The Annual Inspection

The not-so-secret world of annual inspections and other 12 calendar month requirements.

by Michael Berry

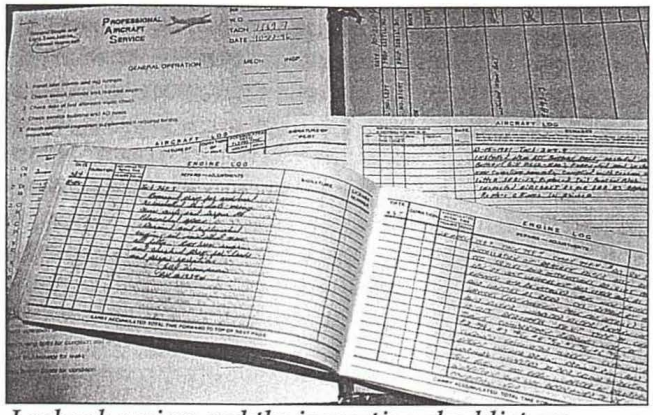
Anyone who has had the opportunity to pay the maintenance bills on an aircraft understands that an annual inspection is a required function for continued use of an airplane. What is little understood by new owners and many veteran operators alike are the two basic questions that inevitably surface when faced with the annual event: What actually constitutes an annual inspection and when is an aircraft considered airworthy?

It's a little more difficult to answer than you think because there are so many subjective answers to the issue of airworthiness, and the dynamics of quality versus cost always play a role in what gets fixed and how the repair is accomplished. To adequately answer the question requires some background into the nuts and bolts of annual inspections. When is an annual required, who must perform the work and what is required to be accomplished? More germane to the question is why these standards for acceptable conditions and procedures are so vastly different from mechanic to mechanic? Sometimes grossly affecting costs that otherwise might be a minor expense. It's a complex and intangible issue that has as many answers as there are airplanes and mechanics. We can, however, start with the basic requirements and list options for the uninitiated. Those familiar with the annual process might be surprised to discover some regulatory obligations they didn't even know existed.

Federal Aviation Regulations

As pilots we are all familiar with the regulation (FAR 91:409) that requires an annual inspection be completed within the past 12 months for an aircraft to be legally considered airworthy. Annual inspections do not apply to experimental airplanes, provisionally certificated aircraft or aircraft operating with a special flight permit (commonly called a ferry permit). Large multi-engine aircraft, turbo-propeller and turbo jet multi-engine aircraft, and aircraft that are maintained under an approved inspection program under FAR parts 125, 127, or 135, are also exempt from the obligation. Progressive Care Inspections and any manufacture's Continued Airworthiness Program may be substituted for an annual inspection for aircraft operated under FAR Part 91 but only with special written approval by the presiding Flight Standards District Office.

Why an aircraft must go through this annual ordeal is largely a mandate by the FAA and the airframe manufacturer who determine the frequency with which certain systems and components must be inspected. This information is analyzed and put into FAA regulatory form, providing a mandated position for all. While it may prove reactionary to inspect some aircraft so frequently, just as many may need more inspection by virtue of their environment, service use and duty cycle.



Logbook review and the inspection checklist are necessary functions in an annual inspection.

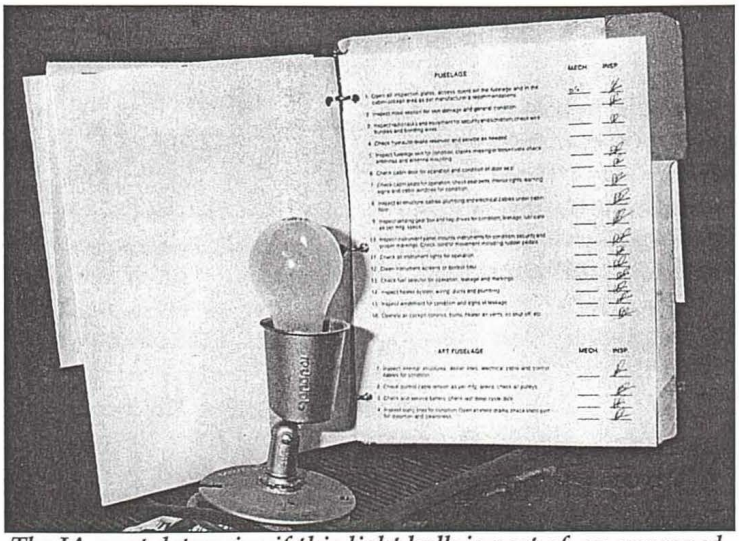
FAR 91.409 requires that these panels and more be pulled and inspected at the end of each 12 month period.

