# Pre-purchase Inspections

*A pre-purchase inspection, especially on older, infrequently flown, or out-of-license planes is fraught with pitfalls.*

BY MIKE BERRY, IA

This article is relevant to aircraft ownership, whether you are buying or selling. While first-time buyers should have the most interest in learning the ropes, sellers should also want to know what it takes to find and keep a buyer interested. Finally, we need to discuss the proper test flight procedures.

The pre-purchase inspection is a critical part of buying a plane, but there is a great deal of paperwork verification that must be done before that part of the process. Buyers may spend a lot of money chasing a plane that may have financially insurmountable problems.

Wouldn't it be a lot better to know that up front? And in this article we are not discussing restoring rare or historical aircraft, only the typical, garden variety types, where money is the prime issue, not historical preservation.

A current annual is a good sign, but in no way is it a guarantee everything is on the up and up. Moreover, there could be major liens, major AD notes not complied with, and missing logbooks or other records missing that should be corrected before even contemplating the pre-purchase mechanical inspection.

Someone who does not have a financial interest in the sale of the plane should do the inspection. Planes out of license and long time sitters, hangar queens and derelicts are particularly dicey deals regardless of price.

With missing logs and paperwork you could end up having to redo every AD in existence for a particular airplane before the plane could be made legally airworthy. In effect you could buy a certified category plane that is so expensive to bring up to date that it is essentially worthless other than a museum piece or parts value.

Getting involved in interstate lawsuits because of misrepresented aircraft is a losing proposition, even if you should win a decision. Collecting money is an entirely different thing from winning the suit—assuming you even win the lawsuit.

## DETAILS, DETAILS

A prospective buyer may fall in love with the plane and figure they can let the paperwork get sorted out later. You simply should not let this happen to you, as it's a formula for a financial disaster. I've seen it too many times.

Airplanes are expensive to buy and expensive to maintain; search for a plane that has had good maintenance and is in license. And beyond mere log entries, while not always possible, a set of confirmatory shop maintenance receipts and other maintenance paperwork as well as other forms of supporting documentation should be available to help assure the logs are legit. The less paperwork, the more your financial danger antenna should go up.

You don't get a break from the FAA if the records are later found to be false—you get to redo every AD or correct every mistake the plane has ever had, some of which could be thousands of dollars, or require a full engine tear-down to verify and rectify.

As a buyer or owner you should be familiar with the technical data requirements of owning a plane. The FAA has good publication, FAA-H-8083-19A (Plane Sense), available in PDF, free on the faa.gov web site. Make a careful review of all the maintenance information required prior to starting an actual pre-purchase inspection. Make and use a written checklist.

Check the plane's Type Certificate Data Sheet (TCDS) in the FAA database for the particular aircraft for details such as approved engines and propellers and appliances for any given airframe, compared to what is installed. Illegal engines and prop models are unfortunately not rare in older model planes. All this data is available free on the faa.gov Web site.

Check the FAA AD records for all relevant notes, and ensure that the plane you are looking at is properly represented, and all listed ADs have specifically been accounted for. The statement "all ADs complied with" doesn't cut it if the FAA or diligent IA decides to check, as often this statement is a cover for not doing a proper AD check. If this is more than you want to do, then hire a mechanic to do it for you, but not an A&P involved in the sale.

You don't want an illegally rebuilt wreck from several other wrecks. Check data plates. Are any modifications installed on the plane legal and does it have supporting documentation such as approved 337 forms, instructions for continued airworthiness, flight manual supplements and equipment listing/weight and balance records that are current?

## BUYER BEWARE

Rarely will one find a deal on a plane for a lower price than the true value other than the commonly overpriced plane by an owner with a sentimental attachment.

**This Beech Musketeer is in good shape and the price about right, but the IO-346 engine is no longer fully supported by TCM. It's critical with older planes to have a source of parts that won't cost a fortune to buy, if even available. Try to stay with common engines and airframes.**

**This old Cessna 172 has a different problem. Parts are available, but there is so much wrong with the plane that by the time you get it airworthy, you could have bought a better plane for the same money. Note missing prop for unknown reasons—allegedly an unapproved prop (or strike). Fixer-upers are money pits.**

A low price below market value should send up your danger antenna as such things are simply not the norm. Genuine great deals for the average person are not common, because professional buyers constantly prowl the markets. It's their livelihood to find the deals first.

