

Maintenance on Amateur-Built Aircraft

**By: Vic
Syracuse**

Vic Syracuse

- **11-time Aircraft Builder**
 - **RV-4, RV-6, RV-7A, RV-8, 3- RV-10's, Prescott Pusher, Kitfox Models II, IV Speedster & 7, Just SuperSport, Hummingbird Helicopter (Grand Champion)**
- **DAR for Atlanta MIDO 19 years (national coverage)**
- **EAA Tech Counselor & Flight Advisor (60+ First Flights)**
- **Commercial Pilot, ASMEL, ASES, RW Helicopter, CFII, A&P/IA (11600 hours, 75 different types of aircraft)**
- **Author 'Checkpoints' Sport Aviation; Kitplanes "Diagnosis" & "Unairworthy"; Base Leg Aviation You Tube, Maintenance Handbook for RV Aircraft, Prebuy Guide for Amateur-built aircraft, Are your Nuts Tight, & Flying to Alaska**
- **Owner/Founder Base Leg Aviation**
- **EAA Hall of Fame Inductee**

**The purpose today is to help
you know where to look on non-
builder-owner AB aircraft**

Don't Be This Guy!



Less than 30 hours of flight



Out with the old...

Amateur-Built aircraft builders were issued Repairman Certificate

The Repairman Certificate was specific to one aircraft

The Repairman Certificate was only issued once to the original builder

Condition Inspections could only be completed by the holder of Repairman Certificate or A&P

In With the New...

MOSAIC enables Conditions Inspections to be performed on non-builder-owned AB aircraft by owner with completion of 2-day Light Sport Repairman Course.

WOW!

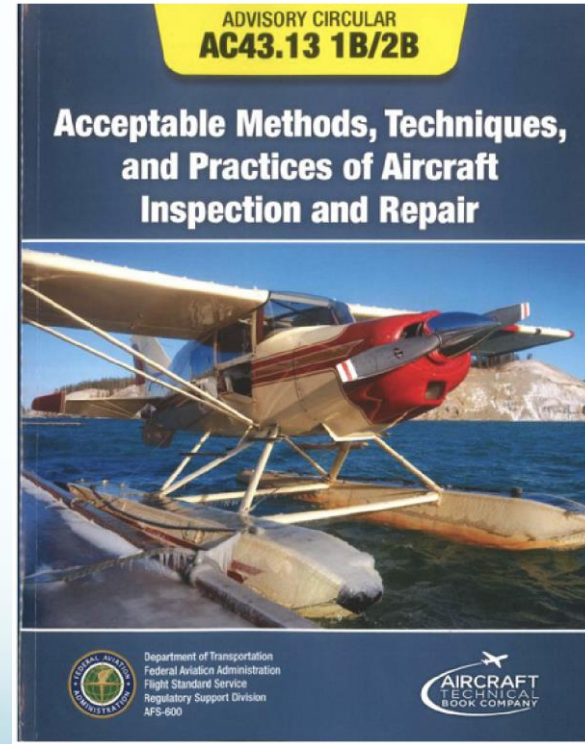
Lots of new freedom comes with lots of responsibility!

Being Responsible starts with Education

- **Lots of on-line material available**
 - **EAA video library**
 - **Manufacturer's websites**
 - **EAA tech counselors (not just for building!)**
 - **Type-specific forums**
 - **EAA Sport-Air workshops**

AC 43.13-2b

- No excuses—it's online or in hardcopy.
- It is the rulebook on what's acceptable



Get to Know your aircraft

- What are others seeing as maintenance items?
- Review manufacturer's website regularly for SB's
- Pay attention to any modifications (this is a young fleet)
- Take the time to inspect engine compartment at every oil change

What is a Condition Inspection?

- **Defined in Operating Limitations: Inspection IAW the scope and detail of FAR Part 43 Appendix D**
 - **Required annually**
- **Paperwork/logbooks are just as important as the aircraft**

When Can I Do It?

- **Anytime!**
- **It doesn't have to be completed all at once (my favorite approach)**

Treat the various systems individually, and soon you will be familiar with your aircraft

Engine & Propeller

SB Compliance

Oil System

Operational Checks

Fuel System

Paperwork

Air System

Airframe

Ignition systems

Exhaust System

Consider starting with Air/Fuel/Spark

Air System

- **Check alignment of intake to cowl (engine sag)**
- **Check air filter for damage and dirt**
- **Check intake gaskets for brittleness and leaks**
- **Check intake hoses for deformation**
- **Check operations of carb heat and alternate air**
- **Check security of air boxes and drain holes**

Air Filter



Air filters are not lifetime use



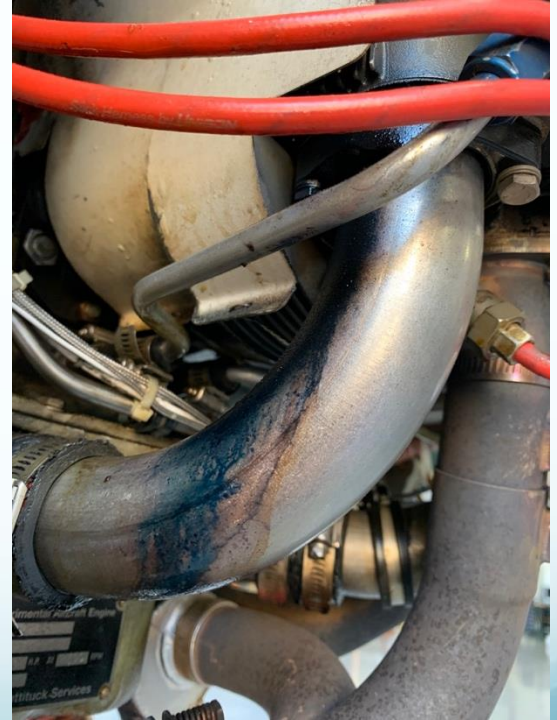
No fillers!!!



