

VAN'S AIRCRAFT

TOTAL PERFORMANCE

**What's your
Condition?**

(inspection)



PREFACE

- This presentation will cover how to do a condition inspection in the manner that professional mechanics do them.
- The FAA has only **one regulation** that dictates exactly how a condition inspection be completed on an experimental aircraft.
- The inspector must certify, using the completion sign-off, that the aircraft has been inspected in the scope and detail of FAR 43, appendix D.

WHY do a condition inspection?

- It is required by E-AB and E-LSA operating limitations.
- It is a good idea from a safety standpoint!



WHO can do a Condition Inspection?

EAB

- Original aircraft builder or group representative
 - Has applied for and received a Repairman Certificate issued for the aircraft being inspected
- A & P mechanic
 - IA not required or allowed

ELSA

- Anyone that has taken the Light Sport Repairman Inspector training class for the class of aircraft they own (fixed wing, weight shift, etc.)
- A & P Mechanic
- Appropriately rated FAA repair station.

WHO should do a condition Inspection?

- **Someone with the skills to complete all of the tasks required!**
 - Learning to do things on your own for the first time is a good way to spend a lot of money needlessly (or worse). Get the help of someone with knowledge and experience.



PREPARATION STEPS

for completing a Condition Inspection

RESEARCH

Service Bulletins/Notifications

- Issued by the kit manufacturer or plans seller.
- Issued by the manufacturer of any accessory part (wheels/brakes, fuel pump/ filter, avionics/EFIS system, etc.)

Firmware/software updates



RESEARCH CONTINUED

- **Research AD's** issued by the FAA that effect the engine or any other component installed on the airplane.
- http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAD.nsf/ViewList?



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PREPARATION STEPS CONTINUED

- Obtain any parts expected to be replaced during the inspection:
 - tires/tubes
 - oil & filter
 - battery
 - etc...
- Note: Do the ELT condition inspection before purchasing a new battery.

CHECKLISTS

- **Use a checklist** (generic example: FAA AC 90-89B, Appendix 1)
Begin the inspection with the powerplant.
- **Use a checklist** to complete the inspection process on the engine and airframe, and document your progress.
- **WHATEVER CHECKLIST YOU USE** it should be cross checked against FAR 43, Appendix D.



LETTER OF THE LAW.....

- Line 14 of current issue operating limitations says.....

No person may operate this aircraft unless:

Within the preceding 12 calendar months it has had a condition inspection performed in accordance with the scope and detail of part 43, appendix D, manufacturer or other FAA-approved programs

and was found to be in a condition for safe operation.

- Scope - The extent of the area or subject matter that something deals with or to which it is relevant.
- Detail - An individual feature, fact, or item.

LETTER OF THE LAW.....

The inspections must be recorded in the aircraft maintenance records showing the following, or a similarly worded, statement:

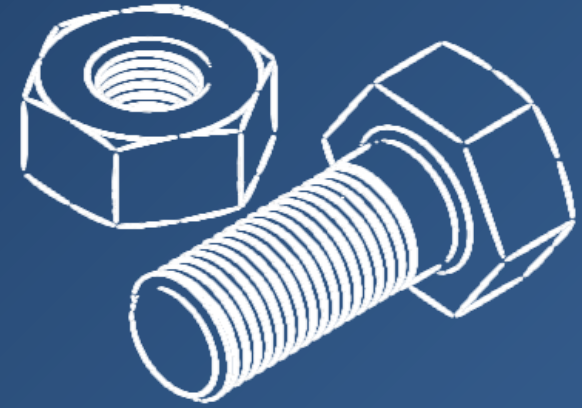
“I certify that this aircraft has been inspected on [insert date] in accordance with the [insert either: scope and detail of part 43, appendix D or manufacturer’s inspection procedures] and was found to be in a condition for safe operation.”

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.

- Scope - The extent of the area or subject matter that something deals with or to which it is relevant.
- Detail - An individual feature, fact, or item.

NUTS AND BOLTS

of the inspection Process



INSPECTION PHASE

- Remove engine cowling, fairings and panels/covers to allow access to as much of the aircraft as is possible.
- Use a squawk list to record any discrepancies or problems needing correction.
- Resist getting distracted from **inspecting**.....
- Save fixing for later (with exceptions).