I have been involved with two recent aircraft purchases and both buyers were attracted to the aircraft by the seemingly low price. Both were bad financial decisions, and the buyers were warned. These aircraft had been flown very little or not at all for years and not preserved or stored properly.

There are so many aircraft available for sale in this situation: out of annual, improperly stored, parked for long periods, and have no recent record of any maintenance. In the case of a Beechcraft Bonanza the aircraft was parked for over six years, mostly outside, and allowed to deteriorate, which required extensive remediation work. The plane was an endless money pit, and when finally made flyable, it would never resell for nearly the money that was spent making it airworthy.

After the Bonanza purchase (when I got involved) I found maintenance records were missing, significant AD notes were not complied with and some were allegedly complied with but had no supporting documentation. The engine maintenance records on both aircraft, an old Navion and the aged Bonanza did not identify when or who did the last engine overhaul, so the time since overhaul could not be determined.

This is not to say that because there were no records of engine overhauls that the engine must be replaced for Part 91 operations. It is, however, a sure bet that an engine with no history of overhaul or major maintenance for many years will require major maintenance and the "as sitting" value of the aircraft will be reduced substantially.

Ten years ago I was offered a complete older Cessna 182 for $5000, and I refused the deal as the cost of bringing the aircraft up to an acceptable level of airworthiness was far more costly than buying a fully functional and airworthy aircraft. This aircraft was parked outside in New England for years with broken windows, a damaged propeller (prop strike), avionics destroyed by moisture, fuel cells shot, damaged flight controls and paint and interior requiring replacement.

Don't be drawn into such a deal as even though this C-182 was dirt-cheap it was a bad buy. While I realize that an aircraft owner who is handy with the tools and knows about aircraft can occasionally make a deal and get a plane to restore, it's more for the project appeal than the flying aspect. If you want a project like that, fine, just be prepared to sink far more money than it's likely worth in the project—much more.

Moreover, there is reliability to consider. Would you trust a 25 year-old-improperly stored engine with no records of an overhaul ever? Would you trust an aircraft that was not preserved and stored outdoors on the flight line in New England for a over a decade? How much are you willing to spend on new avionics when a plane has worthless avionics, wiring and corrosion?

In the case of the 1946 Navion that could be considered a museum or air showpiece with limited flying, avionics may not be as significant a consideration. In the case of a Bonanza, avionics are a major factor in the utility of the aircraft.

Another issue that is a real problem is many aircraft, propellers and engines are no longer being supported by the manufacturers. Availability of parts can be nonexistent or so expensive that the real value of a plane would be next to nothing if it needs an expensive part or one that just isn't available.

Consider the case of the Navion or old Bonanza and the cost of a replacement Hartzell propeller. The cost of a new propeller that works with the E-series TCM engine is in excess of $20,000. The availability and cost of repair parts certainly is an issue when it comes to selecting a plane to buy.

You have to decide if you really want a project to work on or a plane to fly. Often it's a choice of one or the other when lowball prices are the order of the day. Double or triple your estimate of a project plane to make it airworthy—if you can even get the parts.

## SELECTING A SHOP OR MECHANIC

An inexperienced buyer will typically select a maintenance shop based on proximity and price. It's much more important to select a mechanic that has done maintenance on the same type aircraft recently and frequently, even if at a different field than the aircraft. Also, any mechanic who is going to check the plane for discrepancies should be willing to coach you in the process of selecting a suitable plane.

A local shop that may have done previous inspections on a given plane could overlook the same items during the pre-purchase check as they have in past inspections. Depending on the type of plane, expertise with a specific model may be far more valuable to discover problems that may not be apparent to a mechanic with no type-specific experience. Buyers, even though you have your heart set on a particular plane, listen to the mechanics recommendations.

