Views from a JetProp

So You Want to Buy a JetProp?

Travis Holland

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"Ready to inspect"

One of the most important and most-frequently overlooked steps in qualifying a new aircraft is the pre-buy test flight. Ideally done on the way to the pre-buy inspection, this flight will evaluate aircraft performance and air handling, as well as avionics and ice protection. The squawk list generated from this flight will likely uncover a range of issues that are largely outside the scope of your normal aircraft pre-buy inspection.

Since most folks skip this step altogether, I often end up in the position of generating the squawk list during initial training, leaving the buyer to cure the defects at their substantial expense. This article will address getting the plane started; the subsequent column will cover the in-air test flight.

Before proceeding further, let me note that I will not detail all items to be observed on a pilot's pre-flight. I focus here only on items with frequently observed defects found on aircraft for sale. Pilots must refer to the POH, which is the only official pilot's reference regarding visual inspections prior to flight.

Check It Out Outside

Let us start with the outside of the aircraft. The plane will be well covered by the pre-buy mechanic, but a few hot items seem to come up repeatedly. I look specifically for static wicks broken or missing and weeping rivets on the wing, aft fuselage and tail section. A full exterior lighting check is also in order. Next comes a careful review of the gear hydraulic hoses and actuators for evidence of external fluid, indicating past or present hydraulic leaks. Look for evidence of fuel leaks from the collector tanks in the gear wells. The rubber collar that holds the brake lines in place should not be dragging on the brake discs, and the discs themselves should be smooth, not excessively scored or grooved. Look at the main tires for signs of uneven wear, which may require adjustment of the toe-in (wheel alignment with fuselage). Sideways play in the main gear

"Alternate static and left sidewall duct fairing"

scissor linkages should also be checked.

Before entering the aircraft check to see that the flaps are fully retracted in the flaps up position. The trailing edge of the flaps should smoothly transition to the trailing edge of the fairing at the wing root.

Check It Out Inside

When opening the main clamshell door, check the bottom hinge for wear or evidence of damage from extended operations with a broken door cable. On the inside, check that all four green indicators are visible and that the locking mechanism in the top clamshell handle engages when the top clamshell is latched shut.

In the aft avionics bay, look for adequate hydraulic fluid in the reservoir, and verify all documents are available (airworthiness, registration, and POH with empty weight and balance.).

"Door hinge"

Specific to any Garmin 430/530 units, look in the POH supplements for the IFR GPS and ensure that a reference to AC 20-138 is in the POH supplement for each unit installed. Without this in the POH supplement you have may not have a valid IFR GPS installation. While other ways to document a valid installation can be used, this is the most common.

Avionics Check

Check to see that the ground clearance switch powers up both the GPS and the audio panel. Ground clearance configurations with the stock PA-46 wiring diagram will not power the G530. But knowledgeable PA-46 avionics installers will always include an additional relay to power the NAV1 avionics circuit from the ground clearance to power up the GPS. The short-cut for the installer is to power on a KX165 or similar unit, but this takes away your opportunity to copy clearance and program your active flight plan before engine start. The JetProp does not kill the ground clearance power during the start, and the G530 has an internal switching power supply that supports 10-30v inputs. Thus you will have no problem leaving ground clearance on during engine start. That is beneficial because if you turn off ground clearance only after the radio master comes on, the active flight plan programming is preserved. If you do bring the current too low for the G530, the unit will simply reboot without any harm to the box. .

If G530/430 equipped, check the NAV chapter of the GPS for the number of pages present. Four pages indicate that no optional interfaces are active for features like terrain, traffic, weather, and sferics. Verify that all the hazard-awareness options installed on the aircraft are fed to the GPS. Stock Piper aircraft with these features fed to the MFD will ship from the factory without these optional interfaces configured on the GPS. That will rob you of helpful situational awareness options during flight operations. Check the GPS for WAAS upgrade, latest software revision, and database currency. Deeply out of date GPS databases tell me that the seller has not flown for a while or is remiss in pilot and aircraft maintenance obligations. Review the VOR log for VOR check entries (non-WAAS U.S. registered aircraft only) and GPS database update entries. *Each GPS database update is considered "aircraft maintenance" and must be logged in the VOR log or aircraft technical records*.

Have a Seat

For all six seats, check that your arm rests, seat recline buttons, and headrests are secure and operating normally. Do not forget to check out the aft seats' spring-loaded auto-latch mechanism. Note if the pilot seat cushions are broken down and uncomfortable. If so, the seat may require re-stuffing with new foam. On the two seats up front, check the operation of the up/down seat release knob, the lumbar support inflation bulb, and the presence of the fairings on both side walls underneath the cockpit. While you are down there, verify that the pilot side alternate static switch is in the primary (down) position.