Air inlet problem areas



gaskets



Check all SCAT tubing



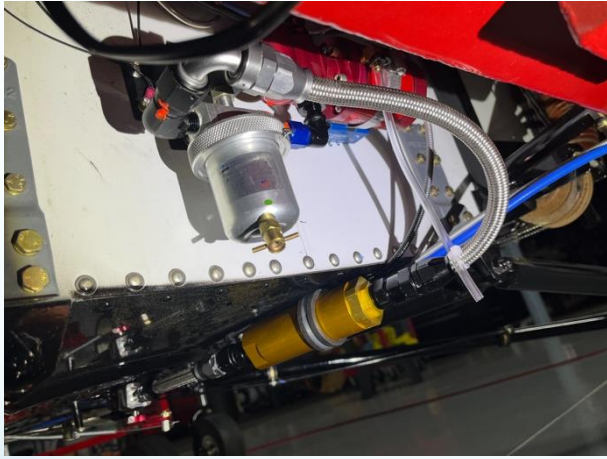


**No BOTH
allowed for RV
fuel selectors!!!**

Fuel System

- Know where the fuel filters are located
- Drain gascolator if installed and check screen for contamination
- Check quick drain on gascolator and wing sumps for leaks. Replace O-rings if needed
- Remove and clean inlet filters on carburetor or fuel servo as appropriate
- Only clean fuel injectors if necessary, making a note as to which cylinder they are removed from
- Check fuel valve/fuel caps for proper operation and placarding

Check fuel filters and gascolator screen



Be sure to ask for the location of all fuel filters!

Don't Trust!

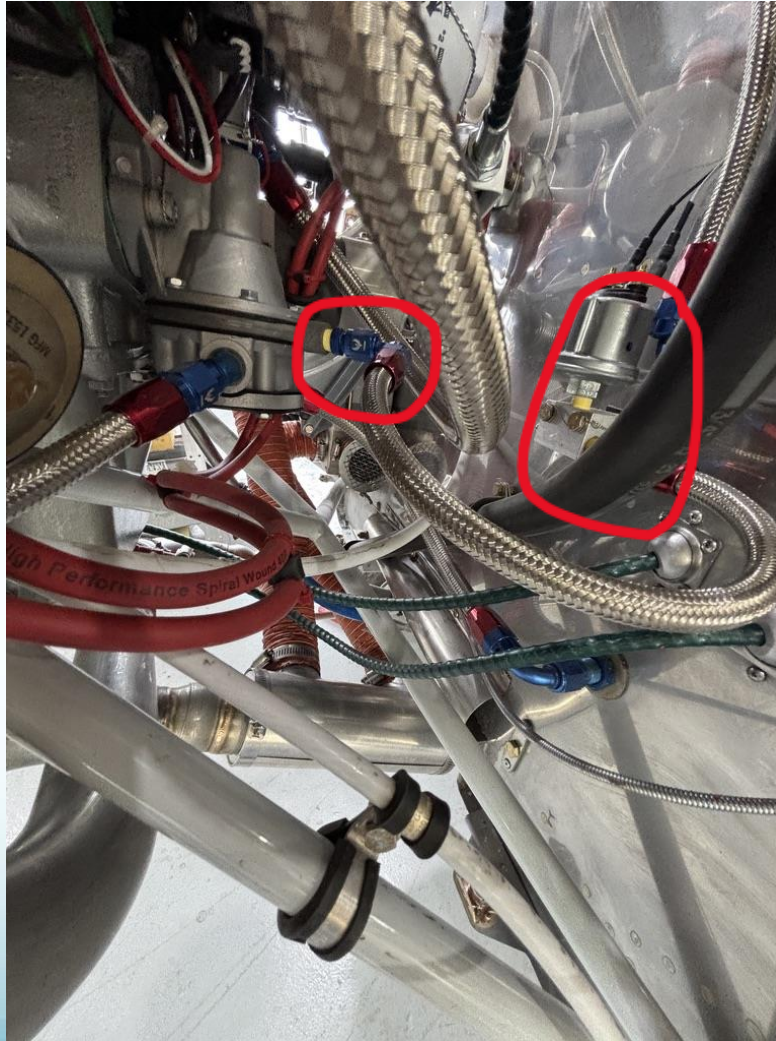
**Inlet and outlet of fuel pump require
A special fitting that uses an O-ring**



**Improper fuel pump fitting
and
Use of Teflon tape!**

Not every builder Gets educated

**Fuel pump overflow tube
Routed to fuel pressure sensor**



NO RTV on fuel system fittings!!!



