oil relief spring was installed (see Lycoming's "Service Table of Limits"). The use of the lower pressure oil relief valve spring is most likely due to the dual oil cooler installation. The test run continued with acceptable results. The engines maximum-recorded speed was 2714 rpm. The engine test run was concluded.

Narrative

Engine serial number L-12899-48 was built as an IO-540-K1A5 and shipped to Piper Aircraft Corporation, Vero Beach, Florida on January 4, 1975. The engine was not returned to Lycoming until after the mishap on February 28, 2002.

The engine test run results show that the engine was capable of producing power. The engine as tested, was within new engine fuel flow limits. There were not any discrepancies or anomalies that would indicate the engine was not capable of running and producing power prior to the mishap.

The engine serial number L-12899-48 was released by the NTSB-IIC on June 12, 2002 and was shipped same date, to Atlanta Air Salvage, Griffin, Georgia.

Witnesses

Name & Address	Phone	Statement Included [Y/N]	Remarks:
Unk	Unk	Unk	Unk

Wreckage Disposition

Insurance:	Salvage:
Unk	Atlanta Air Salvage

Investigative Participants

Name & Address	Phone	Organization
Paul Cox	[redacted]	NTSB
Aaron L. Spotts		Lycoming
Lee Netterblade		Lycoming

Investigator Name:	Aaron L. Spotts	Date: June 6, 2002
Signature:	[redacted]	