



## What the Examiner Sees – Airworthiness Inspections, Records and Required Equipment

by Larry Bothe, MCFI, DPE, 7/18/2012

For our next look at what DPE's see on checkrides we'll consider airworthiness. It's the PIC's responsibility to be sure that a plane is airworthy before going flying. The FAA requires that Private Pilot applicants know how to make that determination. The applicable Private Pilot PTS reference is Area of Operation I, Task B, Airworthiness Requirements. Certain documents must be carried aboard any aircraft to be flown. The applicant must know what documents they are and where to find them. Applicants also must know about required inspections and how to locate them in maintenance records. Finally, they must know how to determine whether an airplane is airworthy if certain pieces of equipment are found to be working improperly, or not at all. What has to be done, and who does it?

We conduct checkrides by creating a scenario to which the applicant must respond and use her knowledge. For the airworthiness topic it might be something like "A friend of yours, who is a student pilot, buys a Cessna 172. He asks you to go to a neighboring airport and fly it home for him. When you get there it is appears that the plane hasn't flown much lately, and you wonder how well it has been maintained. What will you want to check out before flying it home?" If the quick answer is that "I would do a very thorough preflight inspection" I know the applicant isn't thinking the right way. I may have to say something like "from a legal standpoint." That usually gets the applicant pointed in the right direction.

Aircraft documents are an easy subject for an applicant to deal with because they are largely a rote memory item requiring little understanding. By using the common AROW acronym most applicants can tell me about the required documents. But note that the "O" in AROW stands for Operating Limitations, not Owner's Manual. And those operating limitations are found in three places in the plane; in the POH, various instrument markings, and on placards. If a required placard falls off due to old age and weak glue the plane isn't airworthy.

After making sure the required documents are present I'm hoping the applicant will say she will look in the maintenance logbooks for required inspections. All airplanes need 5 things for VFR flight: Annual inspection, 100-hour inspection (if used in commercial service, i.e. rental), transponder certification, ELT inspection and a current ELT battery, and

airworthiness directives have to be complied with. (Note that the pitot/static/altimeter certification is not required for VFR flight.) When you prepare your student for the checkride it is imperative that you get the maintenance logs for the plane to be used, sit down with her, and find each of the required inspections. You explain to her how to find them, but let her do it, and have her put sticky-note tabs on the pages. If you just quickly flip to the various entries and show the student she'll never be able to do it herself for the examiner. Don't rely on the sticky-note tabs left by an earlier student; mechanics don't move the tabs when they do a new entry for a more recent inspection. When we discuss inspections and the applicant starts at the beginning of a maintenance logbook and pages through, that's an indication of inadequate airworthiness training, and this may be a very short checkride.

The two inspections applicants have the most trouble with are ELT and Transponder. When you teach the ELT inspection you have to emphasize that there are really two separate requirements with respect to the ELT. The first is the requirement that ELT's be inspected and functionally tested every 12 calendar months. Since this is usually done as part of the overall annual inspection that entry is easy to find. The second part, about battery replacement, is confusing to many students. They can tell me that the battery must be replaced if it is used for more than one cumulative hour, or it is older than half of its shelf life. However, when I ask how we know if the battery in the plane is OK I'm sometimes told that the battery is good if the ELT works. They have memorized the words but don't know what they mean. In their life experience the things they are familiar with that use batteries that get replaced are flashlights. We use them until the batteries go dead; then put in new ones. You must explain to your students that ELT's are not treated like flashlights. Batteries deteriorate in storage over time, and because an ELT must transmit for a long time if the plane crashes the battery can never be allowed to get below half of its charge strength. The replacement requirement is based on age, not on whether or not the ELT works right now.

How do we know about the current status of the battery? Is it too old? Look in the maintenance logs, of course. Good mechanics put the battery expiration date right after the ELT inspection statement in the annual inspection logbook entry. If the mechanics at your flight school don't do that you should have a word with the head mechanic to try to get it done. If the expiration date isn't included with the ELT inspection entry then you will have to page backwards through the airframe logbook until you find the entry where the ELT battery was installed. That will give you the expiration date.