Check Fuel Drains



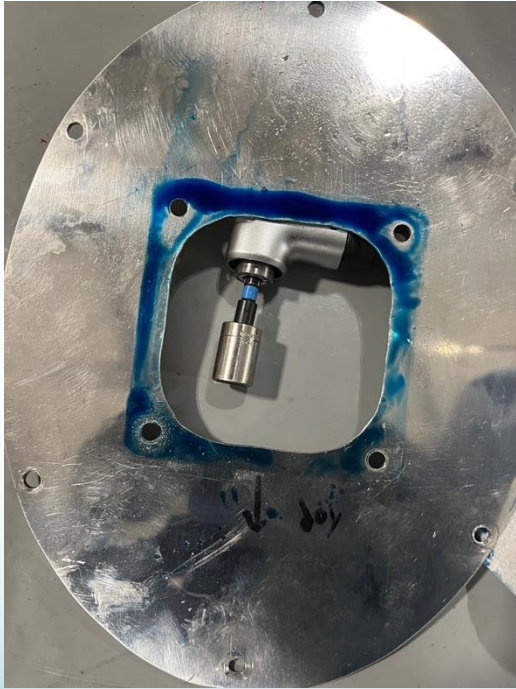
Check primer lines



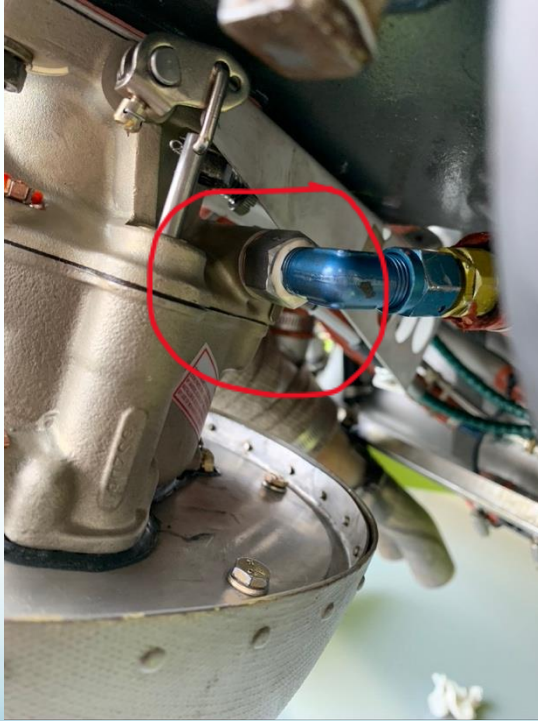
Unacceptable
repairs



Leaking Carb—Fire Hazard



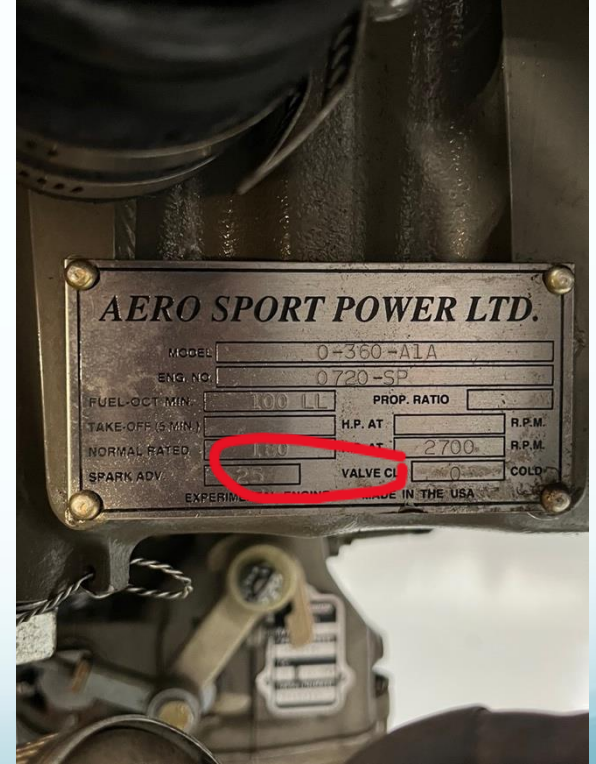
Fuel inlet screens



Ignition Systems

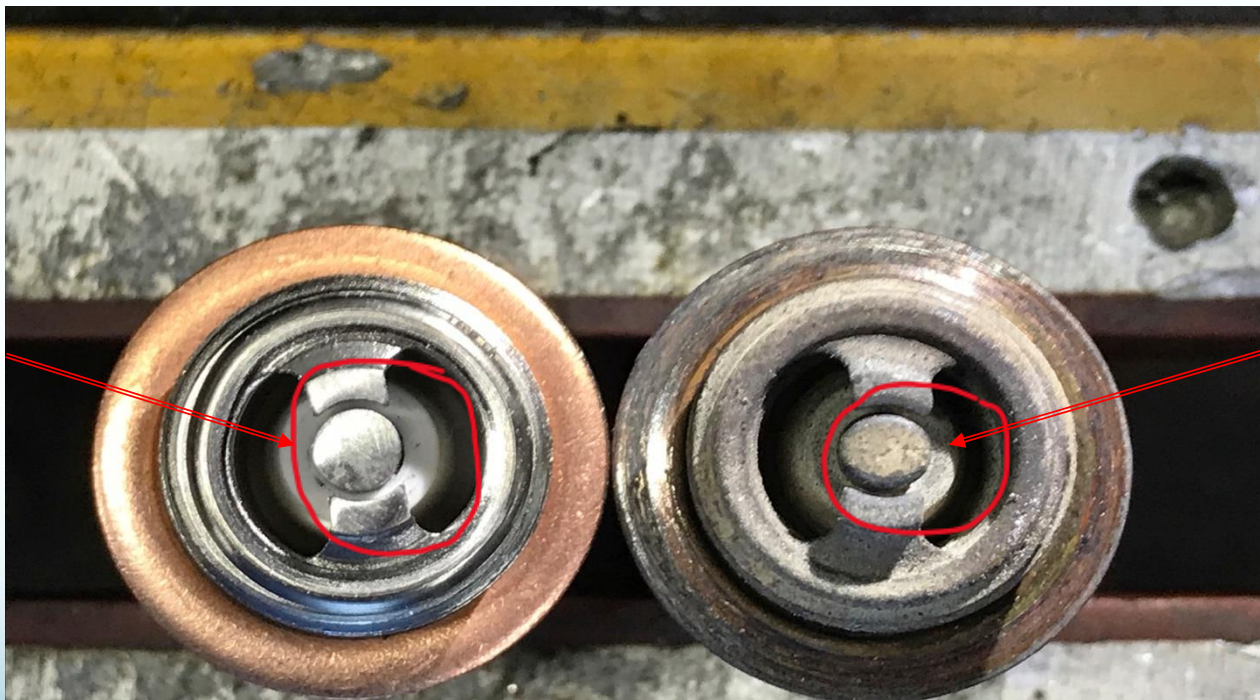
- Check all spark plugs for color, fouling, gap, and resistance
- Check magnetos for proper timing & grounding (Dangerous!)
- Check electronic ignition for security, timing
- Check backup battery if installed for electronic ignition
- Check all harnesses for damage
- Check manufactures' recommendations for any time or life-limited components such as plug wires, contact points, or 500 hour inspections (Slick Mags), gear inspection (PMAG's).
- Reinstall all plugs with new copper washers (flat side towards plug)

Check Ignition Timing



Check Plugs for Wear

Round
electrode



Football
Shaped
electrode

New

Worn

Gap the plugs!



