

Carter Aviation Services

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NTSB Accident Report



N7511D

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Airframe











Induction system was not obstructed. Fuel system was functional and had adequate fuel for flight. Oil Filter was not safetied. The oil sump screen was falling apart. Idle stop screw almost maxed out on adjustment. Magneto timing at 23deg BTDC on initial check. Performed engine ground run. Engine idle rpm seemed high and sounded like it had a dead cylinder/ misfire. The governor would not control engine rpm. Magneto drop test was not within limits. LH at 10% drop and RH 15% at drop. After engine run the oil filter was cut open and inspected. metal was found in filter and a sample was bagged and collected by FAA inspector. An oil sample was taken and sent to Blackstone for analysis. Differential compression test was performed revealing pore cylinder performance. Magneto timing checked after engine removal and was found at 21 deg BTDC on LH mag and 22 deg BTDC on RH mag. Bottom spark plugs fouled with oil and lead. Governor removed and sent to FAA for testing. Engine disassembled and findings listed below.

Cylinder 1

- Differential Compression Hot 60/80 psi
- Borescope inspection shows coking on exhaust valve and slight longitudinal scratching on cylinder wall at 12:00 position
- Exhaust valve shows signs of getting too hot
- Lifter face hammering
- Cam lobe excessively worn







Cylinder 2

- Differential Compression Hot 18/80 psi
- Differential Compression Cold 60/80 psi
- Compression ring #2 frozen
- Lead Buildup
- Rust on cylinder wall
- Sludge buildup on intake valve

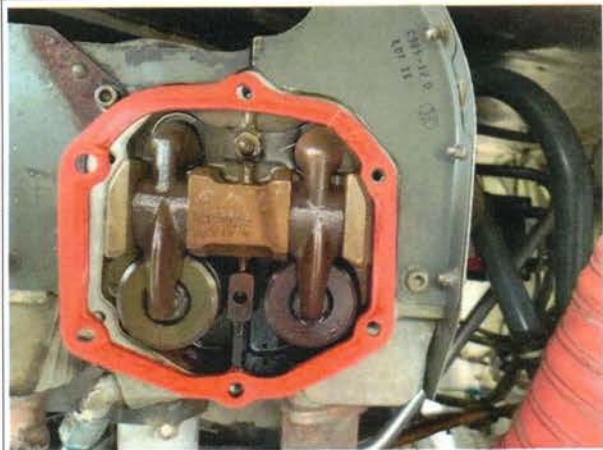


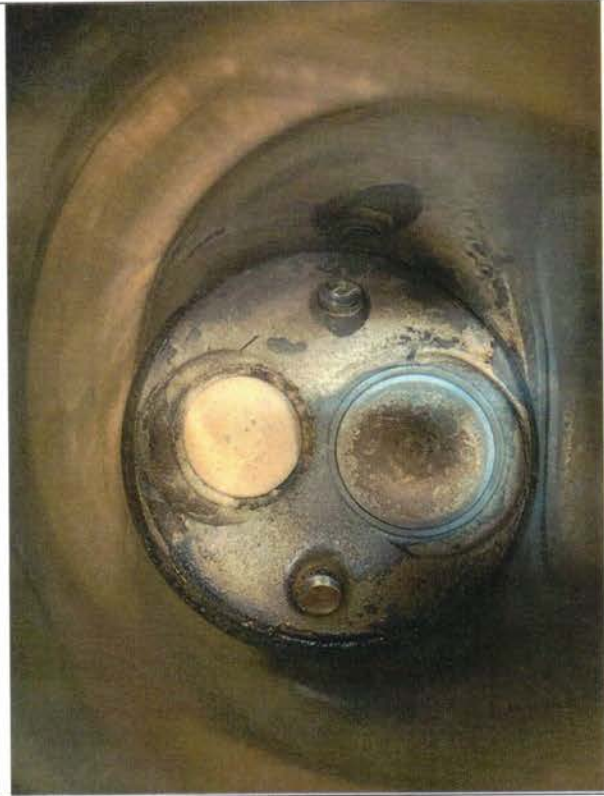




Cylinder 3

- Differential Compression Hot 73/80 psi
- Slight lead buildup
- Slight discolorization on exhaust valve
- Normal wear for high time engine