## TEST FLIGHT

A test flight is an important part of the buying process, but should be done after the technical data review is accomplished. Experimental planes can have a different sequence of events, but in all cases a review of the basic paperwork such as a condition inspection or annual inspection (for certified aircraft) and a valid airworthiness certificate and what restric-

tions may be attached must be done.

Taking a test flight is so important for an experimental aircraft that without the test you should not even consider a purchase. Experimentals may look great, but can have terrible handling characteristics. There is no way to tell without a thorough test flight.

While the majority of plans or kit built planes may be excellent, even small design changes by the builder can have a huge impact on how a plane flies—and its safety. Owners—don't be quick to accommodate every interested person as many potential buyers are just looking for a ride to check out your type of plane but really have no intention or the finances to buy a plane. Ask some qualifying questions.

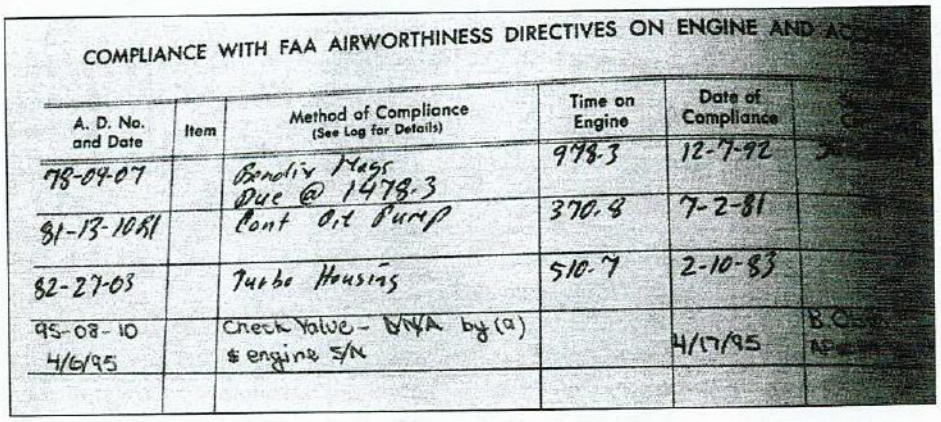
Another consideration is whether the owner/pilot will demonstrate from the left seat, or the prospective buyer will fly it from the left seat. When test flying an aircraft also consider the weather conditions, and the time of day; will there be enough daylight to complete the flight before nightfall?

Night flights are OK but not the ideal condition to do a pre-purchase test flight unless you just want to check out the aircraft lighting. Consider what will be done during the test flight, how long will it take, and where will it be done? Make some sort of realistic written plan as to what you intend to do and stick to the plan. You should know what numbers to look for by checking the manual.

A test flight for the purpose of checking out a plane before you buy it is not about taking the plane to the limits, or a joyride as this accomplishes nothing constructive. The important business is to write a plan and stick to it. Check POH figures and take notes as to what is working, what is not, and check for indications of a problem such as reduced oil pressure after the engine warms up.

The complete test flight scenario would start much before the actual engine start with a good preflight, making note of oil leaks, seeps or drips around brakes. Note if the belly is oily, or there are fuel stains behind the fuel caps or around the fuel tanks or under the wings below the fuel tanks. What was the oil level, color, and smell before and after a flight?

What was the color and consistency of the exhaust residue inside the tail pipe before and after a flight? What was the approximate extension of the nose and main gear struts before and after a flight? What were the static instrument readings before and after a flight; specifically was a fuel gauge showing full before and after a flight even though that tank was used for the flight?



COMPLIANCE WITH FAA AIRWORTHINESS DIRECTIVES ON ENGINE AND AC

| A. D. No. and Date | Item | Method of Compliance (See Log for Details) | Time on Engine | Date of Compliance | |
|---|---|---|---|---|---|
| 78-09-07 | | Bendix Mags Due @ 1478.3 | 978.3 | 12-7-92 | |
| 81-13-10R1 | | Cont Oil Pump | 370.8 | 7-2-81 | |
| 82-27-03 | | Turbo Housing | 510.7 | 2-10-83 | |
| 95-08-10 4/6/95 | | Check Valve - N/A by (a) $ engine S/N | | 4/17/95 | B C AP |

**One of the first things to check on a candidate plane are the Logs and AD compliance records. If they are not well documented, there's usually a good reason—poor or incomplete maintenance.**

Was the oil pressure at zero before the flight with the engine stopped but after the flight the gauge read 10 psi when the engine was off? Check the airspeed indication when the aircraft is stationary; it should be near zero, and the altimeter with proper barometric pressure setting should indicate close to field altitude.