**Gap Aviation Plugs
.016"-.018"
At least every 100
Hours**

**Replace EI plugs
Every 100 hours**



Always Check Plug Resistance



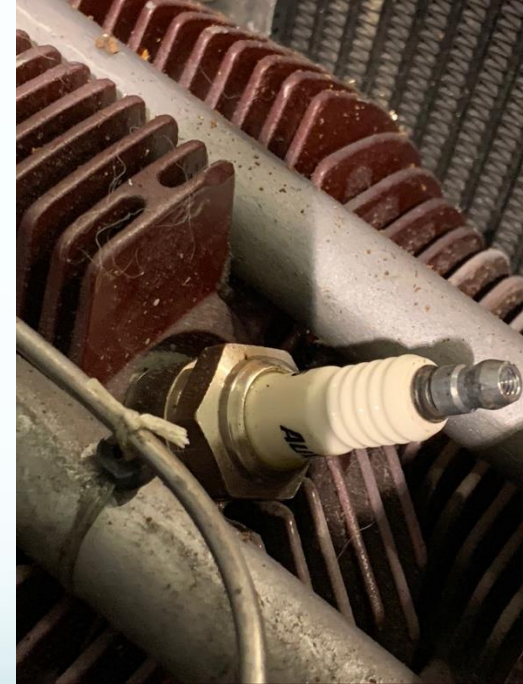
< 2K is optimal
for aviation plugs



Not all fine wire
plugs are equal

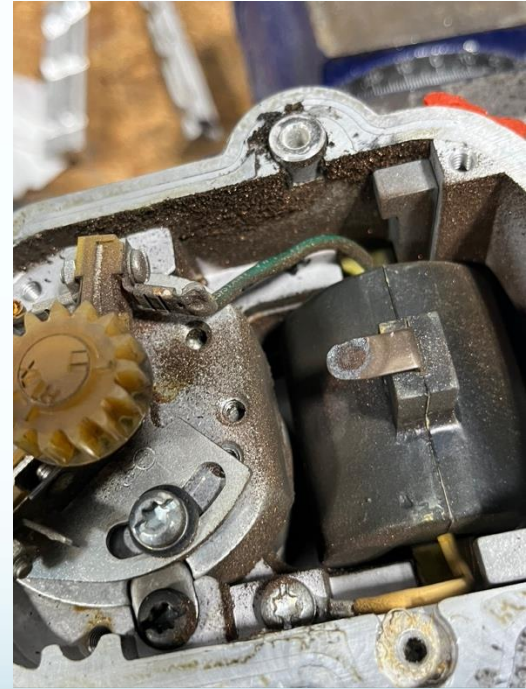


Spark Plug Connections



Use solid plugs instead of removable tips

Slick Mag 500 hr SB



Replace the cushions on 6-cylinder magnetos



PMAG SB's

- *Cotter key
- *Shaft play
- *s/w updates



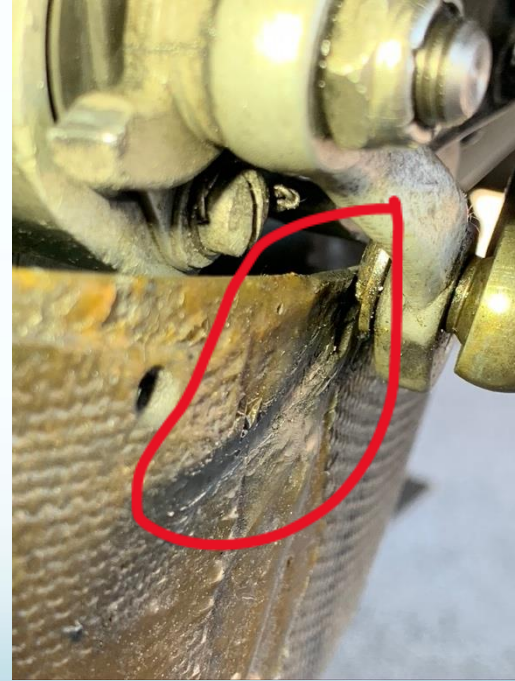
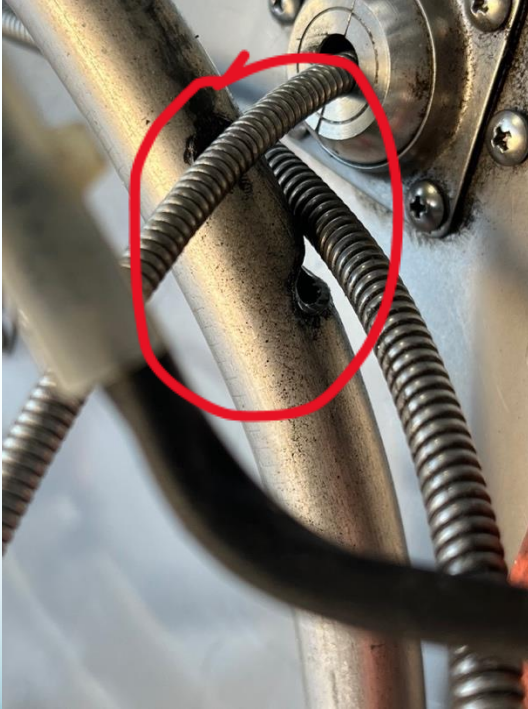
Engine & Propeller

- **When removing cowling note any signs of rub marks, interference, or oil leaks**
- **Perform general inspection of engine compartment looking for leaks, chafing, loose connections, broken baffles, mounts, exhaust mufflers, exhaust system, corrosion**
- **Remove spark plugs noting location, color, and wear**
- **Perform compression test (Be careful!!!)**
- **Borescope cylinders and valves, especially if compressions less than 70/80 cold**
- **Check engine controls for proper travel, no binding, and security**
- **Check intake and exhaust gaskets for leaks and proper torque**
- **Check all wiring for security and proper sizing**