The transponder certification is often the most difficult entry to locate. That's because it is not usually accomplished at the time of the annual inspection, and can be done any time in the preceding two years. It is necessary to page backwards through the airframe or avionics logbook until you come to the entry. The transponder certification was probably

done by an outside avionics shop so the logbook entry will have a different appearance, thus making it stand out. Have your student find it and put a sticky-note tab on the page.

Many applicants struggle to remember the need for compliance with Airworthiness Directives (AD's). The reason may be that AD compliance is not an "inspection" per se. Because of this instructors have to place special emphasis on the AD component of airworthiness. If the applicant is otherwise doing a pretty good job with this topic I may give them a hint by asking what has to be "complied with."

Aircraft maintenance shops subscribe to an AD service. The mechanic enters an aircraft's make, model and serial number into a computer and gets a listing of all the AD's that *might* apply to that particular aircraft. It's *might* because some AD's apply to parts or equipment that *may* have been installed *after* the airplane was manufactured. Your airplane may or may not have those parts or equipment. The mechanic compares the AD list with the maintenance logs back to day one to determine which ones apply to that particular airplane.

In the case or folder containing the aircraft records (but usually not in the maintenance logbooks themselves) you will find the AD listing. The ones that apply to that particular airplane will be marked in some fashion. In the annual inspection entry you will likely see an entry or entries that look like "C/W AD #XXXXXXX, seat track inspection", or similar. If you see C/W ("Complied With") statements followed by an AD number you can be pretty well assured that the mechanic paid attention to the AD's. If there is no mention of AD's at all in the annual inspection entry the examiner is going to be very concerned; virtually all airplanes have at least a few AD's against them.

After all the documents and inspections are verified we can move on to that detailed preflight inspection. In spite of the shabby appearance the plane seems to be in sound mechanical shape. You get in and start the engine, which fires right up because the seller charged the battery last night. You turn on the avionics and start looking at gauges. Well darn, it looks like some of this stuff doesn't work. Can we fly the plane? Maybe.

Before we dive into what to do about inoperative equipment we need to clarify our terms. Some instructors talk about inoperative *instruments*, rather than *equipment*. The instructor may be thinking about anything that doesn't work correctly, but by saying *instruments* the student thinks literally only about instruments, and usually, even more narrowly, the six flight instruments. Then when the examiner asks what they need to do if the #2 NAV/COM doesn't work, they don't know how to respond. When teaching about inoperative equipment be sure to use the word *equipment*, and explain that it means anything in the airplane that isn't working correctly.

When faced with inoperative equipment the first step is to determine if the thing that doesn't work is *required* or *not required*. Start with the listing for Day-VFR required equipment found in FAR 91.205. If the item is listed there, it's required. If it's not in 91.205

then the next place to look is the equipment list found in the POH for newer airplanes. My '61 Champion 7EC doesn't have an equipment list, but the 2007 Cessna 182 that I occasionally fly certainly does. In the newer airplanes with extensive equipment lists from the factory, items that are required are usually coded with the letter *R*. And if the manufacturer says it's required, it is, regardless of 91.205, because the airplane was certified that way. (Some more sophisticated airplanes, typically twin-engine ones used for Part 135 charter, have either a Minimum Equipment List and/or a Kind of Operation List calling out certain equipment. This is Commercial-level knowledge; I don't ask it of Private Pilot applicants.)

As an examiner I don't expect applicants to have memorized the Day-VFR required equipment list from FAR 91.205. There are a couple of mnemonic devices, GOOSE-A-CAT and TOMATO FLAMES (you figure them out) that represent the items in the list. However, I'm a whole lot happier when the applicant knows that the list is found in 91.205, and can consult it as necessary.

On with the scenario. During the preflight inspection we observed that the fuel tanks are full, but sitting in the airplane we see that the gas gauges say *Empty*. We're expecting a ½-hour flight, and we know from experience that a Skyhawk has at least 4 hours for fuel when full. Can we go? The FAA says *No*. Operating fuel quantity indicators are required per 91.205. And by the way, don't try to tell me, as one applicant recently did, that it is an unfair question because I asked about "gas gauges", and the FAR calls out "fuel quantity indicator". If "gas gauges" truly confused the applicant then we have another example of memorization without understanding.