FAR Part 43 Content & Form

Of the many individuals who will work on your aircraft from time to time, the only ones authorized to return an aircraft to service after an annual inspection are: Mechanics holding an Inspection Authorization, Certified Repair Stations, and any Airframe Manufacturer inspecting his own product. Foreign Certified Repair Stations are not authorized to return to service any aircraft subject to an annual inspection while that aircraft holds a U.S. registration. This comes as no surprise because these Repair Stations are not

subject to the same operating criteria as U.S. stations.

After an annual inspection is completed, a clear statement that includes the date, total time and the wording "Annual Inspection," signed by an authorized person, must be entered in the maintenance records. No other inspection may be substituted for this and wording of the log book entry must be specific. Aircraft maintained in accordance with "Progressive Inspections" or "Continuous Airworthiness Inspection Programs" also must be entered into the maintenance record identifying the total time, the phase or class of inspection just completed and signed by an authorized individual.



The IA must determine if this light bulb is part of an approved installation when installed in the tail of the aircraft he is inspecting. (It was not.)

Annual inspections must be conducted using a checklist that can take one of several forms. Many mechanics holding an Inspection Authorization (IA), use the inspection form supplied by the airframe manufacturer which is generally found in the aircraft Maintenance Manual. This option is particularly good for aircraft which are built using some unique procedure or assembled with composite materials that form support structures and primary control surfaces. Any aircraft designed with structures or systems that depart heavily from conventional aircraft construction would benefit greatly from a manufacturer's inspection checklist and form.

More conventional aircraft can use the standard inspection form found in Appendix E of FAR Part 43, or the inspector may write his own checklist which, at a minimum, must include the items found in Appendix E. Often times, a checklist made from the content in Part 43 and embellished by the needs and wants of an experienced IA can be extremely useful for specific airplanes– especially older aircraft. Some airplanes develop failure patterns with specific systems or components that require additional inspections, or more detailed disassembly in order to better evaluate their condition. These aircraft benefit from the IA's experience in a particular type of airplane but the maintenance shop benefits as a whole from a custom- made inspection form which includes items based on years of experience.

Configuration and Condition

An aircraft subject to an annual inspection can be disassembled, serviced, cleaned and prepped by any qualified individual, but the actual inspection must be accomplished by the inspector or other equally designated and approved individual. The inspection cannot be delegated to any other individual, however, unairworthy items may be corrected by an appropriately rated mechanic. While the inspector or his assistant may remove panels, inspection covers and other equipment as necessary, only the IA can determine the two most important issues in the inspection. *Does the aircraft conform to the original type design as specified by the Type Certificate Data Sheet (or as amended) and is the aircraft in a safe condition for flight?* The inspection, as a whole, is designed to answer these questions in the normal course of compliance. However, there are specific issues that must be supported by proper documentation. They are made up of, but not limited to, the following important points:

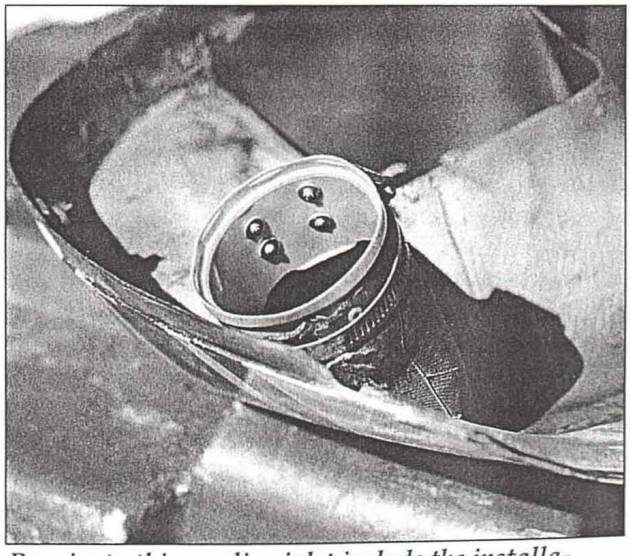
1) Maintenance to the basic aircraft configuration and all modifications must be properly recorded in the maintenance records and conform to the data and inspection requirements of maintenance manuals, AC 43.13, Supplemental Type Certificates (STC) and instructions for continued airworthiness. (Any FAA Form 337s concerning modifications and all STC information should be available to the inspector at the time of the inspection).