The VSI should be close to zero and not have any indications of moisture inside of the glass. The compass should have full fluid and indicate correctly and have a compass correction card.

How about avionics; do all the navigation and communication radios work? Is there a VOT available to use to ground test the VOR for accuracy? Do the switches and knobs move easily and are indications correct, not fuzzy or missing digits?

A good test flight starts with a good preflight and a tablet full of notes to compare before and after flight. Take things methodically and allow plenty of time to do everything necessary to accomplish a good test flight.

Don't show up an hour before sundown (even if the plane is in a hanger and lighting is good) and expect to accomplish a good check of anything. I would allow something in the order of three hours to do the complete test flight sequence. This is not three hours of actual flying but an hour of inspection/preparation, 45 minutes of flying and another hour or more of post-flight checks and discussions of findings.

After a good pre-flight, start the engine and be prepared to note the instrument readings; did the oil pressure come right up or did it slowly react? Did the alternator show a charge right away after start up? Did the engine start right away or did it take several attempts to start? Did the engine run rough after start up but then smooth out?

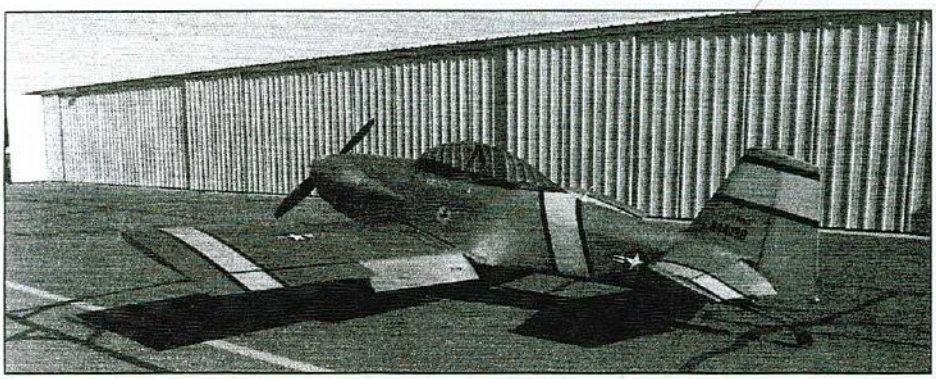
In the engine run-up phase were all the checks considered typical? Was the magneto and ignition system check normal? Did the use of the carb heat indicate a positive drop in engine RPM or manifold pressure? What was the oil pressure during the run up as opposed to idle RPM or during take off?

What was the engine RPM at the beginning of the take-off roll as opposed to the climb out? While it may not be possible to write as fast as events are occurring, these are some of the things to look for and a video camera will catch it all.

It would be a good idea to have an observer in the back seat making a video of the entire flight, or securing a camera and using a remote control. Whatever method you choose to document the test flight, try the video setup you plan use ahead of time so there is no loss of concentration on the flying and observing of performance.

In short, have your video act together before the test flight, and don't be troubleshooting video issues during the test flight. In fact it wouldn't be a bad idea to video the plane itself thoroughly on the ground if your mechanic can't be there for the first look. He may be able to rule the candidate plane out from what he sees on the video.

During the actual flight, check the gyro instruments for proper operation; check the avionics again and check the



**When buying an experimental it's far more difficult to properly asses value. You need to know the background of the builder, and have someone who knows this specific type of plane to go over it like your life depends on it, because it does. We strongly recommend against low time pilots solo flying most experimentals. As a group they are more demanding of skill and less forgiving of mistakes. The engine choice is also important. Avoid geared or non-aircraft engines, or unsupported or uncommon engines. How extensive is the documentation so it can be properly maintained and repaired?**

heating and ventilation systems for proper operation, unusual smoke or fumes from the system. Does the aircraft fly hands-off during level flight? How about slow flight; any peculiar observations to record?