The inoperative piece of equipment is required, so we can't fly. There's no maintenance shop on the field. What do we do now? Abandon the airplane? No, that's not reasonable. The FAA gives us two choices. We could call a shop at a nearby airfield and ask that a mechanic bring tools and come over to make the repair. But mechanics don't like to do that because no matter how well they plan ahead they always seem to come up short of some tool or part, and have to make a second trip. The response is usually "bring the plane over to my shop, and I'll fix it." But we can't fly. Catch-22. Oh yes you can. Contact the nearest FAA FSDO and get a Special Flight Permit, aka "Ferry Permit". Ferry permits are routinely granted, can be obtained by FAX, and you can get one in about 15 minutes during normal FAA business hours. It's a bit more difficult on weekends; you may end up waiting until Monday. Note that an A&P mechanic has to sign a ferry permit, indicating that he believes the airplane is safe for the intended one-time flight.

What if we discover that a piece of equipment that is *not* required, say the turn coordinator, is found to be inoperative? Can we fly the plane? Since neither the FAA nor the manufacturer requires the turn coordinator, now it's up to the PIC. If the PIC is comfortable without the turn coordinator (or any other equipment that's not required), then you can fly. But not so fast, Ace. The FAA wants to guard against a pilot flying a plane with something

that doesn't work, and the pilot doesn't know it's not working, and could be relying on it working later. To cover that possibility the FAA again gives you two choices. You can either have the piece of equipment removed from the plane (usually done by an A&P mechanic), or placard the equipment INOP. In our turn coordinator example a mechanic may remove it from the instrument panel and send it out to be overhauled. You can fly with that unsightly hole in the panel. Nobody will rely on the TC working because it's not there. If there is no mechanic around, or you don't choose to have it fixed right away, you can put a label (piece of masking tape?) on the face of the instrument with the word INOP written on it. In addition, if there is any chance that the inoperative piece of equipment will interfere (over heat, short circuit, etc.) with any other equipment, or it might work intermittently and therefore confuse the pilot (even though placarded INOP) then it will have to be disabled (disconnected from its power source). That satisfies the FAR. Now go flying.

After we complete the oral, the applicant having demonstrated satisfactory knowledge of airworthiness (and the other subjects as well) we go out to fly the plane. The examiner *does not* want to see that, in spite of the applicant's knowledge of airworthiness, the plane presented for the checkride is actually unairworthy. That old clock doesn't work? Where's the INOP sticker? How about the dead ADF or LORAN? Stickers on them? And it's no defense for the applicant to say "gee, those things haven't worked for the whole year I have been taking lessons." Ignoring the law for a period of time doesn't change the law. Don't send your student for a checkride in an unairworthy airplane. The examiner WILL NOT FLY in an unairworthy airplane, no matter how trivial the reason. Don't even think it! However, most examiners will allow an airplane to be made airworthy. For example, if the preflight inspection reveals a tire with the cord showing through the shop can put a new tire on it; then we can fly.

At the Private Pilot level the DPE needs to be assured that the applicant knows the five basic inspection requirements; annual, 100-hour, ELT, Transponder and AD's, how to locate the appropriate logbook entries, and what to do if equipment is found to be inoperative. Finding the inspection records will be easy for your student if she has gone through the logbooks with you in advance of the checkride and tabbed the various entries. Take a little extra time to explain the two parts of the ELT requirement so your student really understands that the inspection is separate from the battery, and the battery is replaced based on age, not functionality.

Your students can master Inoperative equipment if you teach them to think in two's. There are initially two choices; is it required or not? Then for each outcome you have two choices again. If it's required then you must either have it fixed on the spot or get a ferry permit from the FSDO to fly it somewhere to get repaired. If it's not required then you can fly, but you must either placard the equipment inoperative (INOP), or have it removed from the plane. And please don't send an unairworthy airplane for a checkride.

After essentially completing this article I had the notion that there really ought to be an acronym to help students remember the five required inspections. Using the letter tiles from my Scrabble® game I came up with this memory jogger. *Flying an aircraft that does not meet airworthiness inspection requirements might result in **A DEATH: AD's, ELT, Annual inspection, Transponder, Hundred-hour.*** That thought may be a little grim for some, but it covers the bases.

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