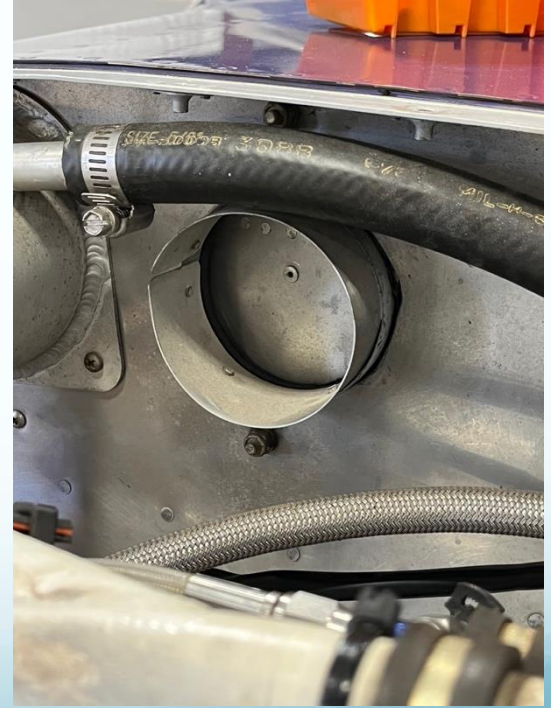
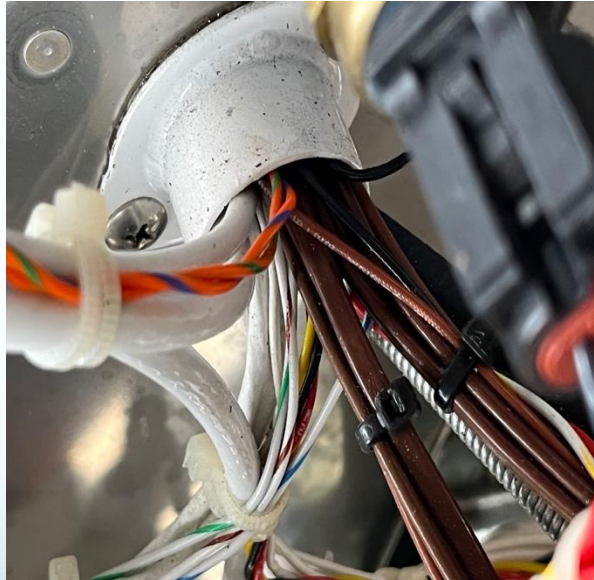
Engine & Propeller (cont.)

- **Check propeller blades for nicks and bolts for proper torque**
- **Check propeller for overhaul requirements if applicable**
- **Check spinner for cracks**
- **Check flywheel for broken teeth**
- **Clean engine**

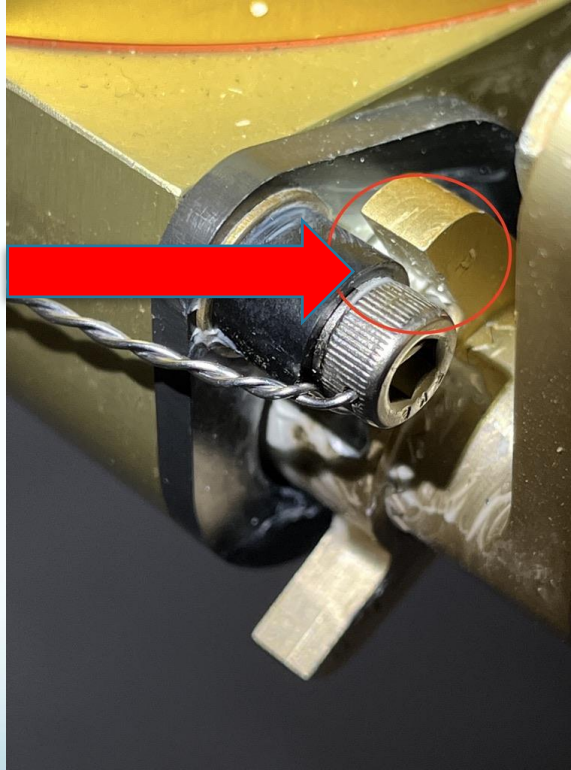
Check for chafing



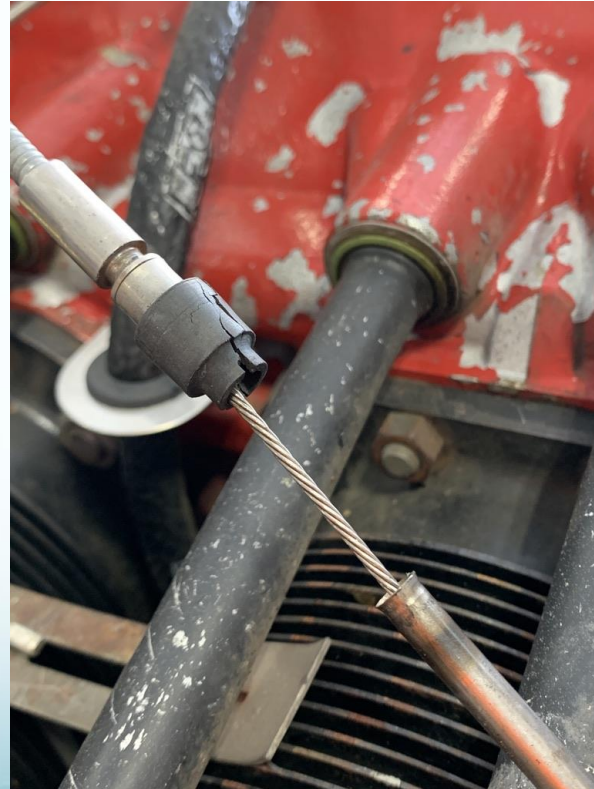
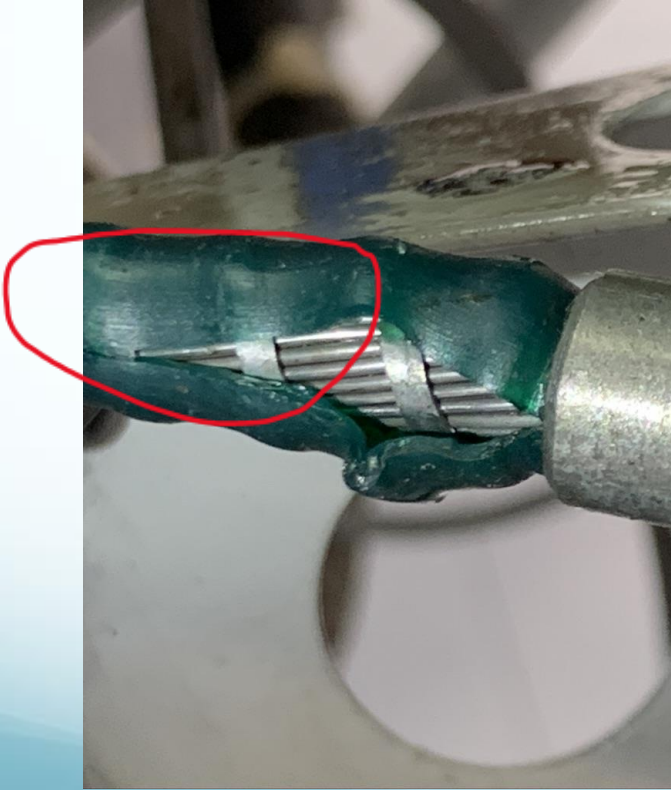
Seal all firewall openings