NUTS AND BOLTS CONTINUED

ELT inspection and documentation requirements

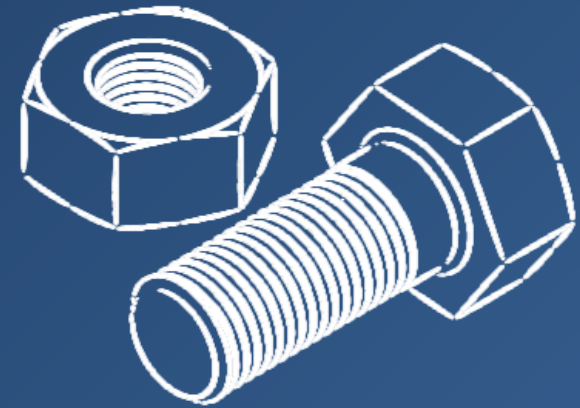
FAR 91.207 says.....

The new expiration date for replacing (or recharging) the battery must be legibly marked on the outside of the transmitter and entered in the aircraft maintenance record.

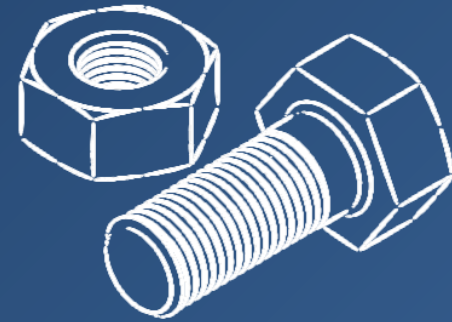
Paragraph (c)(2) of this section does not apply to batteries (such as water-activated batteries) that are essentially unaffected during probable storage intervals.

(d) Each emergency locator transmitter required by paragraph (a) of this section must be inspected within 12 calendar months after the last inspection for—

- (1) Proper installation;
- (2) Battery corrosion;
- (3) Operation of the controls and crash sensor; and
- (4) The presence of a sufficient signal radiated from its antenna.



NUTS AND BOLTS CONTINUED



ELT functional testing

b. Testing. (as prescribed in the AIM)

1. ELTs should be tested in accordance with the manufacturer's instructions, preferably in a shielded or screened room or specially designed test container to prevent the broadcast of signals which could trigger a false alert.

2. When this cannot be done, aircraft operational testing is authorized as follows:

(a) Analog 121.5/243 MHz ELTs should only be tested during the first 5 minutes after any hour. If operational tests must be made outside of this period, they should be coordinated with the nearest FAA Control Tower or FSS. Tests should be no longer than three audible sweeps. If the antenna is removable, a dummy load should be substituted during test procedures.

(b) Digital 406 MHz ELTs should only be tested in accordance with the unit's manufacturer's instructions.

406 MHz ELT's do not transmit a squitter burst on 406 MHz until the unit has been activated for at least 50 seconds so any test should always be terminated in less than 30 seconds to avoid a false transmission violation.

A good test for proper transmit power on the 121.5 MHz freq. is to activate the ELT in close proximity of an AM band radio receiver (tuned freq. doesn't matter) and listen for the transmitted signal.

NUTS AND BOLTS CONTINUED



Transponder Inspection and documentation requirements

FAR 91.413 says...

(For IFR, FAR 91.411 also applies)

- (a) No persons may use an ATC transponder that is specified in 91.215(a), 121.345(c), or §135.143(c) of this chapter unless, within the preceding 24 calendar months, the ATC transponder has been tested and inspected and found to comply with appendix F of part 43 of this chapter; and
- (b) Following any installation or maintenance on an ATC transponder where data correspondence error could be introduced, the integrated system has been tested, inspected, and found to comply with paragraph (c), appendix E, of part 43 of this chapter.
- (c) The tests and inspections specified in this section must be conducted by—
 - (1) A certificated repair station properly equipped to perform those functions and holding—
 - (i) A radio rating, Class III;
 - (ii) A limited radio rating appropriate to the make and model transponder to be tested;
 - (iii) A limited rating appropriate to the test to be performed;
 - (2) A holder of a continuous airworthiness maintenance program as provided in part 121 or §135.411(a)(2) of this chapter; or
 - (3) The manufacturer of the aircraft on which the transponder to be tested is installed, if the transponder was installed by that manufacturer.



START AT THE POWERPLANT

Begin the actual physical inspection of the aircraft here

It has the highest probability of discovered issues that will require work by an outside shop.

(If that is required, sending it out early in the inspection process will minimize down time.)