The plane should be flown at cruise speed and some turns, climbs, and descents made. It is not necessary to do a full stall series; maybe one approach to a stall checking for any unusual handling qualities, a stall warning, then a brief period of slow flight with some turns at reduced speeds.

When doing these maneuvers select a good day when the weather will allow this to be done safely. Play it safe; when the weather is less than optimum, either reschedule or modify the sequence skipping some maneuvers in the interest of safety.

During landing, note any tire/wheel vibration such as nose shimmy, and main tire out of balance condition. Check the brakes work sufficiently but don't skid the tires to prove that the brakes work.

Just before parking the aircraft check that the ignition switch briefly selected to "off" does start to shut the engine down (know how to do this properly). To do the mixture check, operate the engine at just above idle RPM and shut down with the mixture control to verify that there is a slight RPM rise before actual drop off to engine shutdown.

After shutdown secure the aircraft and then open the cowl to look for fresh oil leaks and other items of note such as loose parts, and fuel leaks or stains (you should have checked before flight).

Another check that can be made is to lay on a blanket and look up from under the bottom of the engine cowling to get a good view of the engine, firewall, and lower fuselage areas. You can see a lot from this position looking for oil leaks, exhaust leaks, the color and consistency of the exhaust outlet, loose engine baffles and distorted or buckled firewalls.

Look at the belly of the aircraft and compare what it looked like before and after the flight; are there fresh signs of oil leakage, hydraulic fluid or fuel stains along the belly? While some, if not all, of your findings may concern you, it is important to note each item of concern and discuss this with your mechanic during the pre-purchase inspection.

This is not the time to terminate the process of buying a plane as in reality some of the things you may see could possibly be repaired, or explained as normal or acceptable, or be negotiating items on price adjustments. An experienced mechanic can help evaluate the aircraft during the pre-purchase inspection with your notes at which time the particulars can be discussed.

## THE ACTUAL INSPECTION

A plan of action or checklist with clearly stated goals should be agreed upon before having a mechanic start an inspection. A pre-purchase inspection can be anything the buyer and mechanic agree upon but the best situation is that of an annual inspection as this is a specific inspection with known/defined guidelines.

I suggest an annual inspection checklist be obtained and reviewed with the scope of a pre-purchase inspection similar to that of an annual inspection. How many hours should be spent and what would be the most important items to look at during the pre-purchase? In as little as four hours with an experienced technician, a general idea of the condition of a small general aviation plane could be determined.

This would be a basic check and I would not in any way call this an annual, but a check of important points. Generally a compression check, a check of the oil filter for contaminants, an oil sample sent in for evaluation, a second look at the AD note listing and a check of the aircraft for compliance.

A review of the test flight should be conducted prior to any check is made since there are areas on the test flight list that the inspector would be interested in before opening up panels and cowlings and checking the compression etc. Inspection panels should be removed and specific areas of the wing and aircraft structure should be checked for wear, damage, and corrosion to list some of the highlights.

The owner should be involved in this process and also have an agreement with the prospective buyer and the mechanic as to who will pay for services, material, and tests. Certainly the buyer will pay for most if not all of the pre-purchase inspection but occasionally problems arise and the buyer suddenly withdraws interest. The owner may be left holding the bag here, especially if the plane is found as un-airworthy and expensive repairs are required.

Buying and selling a plane can be somewhat trying at times, but I can't over emphasize the importance of sellers maintaining control of the situation in all of the sale phases, and buyers sticking with the recommendations I have made.

"Falling in love" with a plane regardless of the reason can get you in serious financial trouble in a short time if you are not careful. Buyers, be realistic, especially with your first plane purchase as there are a lot of things to learn.

Don't take on a financial albatross just to own a plane that looks good but is much too expensive to operate or you can't afford to maintain or put fuel in, unless you like the idea of being a "poser." If the deal seems too good to be true then it probably is not a good deal. •