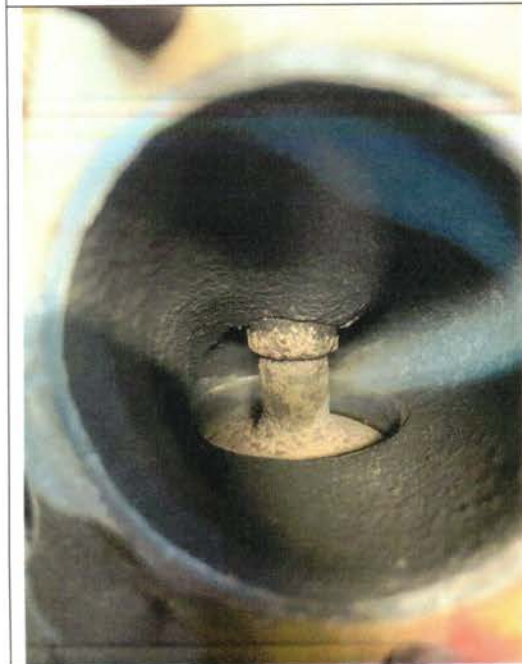
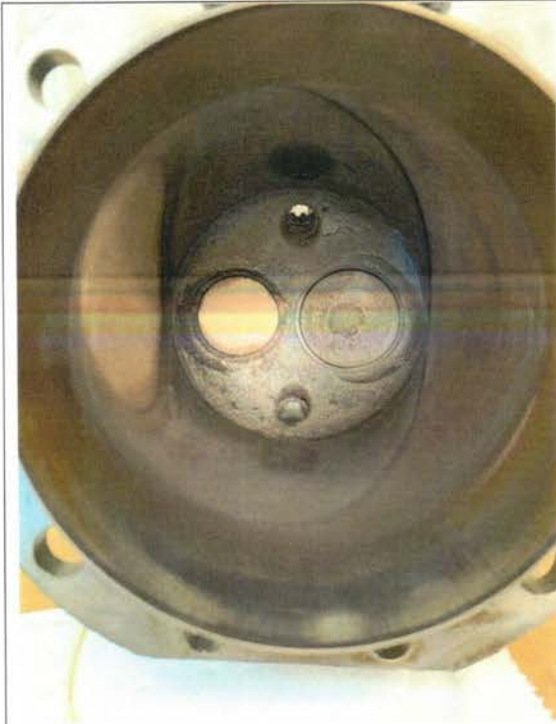




Cylinder 4

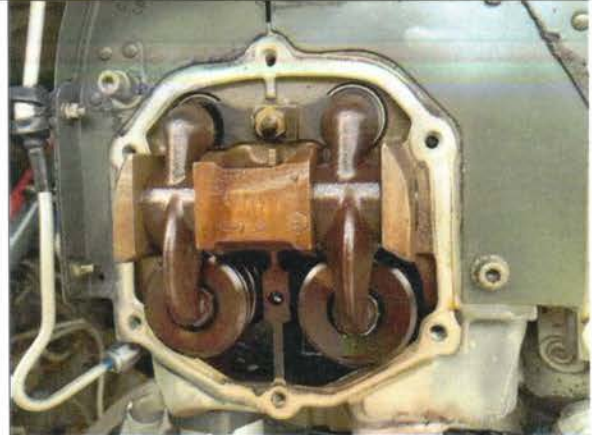
- Differential Compression Hot 76/80 psi
- Dicolorization on exhaust valve due to heat
- Slight lead buildup
- Piston ring clearance excessive
- Sludge buildup on intake Valve