NUTS AND BOLTS CONTINUED



Engine Inspection

At a MINIMUM should include-

- Oil and filter change with inspection of the filter media
- Oil suction screen inspection (often missed)
- Cyl. leak-down (compression) check.
- Fuel servo or carburetor inlet filter inspection.
- Carburetor (if installed) float bowl drained and fuel inspected.
- Gascolator and/or fuel filters drained and filter screens inspected.
- Spark plugs cleaned, regapped, inspected and if possible, tested.

NUTS AND BOLTS CONTINUED

ENGINE INSPECTION

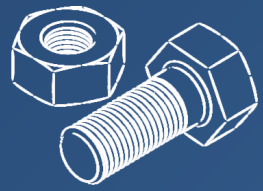


At a MINIMUM should include-

- 500 Hr magneto inspection (or as recommended for other ignition systems)
- Check / adjust ignition timing, and confirm that ignition switch('s) do disable the ignition system.
- General condition of exhaust system. Should include a pressurized soap bubble test in the vicinity of welded on flanges flanges for cabin heat mufflers if present.
- General inspection of all hoses (fluid and SCAT), wiring, engine mount and vibration isolators, oil leaks, condition and proper operation of controls, oil cooler, cooling baffles and seals, etc.

NUTS AND BOLTS CONTINUED

ENGINE INSPECTION

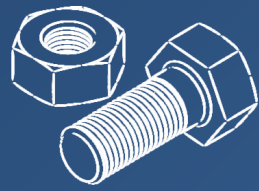


OPTIONAL

- Oil Analysis
- Camera inspection of valves and cyl interior.

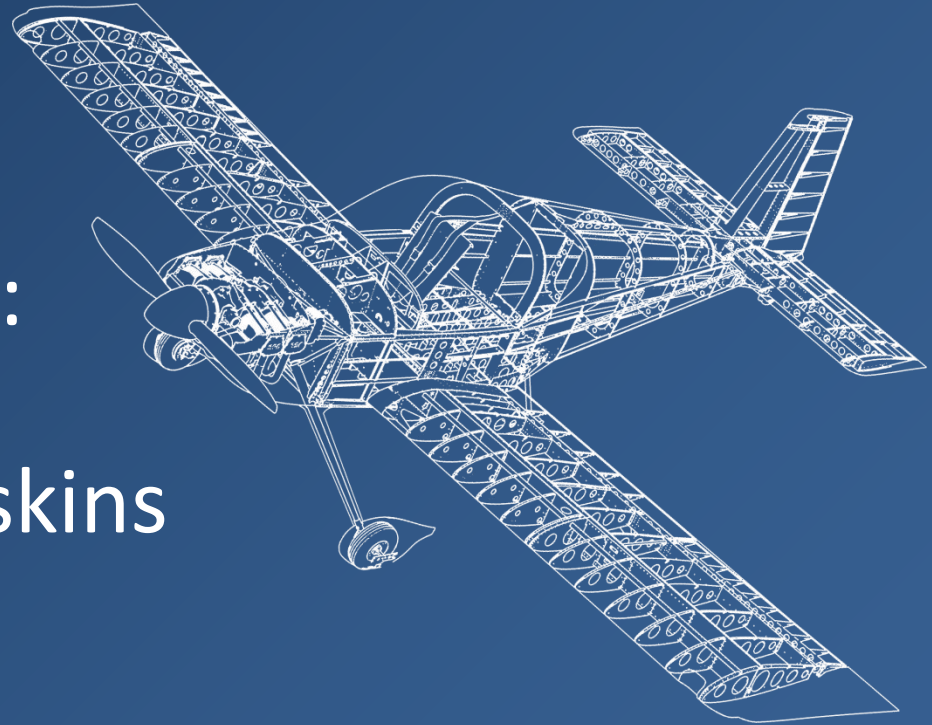
NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION



Inspect for evidence of impact damage or overload of structures:

- Wrinkled or bent skins and sub structure
- Bent brackets and attach hardware



NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION



Look for evidence
of fatigue.