Check controls for full travel



Engine control problems



Low compression may warrant further checks



Burnt valve

Borescope Valves and cylinders

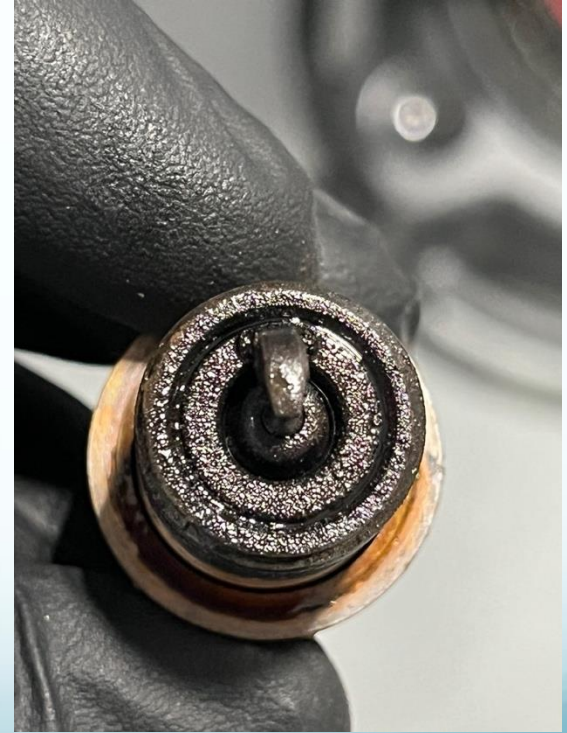
**Good Exhaust
Valves**



Rust

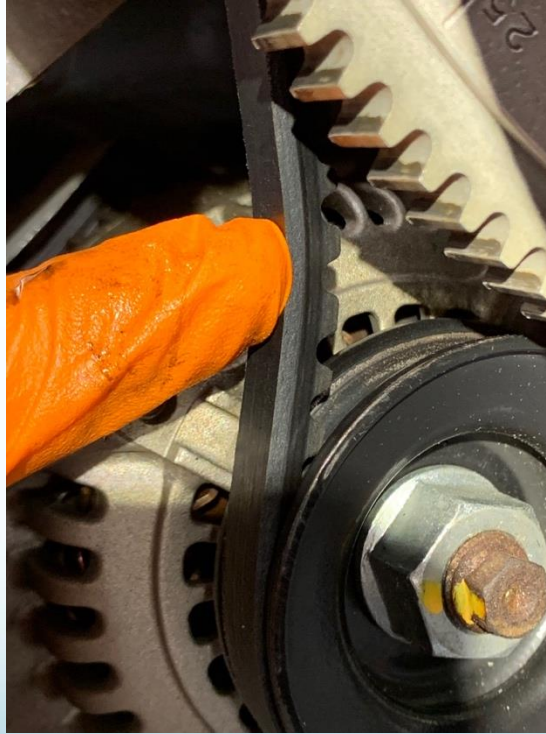


Black Oil=Blowby



Black Oil after 1 hour of flight time

Alternator components



Prop Overhaul Time?



There are calendar and service time limits for constant speed props, e.g., 8 Yrs. or 2000 hrs. on Hartzell props, 6 years & 2000 hours on MT



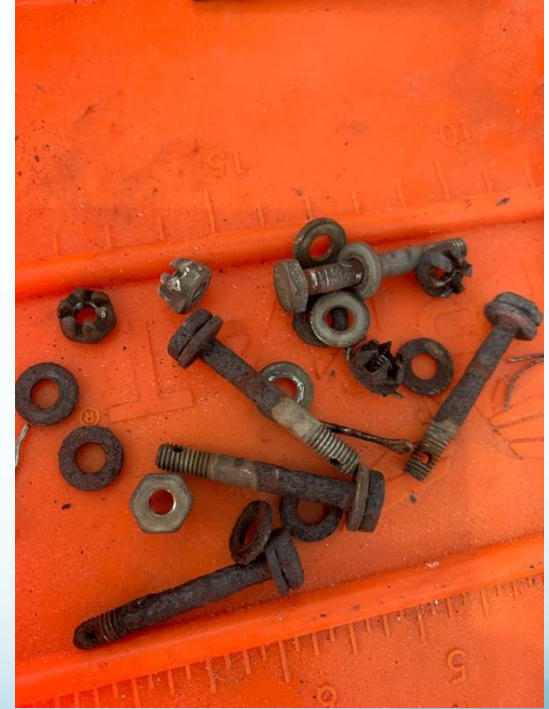
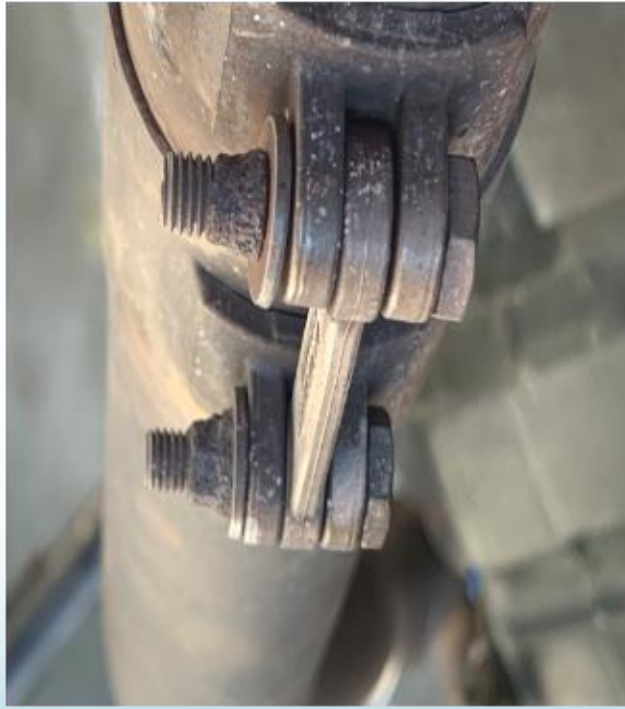
Condemned from overhaul