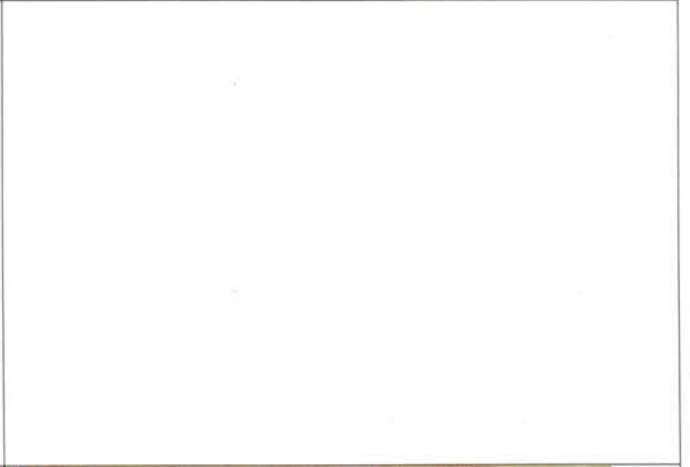




Cylinder 5

- Differential Compression Hot 72/80 psi
- Dicolorization on exhaust valve due to heat
- Sludge buildup on intake valve
- Spots on cylinder wall
- Piston ring clearance excessive

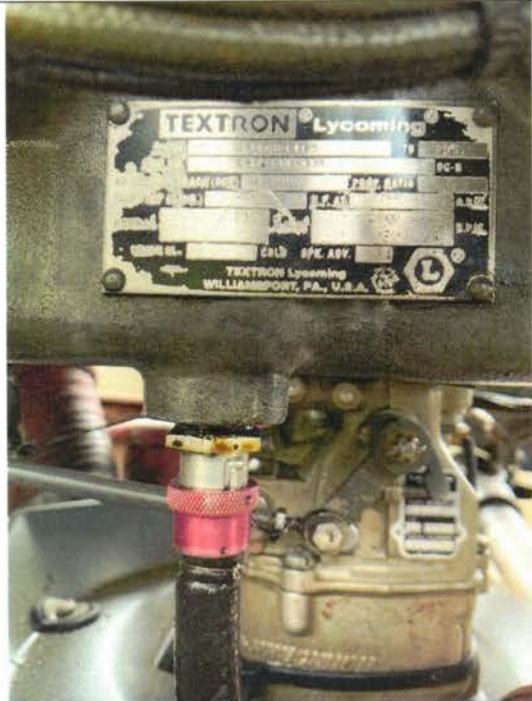




Cylinder 6

- Differential Compression Hot 60/80 psi
- Exhaust valve getting hot
- Lead buildup
- Excessive oil in cylinder
- Sludge buildup on intake valve
- Piston ring clearance excessive





Systems check protocol for N7511D

If any anomalies are found, make a record of issue and determine Cause and Effect (pre-impact or post impact, will it hinder this test, will it cause a safety hazard, can it be simply repaired for the purpose of this test?) If clarification is required contact Thom Webster (RHC) at [REDACTED] or Courtney Liedler (NTSB) at [REDACTED]

- Ignition switch OFF ✓
- Disengage clutch switch - all switches OFF - Gov OFF ✓
- Pull all circuit breakers ✓
- Mixture knob - pull full lean ✓
- Fuel valve OFF ✓
- Check fuel level ✓
- Check gascolator screen - Check amount of fuel in bowl - Reinstall and secure bowl ✓
- Sump both tanks - ✓
- Add fuel to main tank if necessary - sump main tank ✓
- Fuel valve ON ✓
- Check fuel system for leaks ✓
- Fuel valve OFF
- Remove intake duct from airbox ✓
 - Air filter clean ✓
 - Intake duct clear ✓
 - Carb heat slider operates properly ✓
 - Reinstall duct ✓
- Remove upper spark plug access panels ✓
- Visually inspect push rod tubes for damage (possible bent push rod) ✓
- Disconnect and Inspect ignition leads - upper and lower ✓
- Remove spark plugs - number plugs for reinstallation - Serviceable? ✓
- Check magneto security ✓
- Check ignition harness security ✓
- Check P-Lead security - check 2 pin wire connector on right magneto (tach) wires - check for wire repairs in area ✓
- Mark and Remove V-belts - suggest cutting ✓

Borescope Findings

Cyl #1 - exhaust valve is getting hot + burning
Longitudinal scratching along cylinder wall 12 o'clock position.
Coking on Valve Stem Exhaust Side

Cyl #3 - Not bad, normal wear

Cyl #5 - Not bad, normal wear, slight amounts of lead.