2) The status of airworthiness directives and mandated life limited parts replacement schedules must be up to date.

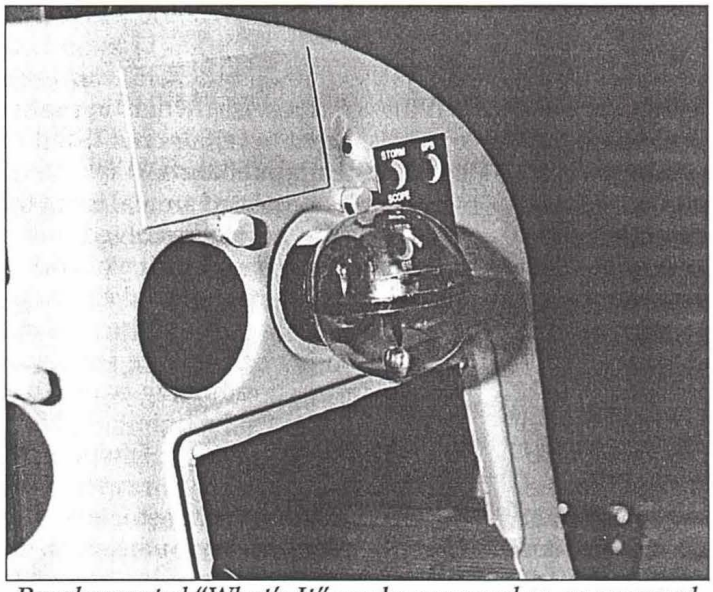
3) Mechanical and operational checks must be conducted to confirm that the aircraft is in a safe operating condition, consistent with manufacturers maintenance manuals, STC information, AD notes, service bulletins and FAR 43 appendix E. A partial list will include engine and propeller operations, emergency equipment and ELT operation, retractable landing gear systems, flight controls, and electrical system checks.

4) Identification plates, placards, instrument range markings and other markings must be consistent with current regulations, aircraft type certificate data sheet, ad notes, etc.

5) Nationality markings, transponder and pitot static checks, VOR calibrations and verification of current airworthiness certificates, radio licenses, weight and balance data and other op-



Repairs to this cowling inlet include the installation of a plastic cap from a can of spray paint.



Panel mounted "What's It" can be approved or unapproved depending on the paperwork. The owner is ultimately responsible for the airworthiness of the aircraft he is flying.

erational requirements are not considered part of an annual inspection. It is, however, considered good operating practice on the part of the inspector to notify the owner if these items are not current or are improperly employed.

In the case of a properly maintained and well documented aircraft, the annual should not be a major operation. Nevertheless, the annual is intended to be quite an exhaustive inspection. With an aging aircraft fleet, inspectors must become more aware of the possibilities of defects not usually seen in newer aircraft. In addition, it is imperative that the IA become familiar with optional repair procedures, especially for aircraft unsupported by the original manufacturer. Manufacturers supply of repair parts and technical service has in many cases decreased, making repair options more limited, difficult and of course expensive. Therefore, an inspector knowledgeable in "type specific repairs" plays a very important role in keeping aging aircraft in a safe operating condition.

Inspector and Owner

While the inspection billing and discrepancy repairs are usually included on the same bill, the work required for the inspection and that which is considered part of a repair are actually two different operations. After an annual inspection is completed, an owner should arrange a meeting with the inspector and ask for a written report of the inspection results. If any items are considered unairworthy, repairs to make the aircraft airworthy and the options to do this should be discussed. This is important because while an item may be considered unairworthy there are repair options that can save a considerable amount of money. If large, complex repairs are necessary,the owner may wish to get a second opinion before agreeing to have repairs done. Occasionally, it's found that another repair facility is better equipped and employs factory- trained personnel for a specific job. In cases like this, it's important to have good communication between the owner and inspector.