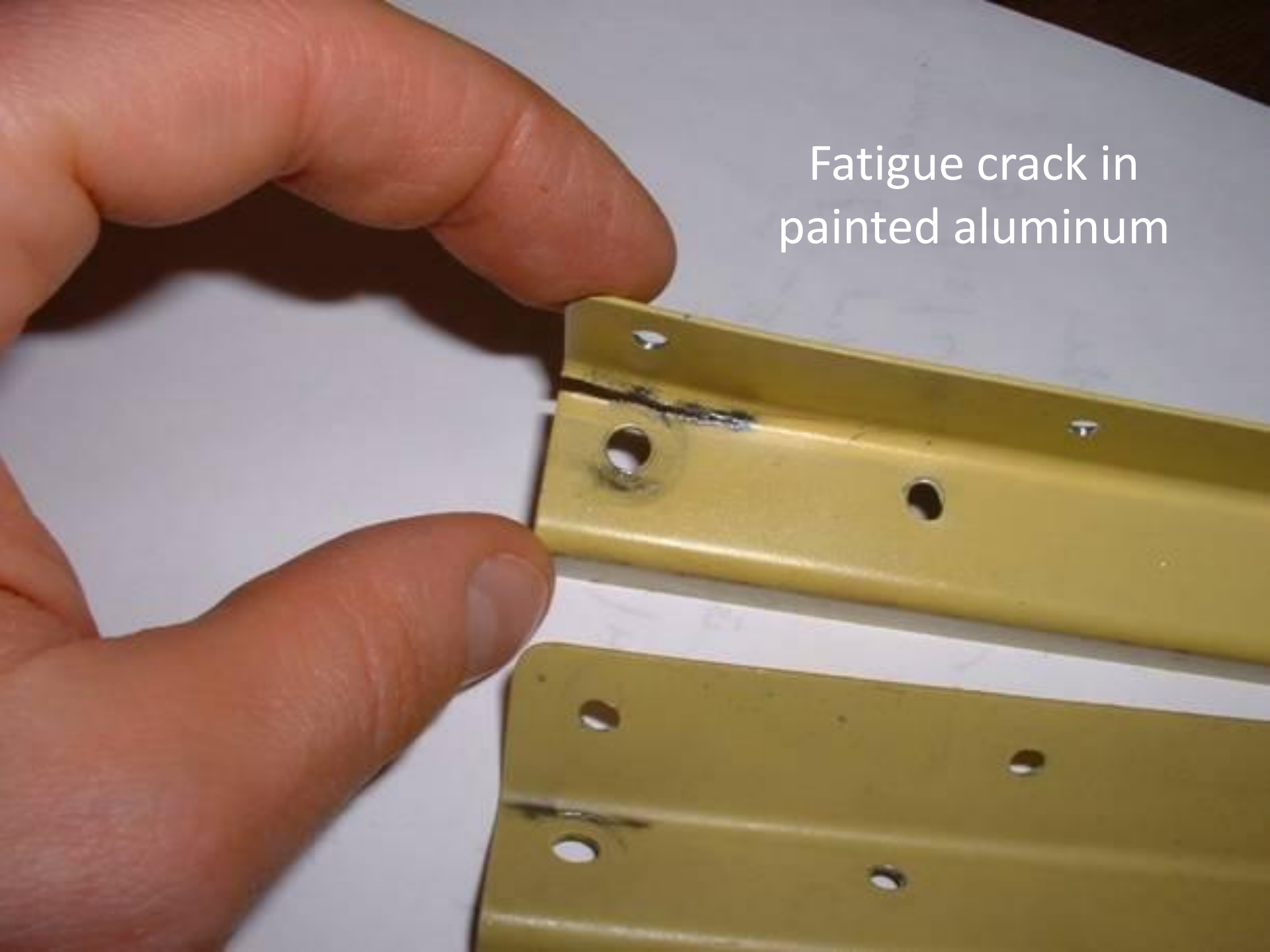
- Cracks in skins,
sub-structure/formers,
brackets, metal or
fiberglass fairings, etc.



Fatigue crack in
bare aluminum



Fatigue crack in
painted aluminum



Fatigue crack



Rivet hole fatigue crack



Screw hole fatigue crack



Crack along
tube weld



NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION



Confirm proper torque on critical fasteners

-Landing gear, engine mount, wing and emp attach, etc.

Note: Presence of torque seal or a cotter pin is not proof of proper fastener torque.

- It is fairly common for fasteners on a thick stack-up of parts to lose preload after accumulating some flight time.

NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION



Inspect for ANY movement where there should be **NONE** (Anything solidly bolted or screwed to something else)

- Landing gear legs, etc

It is typical to see fretting evidence (A change in surface texture and or grey/black dusting in the vicinity) if something is moving, but not always.

NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION



Inspect for smooth freedom of movement on anything that is intended to move.