Cyl #2 - lots of lead @ top of barrel, rust on cylinder wall 3 o'clock pos.

Cyl #4 - slight coking on exhaust valve

Cyl #6 - exhaust valve getting hot, slight coking

Compression

#1 $\frac{60}{80}$, #2 $\frac{46}{80}$, #3 $\frac{73}{80}$, #4 $\frac{76}{80}$, #5 $\frac{79}{80}$, #6 $\frac{60}{80}$

Remove rocker covers – inspect for anomalies ✓

Rotate crankshaft by hand using cooling fan or socket/ratchet on fan nut. ✓

Ensure smooth rotation – no anomalies – rockers operate properly ✓

Check thumb suction and compression on each cylinder ✓

Check for spark at each ignition lead – requires spinning fan a lil faster ✓

Using a borescope, inspect inside each cylinder ✓

Reinstall rocker covers ✓

Check magneto timing – Do not correct if timing is off at 23° ✓

Reinstall spark plugs and secure ignition leads – Panels can remain off ✓

Drain oil into clean container – to be reused ✓

Remove oil suction screen – inspect for debris Note: Oil filter will be checked later

NOTE: IF DEBRIS IS FOUND IN SCREEN, DO NOT PROCEED. Contact IIC

Reinstall oil suction screen Too Damaged to Reinstall

Return oil to crankcase ✓

Check oil level ✓ added 2 qts AcroShell 15w50

Check mixture control – Knob operates – arm on carb has full travel – Pull mixture knob full up ✓

Check throttle control – Grip operates – arm on carb has full travel – arm on carb operates with collective movement Throttle binds with collective down due to frame damage ✓

Perform an overall visual inspection of engine to ensure there is no damage that could cause a safety hazard while operating the engine (broken exhaust pipes, oil lines, cooling panels, debris in cooling scroll, etc.) ✓

Disconnect wire connector to actuator motor ✓

Check battery condition and connections ✓

Close the following circuit breakers: Clutch Start, Horn Start, Tach E, WARN LTS, Gages, GOV and ALT ✓

Clear engine area and engage the starter switch momentarily to ensure switch is operational – ✓

If not; ensure rotor brake is OFF – Check rotor brake switch on MRGB for damage & jump terminals if necessary. ✓

Fuel valve ON ✓

Clear engine area and perform normal starting procedure – Do not engage clutch

NOTE: ENGINE WILL IDLE AT A HIGHER THAN NORMAL RPM ✓ 65-70%

Expect some gray smoke out the exhaust at first ✓

Ensure oil pressure ✓

Engage ALT switch – ensure charge ✓

Let idle for 1-2 minutes – ensure no anomalies (sound, gages, etc.) ✓

Roll throttle open to 75% and perform Magneto Drop checks -7% max in 2 seconds

LH 10% RH 15%

Manipulate magneto P-lead wires by hand to ensure no intermittent grounds ✓

Slowly raise collective – ensure a rise in RPM – lower collective – ensure a reduction in RPM

NOTE: Low RPM horn and light will activate when raising collective

Governor
Not Working
Properly

Switch Governor ON – roll throttle open to 80% and allow governor to raise RPM

will not latch at 80%

NOTE: RPM WILL FLUCTUATE AROUND 102% DUE TO NO ROTOR

Check gages – ensure no anomalies (sound, gages, etc.)

Using throttle grip, reduce RPM to 90% and release to allow governor to return RPM to around 102%

reduce RPM to 81% and release to allow governor to return RPM to around 102%

Ensure no anomalies

Switch governor OFF – adjust throttle for 102%

Apply full carb heat – Ensure carb temp rise – close carb heat

✓ ok

Close throttle – allow to idle ✓

Ensure no anomalies ✓

Pull mixture knob – switches OFF – ✓

Perform compression test ✓

Remove oil filter – cut filter open – ensure no debris ✓

Report results to IIC

7-29-20

Christopher S. Lore
A10 #

Rotors





8-15-2020

Date

Christopher S Lore

Name Printed



Signature

A&P#