Exhaust System

- **Check for security of mounts**
- **Check exhaust flanges for cracks**
- **Check exhaust gaskets for leaks**
- **Check exhaust links for movement**
- **Be sure to lubricate any moving parts (Mousemilk)**
- **Check for broken/missing springs on Rotax exhaust**

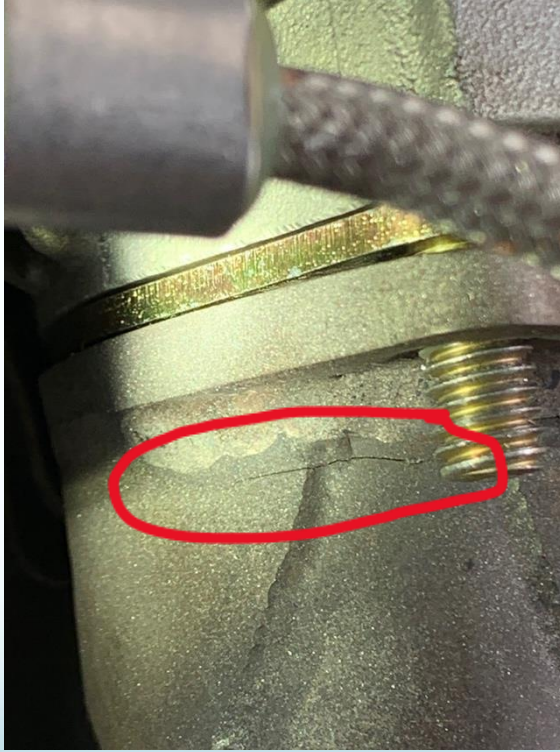
Check Exhaust links & hardware



Check exhaust gaskets & springs



Check exhaust and heat muffs for cracks



Check breather lines



**Blockage at
exhaust
connection**

No Exhaust wraps!



Oil System

- **Drain oil and take sample for oil analysis if so desired**
- **Remove sump drain and check for particles/contamination**
- **Check oil hoses for date codes, flexibility, and leaks**
- **Check oil cooler and oil cooler mounts for cracking**
- **Remove oil screen or oil filter as appropriate**
- **Clean oil screen and cut open oil filter, checking for contamination**

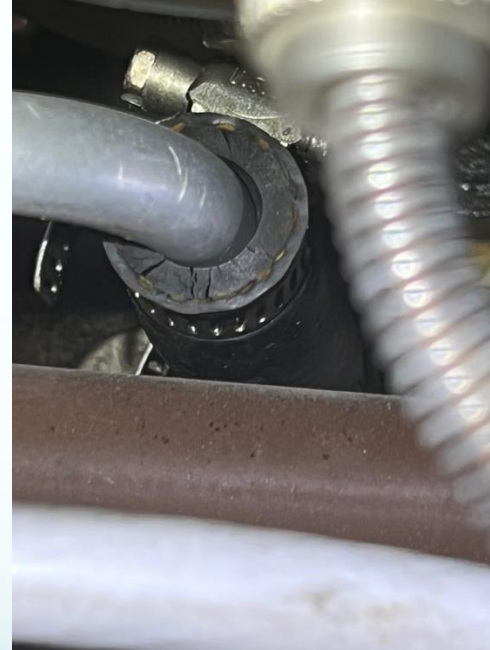
Oil System cont.

- **Reinstall new oil filter (Dow 4 on gasket except for Tempest EZ-Spin) and sump drain (new AN 900-16 crush washer on sump drain)**
- **Check oil filler tube for security, leaks, and proper marking**
- **Check oil drain-back hoses below cylinders for security and leaks**