- Bearings, Rod Ends, Pivot Bushings, Clevis Pins or Bolts, etc

NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION

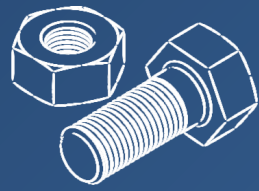


Inspect for excess or abnormal play on anything that is intended to move.

- Bearings, Rod Ends, Pivot Bushings, Clevis Pins or Bolts, etc

NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION



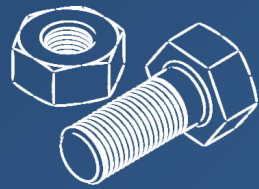
Inspect for evidence of wear between objects that are in contact or close

Proximity

- Electrical cables and harnesses
- Flight control system cables & push/pull tubes
- SCAT hose and fluid hoses
- Hard fluid lines (fuel, brake, etc.)

NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION



Inspect critical systems (flight control, engine control, fuel, etc.) **by following from the very beginning** (such as point of hand contact) **to the very end.**

Example: Pitch control system

- Attachment of stick grip to stick
- Condition of stick itself (Cracks at welds, etc.)
- Bolt that mounts stick.
- Bolt that attaches push/pull tube rod end
- Condition of rod end (play, stiffness, etc.)
- Jamb nut on rod end
- Coupler riveted to push/pull tube
- Push/pull tube condition
- Etc.

NUTS AND BOLTS CONTINUED

AIRFRAME INSPECTION



TOUCH EVERYTHING



Your hands are as valuable of an inspection tool as your eyes (in some instances, more valuable).

When possible, touch everything you are looking at.



USE A BRIGHT LIGHT

Very bright LED lights have gotten fairly inexpensive.

I have detected problems while using one that I never would have seen with a traditional flashlight.

REPAIR/CORRECTION/MAINTENANCE

- **Make a decision** regarding items on the squawk list (whether any items can be deferred and if they will be).
- **Complete work** related to squawk list items and any general preventative maintenance (new tires) being done.

Note: With some items there is slight overlap of inspection tasks, with maint./correction tasks.

Example : It makes sense to install new tires while doing the inspection on the wheels and brakes so that the time the airplane spends in the air on jacks (more vulnerable to an accident) is minimized.

POST-CONDITION INSPECTION

- Re-assemble the airplane minus the cowling and any access to portions of the fuel system that were disassembled during the inspection or maintenance.
- Complete a ground run / operational check of the engine and all aircraft systems.
- After shutdown, inspect for leaks on the engine and systems.
- Fully re-assemble the aircraft.

POST-CONDITION INSPECTION CONTINUED

- Complete required logbook/documentation entries.
 - Make sure the entry meets the wording requirements in the operating limitations for the aircraft, and the requirements for the ELT inspection (battery expiration date, etc.).
- Confirm that the required documents are in the aircraft.
 - Form 8130-7 Certificate of Airworthiness (must be displayed and visible from the entrance to the aircraft)
 - Operating limitations. These are part of the Certificate of Airworthiness and must be in the aircraft at all times.
 - Registration Certificate (Form 8050-3)
 - Weight and balance documentation
 - FCC Radio Station License (if aircraft flown outside of the USA)
- Complete a thorough preflight inspection.

Post Maint./Inspection Test Flight

FAR 91.407 says.....

(b) No person may carry any person (other than crewmembers) in an aircraft that has been maintained, rebuilt, or altered in a manner that may have appreciably changed its flight characteristics or substantially affected its operation in flight until an appropriately rated pilot with at least a private pilot certificate flies the aircraft, makes an operational check of the maintenance performed or alteration made, and logs the flight in the aircraft records.

(c) The aircraft does not have to be flown as required by paragraph (b) of this section if, prior to flight, ground tests, inspection, or both show conclusively that the maintenance, preventive maintenance, rebuilding, or alteration has not appreciably changed the flight characteristics or substantially affected the flight operation of the aircraft.

- **<Maintenance.** Inspection, overhaul, repair, preservation, and the replacement of parts, but excludes preventive maintenance.>
- **<Preventive Maintenance.** Simple or minor preservation operations and the replacement of small standard parts not involving complex assembly operations.>

The FAA's official position is that this does not apply to experimental aircraft, but that it is a very good idea.

Post Maint./Inspection Test Flight cont.

- Resolve any discrepancies found during the test flight.
- **Good to go for another year..... Have fun and fly safe!**