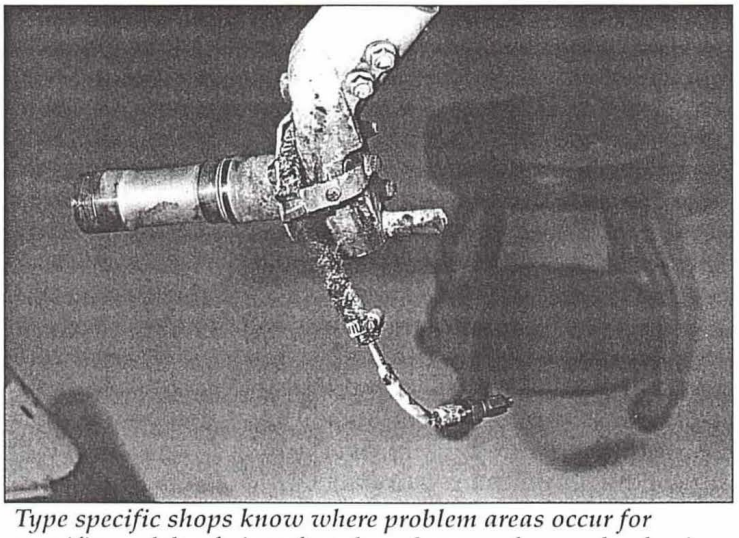
Just because an inspection was accomplished in one facility doesn't mean that needed repairs can't be accomplished in another. Provisions for log book entries that declare an aircraft unairworthy but also state that the annual inspection was completed can be used to both protect the inspector and allow the owner to deal with the discrepancies as a separate matter. While the annual was in fact completed, the aircraft cannot be flown with any unairworthy items until proper repairs are made (unless the FSDO issues a "special flight permit"). It's possible, however, for the owner to make repairs that fall under the guidelines of Preventive Maintenance (a new tire, perhaps) and thereby satisfy the discrepancies noted by the inspector. For more complex jobs requiring the assistance of a licensed mechanic, individual discrepancies can be addressed to the mechanic's satisfaction and the aircraft returned to service with the appropriate log book entry. In either case, the aircraft is considered airworthy without further participation by the inspector when the unairworthy items are corrected by the appropriately rated individuals.

Like all FAA regulations, the obligation to ensure that the aircraft is maintained in an airworthy condition rests with the owner/operator. The inspector simply inspects the airplane and reports his findings to the owner. Technically speaking, how the aircraft is returned to an airworthy condition is up to the owner but usually a bipartisan approach is taken in the negotiation. It is for this reason that knowledge of these procedures, and all proper log book entries are important to the owner who may incur both the cost of correcting improper documentation at a later date and the risk associated with potential FAR violations.

The pilot has the final say as to aircraft airworthiness. Technically, taxiing for the purpose of flight constitutes acceptance of an aircraft as airworthy. Therefore, after an annual, plan your departure to occur in day VFR weather, having allowed plenty of time to complete a thorough preflight and final log book review.

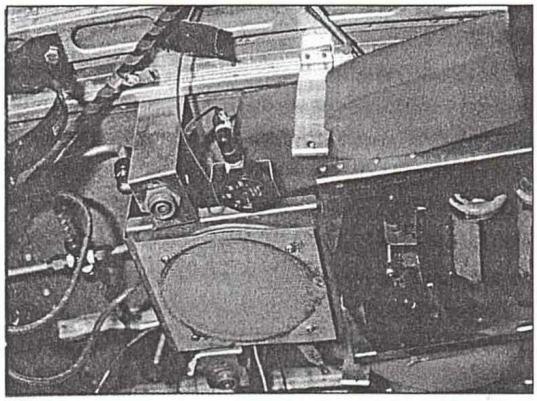
Shop Options

After accepting the fact that an annual is necessary and understanding who is responsible for what, the next question to be asked is *Where should I take*



Type specific shops know where problem areas occur for specific models of aircraft and can be a good annual value in the long run. Note the frayed brake line on this Cessna T210.

the airplane and who should do the work? The annual inspection is–by regulation–made up of certain inspections and procedures that will be the same for everyone. Differences among repair shops can include the depth of the inspection and standard shop repair procedures. Some facilities require compliance with all Service Bulletins, others require compliance with only the "Mandatory Bulletins." Inspectors vary, but some insist on performing all 500 and 1000 hour items during and annual and some shops refuse to repair a component, opting for wholesale replacement of the offending part. Investigate your options and make an attempt to find out what the policy is for the shop you intend to use.



Some shops routinely comply with 500/1000 hour items in the normal course of an inspection. Removing the oxygen bottles for hydrostatic check is routine, overhauling the regulators is not. Ask for shop policy before starting the inspection.