Check Oil screen for contaminants

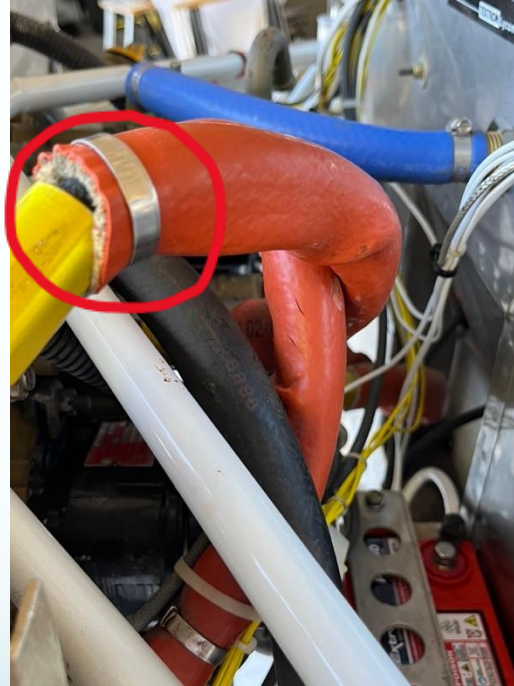


Cylinder Drainback Hoses



**Replace hoses with Mil 6000-6
When replacing intake gaskets**

Check date codes and flexibility



Pull back firesleeve to see date codes

Cracked Oil cooler Mount



Repaired using
.063" x 1" x 1"
Angle aluminum

Check Pressure senders for leaks and security



**Kavlico senders have a SB
for potential leaking**

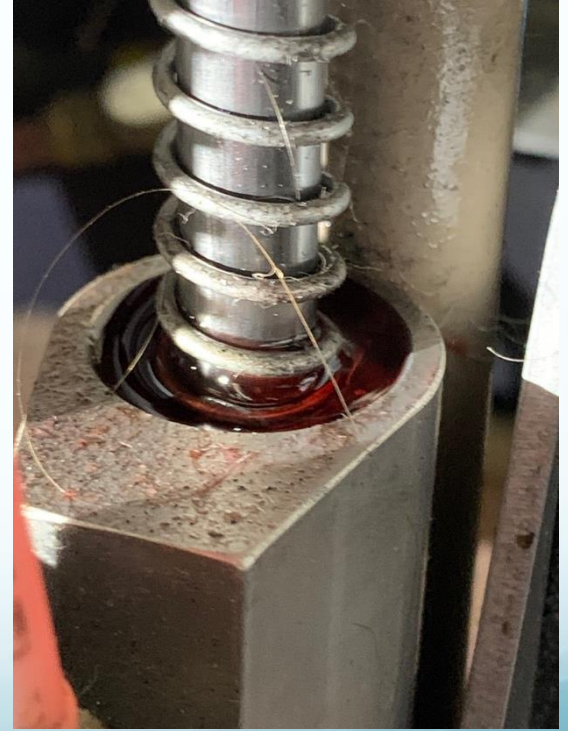
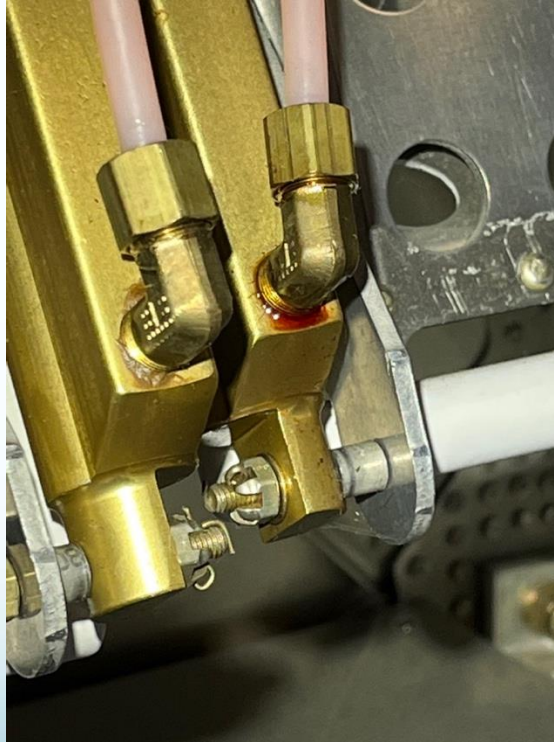
Airframe

- All controls for freedom of operation and full deflection
- Inspect brakes for wear and leaks
- Inspect/replace tires and tubes
- Check or repack wheel bearings
- Lubricate controls
- Check for security of all control stops and jam nuts
- Check Tail wheel control systems (cables, linkage, springs, bearings)

Airframe (cont.)

- **Use Crosscheck/torque seal**
- **Check for skin damage, loose connectors, smoking rivets**
- **Drill stop holes for cracks**
- **Check canopy or door latch mechanisms for security**
- **ELT annual operational check and battery expiration check**
- **Shock cords should be checked for broken strands**

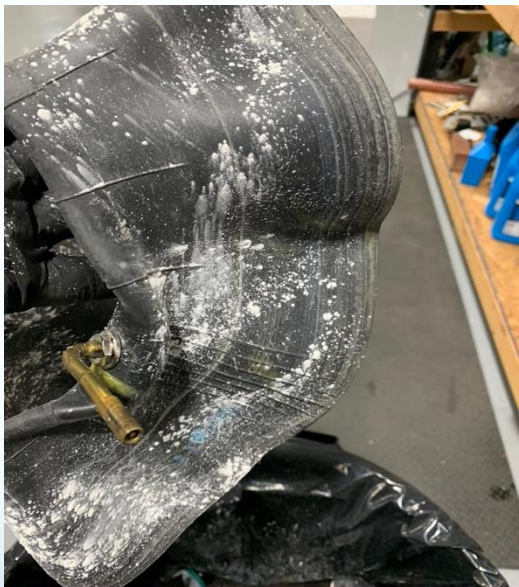
Leaking Brake Master Cylinder



Tires & Tubes



Talcum Powder & Alignment



**Liberal use
Of Talcum
Powder on Tube**

**Don't reuse
Old tubes!**



**Align Stem
With Dot on Tire**

Check Wheel Bearings



Tail Wheels need TLC too!



Worn Brake Pads



Wear Indicator



Proper rivet pressure!



**Don't use a
hammer to
set the
rivets**

Check Electrical Connections



Check lights



Loose crimps/corroded grounds



Van's SB on premade crimps



Jamnuts! Jamnuts! Jamnuts!



ELT Battery



**Don't forget the
10-yr battery
replacement in
the control
module**

Annual Ops check required; 406's more often

Check Steps for Cracks



SB's should be performed

Flap Motor



Motor Mounts



Note Gap

Paperwork!!

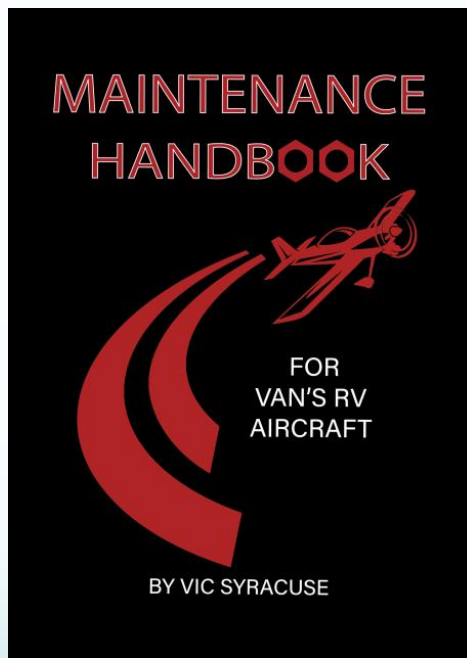
- **Operating Limitations are part of Airworthiness Certificate and need to be in the airplane**
- **Verify Proper Phase I signoff**
- **Verify Proper W&B data (check if painted after certification and W&B redone)**
- **Verify ELT annual checks**
- **Verify Transponder/pitot static checks**
- **Verify SB compliance and applicable AD's**

Inspection logbook entry

- The entry will include the aircraft's total time-in-service (cycles if appropriate), and the name, signature, certificate number, and type of certificate held by the person performing the inspection. Search Operating Limitations for guidance on verbiage.
- Aircraft systems should all be thoroughly ground checked prior to flight. Run engine with cowling OFF.

QUESTIONS?

This
presentation
will be posted
on our website



EAA Wearhouse at AV
Or
Aircraft Spruce
Or
<https://baselegaviation.com/store/>

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