When shopping for a place to take your plane for inspection, you'll find that there are generally three basic shop and mechanic options available. One of the three will fit your particular needs, depending on the kind of airplane to be inspected, type of work to be accomplished and the amount of money you have to spend.

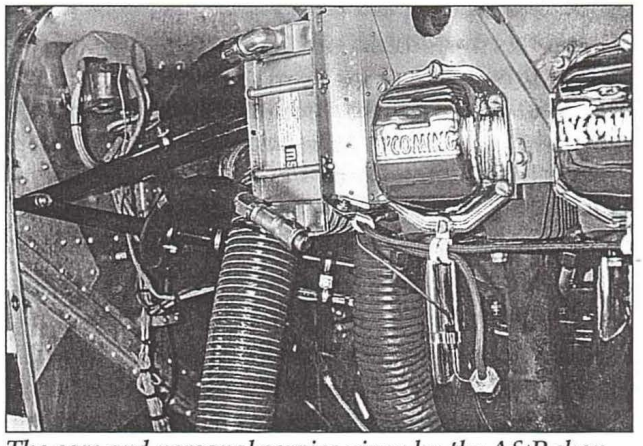
Factory Authorized Service Centers are FAA Repair Stations that also have the "blessing" of the factory. These shops may operate in a slightly different way than other shops do in that they may be mandated either by the factory or the FAA repair station requirements to do certain additional inspection items or repairs over and above the minimum requirements.

Factory authorized service centers have direct access to factory technical support, can usually obtain parts quickly, and generally, have a large supply of spare parts on hand. Therefore, owners can expect a speedy turnaround but may pay more for this service. Generally, factory authorized service centers do not allow owner participation because of insurance regulations and the strict timetable for completion to which these shops customarily adhere. A comparison can be made between these shops and the local Ford or Chevrolet dealer service facility.

Type-specific shops are geared more for owners of older or specialized aircraft and may, for some, offer the best value for the money. While some "type-specific" shops allow owner participation (opening panels, removing seats, etc.), most do not because of the specialized nature of their operation. At a given point in time, several mechanics may be working on the aircraft, each in his or her area of expertise (sheetmetal repair, engine work or electrical/avionics installations). Typically, these shops are devoted to certain types of aircraft that probably are not supported by a manufacturer, (for reasons of age and economic impracticality). The type-specific shop has the equipment needed to properly repair, service, modify and, in some cases, with cooperation from the owner, even duplicate rare replacement parts from factory blueprints. The type-specific shop generally has had years to develop special resources for parts support and efficient repair techniques, as well as employing specialized talent outside of "factory circles." Type-specific shops typically employ seasoned mechanics, dedicated to a specific type of aircraft who generally view their work as a "labor of love" instead of simply a way to earn a living.

The last option, and for some the most agreeable of the three, is the local A&P mechanic. Your airport A&P shop can offer a "personal touch" sometimes hard to find in this "production oriented" world. Many local A&P mechanics work with owners on the "owner-assisted annual" (inspector does the annual - owner assists in preparing /reassembling). Beyond the annual, some A&P mechanics are even willing to supervise owners in the accomplishment of repairs not listed as preventive maintenance.

The owner-assisted annual is not for everyone. Do not get involved in the owner-assisted process if you don't have the time, interest and the basic mechanical ability to devote to this operation. Prepare to learn a lot about your plane. Just removing panels has a way of drawing the uninitiated into the workings of an annual inspection. Do your homework by discussing the details with your inspector and develop a "plan" for your participation. While owner assistance is a valuable learning tool, many mechanics don't allow "help" as it hampers their progress and it sometimes takes longer to explain how to do a task than just doing it yourself. If your motivation for participating in the owner-assisted annual is principally economic, you may be disappointed. The final cost for the annual may not be much different from other conventional inspection methods. However, you can't put a price on the unique opportunity to learn all about your airplane while participating in its maintenance.



The care and personal service given by the A&P shop can keep your baby in the kind of shape you want, with particular attention to your needs.

While cost is certainly a factor to consider, don't let this overshadow the goal of keeping your aircraft in safe operating condition. As a pilot and owner, you have a responsibility to provide your passengers with safe transportation. The cost of an annual really depends on what you as owner do to effectively manage your maintenance program during the previous

(Continued on page 24, Annual Insp.)