Battery Check

When you are settled in and ready for engine start, check both batteries for voltage and capacitance separately. Inquire about the last start date; if less than one week earlier, the batteries should show above 24v individually, for at least three minutes, with the battery master on. If more than one week has passed since the last start, ask if a battery charger was used. If so, get specific to determine if the owner used the Battery Minder or just the stock 'paperweight' charger (which was supplied with a new JetProp before serial number 220 or so).

Low voltage or any significant voltage drop (.7 v or more) in the first few minutes after the battery master is turned on warrants a pilot capacitance check. Testing one battery at a time, engage the starter (only) for 1-2 seconds and observe the low voltage reading. Anything below 10v, or below 15v during the actual start on both batteries, indicates a poor capacitance. If that is the case, the batteries will likely need to be replaced.

"Seats"

Shadin Check

Take a look at the Shadin air data computer. Hopefully you already reviewed the aircraft's Shadin data for information on the plane's normal operating profile. The Shadin records engine telemetry full time and is a great place to get a sense of the aircraft's usage. Look for any gaps in the data.

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"Tire and brake line clamp"

"Don't buy this one"

On the Shadin box itself, verify that engine exceedances recorded have not exceeded actual published engine limitations. For any exceedances beyond actual engine limits of torque and temperature, check that the listed exceedance durations do not mandate additional inspections that are not already reflected in the aircraft logs.

Look at the airframe exceedances. Beyond the aircraft certification tests at Rocket, you should find no more than a few over-speed exceedances. The over-speed horn activates at 173 or 181 KIAS; the exceedance records at 186 knots. Multiple over-speed exceedances of more than 3-5 seconds duration are evidence that a past operator has been flying with the over-speed warning horn breaker pulled. Over-speeds by themselves are not harmful to the aircraft in smooth air, but a general disrespect for aircraft operating limitations should be taken into consideration. Oil-canned wing skin, weeping wing rivets laterally along the aft spar and longitudinally fore of the flaps are confirmation that the aircraft has been flown harder than you might desire for your next airplane.

Look at the total time, starts and cycles on the engine. Verify the records match the advertised specs. This is a good time to ask the seller casually about service bulletin compliance and vacuum pump, alternator and start/gen time-in-service. The start gen should be serviced at 500 hour intervals, and the other items at intervals of 400 hours. Also inquire whether the gear down-spring was replaced at the last annual. Items not in compliance indicate that the aircraft is being maintained at a lower standard than your aircraft deserves. You should expect a more expensive squawk list out of pre-buy.

Annunciator

Check your annunciator and gear lights for any dim spots. Each indicator has two light bulbs, which ensures indication if one bulb is out. Continued operation with one bulb burnt out discards the redundancy provided by this feature.

Next you are ready to start the engine and go flying, which will be covered in the next issue.

If you are in the market for a JetProp, I recommend using the aircraft pre-purchase service offered by Bynum & Associates. (I have no financial benefit in making this recommendation; just good past experiences with them. Of course ask around and you might find others better suited to your needs). JetProps are handled by John Mariani, arguably the most qualified instructor pilot and PA-46 systems expert in our entire community. The investment into a good expert pre-buy test flight will pay for itself many times over the first few months of operating your new JetProp.

Views from a JetProp

So You Want to Buy a JetProp? Part II

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As with any aircraft purchase, the pre-buy test flight is an essential element in evaluating a JetProp before parting with your hard earned money. Through careful observation and closely checking all essential systems, you can be much more confident in your purchase.

The most common systems in which defects are often observed are icing, pressurization, avionics and stall warning. However the performance of the aircraft at maximum altitudes also should be carefully evaluated. These checks supplement but do not replace a careful mechanical pre-buy inspection, including visual borescope inspection.

Autopilot

Do the complete set of ground checks before takeoff including the prop over-speed governor and the autopilot expanded ground checks. Defer the icing checks until in-flight. Make sure to observe that the pitch servo will move the yoke and does not actuate the auto-trim until you override the yoke with arm pressure. There is a torque limiting feature on the pitch servo which powers the trim servo to relieve control pressure. Most STEC installations I see move the auto-trim almost immediately, which will lead to an over-active pitch trim and porpoising.

Autopilot in ROLL and PITCH (natural) modes

KI256 under autopilot calibration on bench

The King autopilots rely on the King KI256 attitude indicator for pitch and roll attitude information, and the function/calibration of this instrument is essential. To test this instrument, climb to a VFR maneuvering altitude in the low-teens and set power at about 500 pounds of torque. Adjust the rudder trim to center the ball and set rudder trim, then ensure that your fuel is balanced enough to hold wings level hands off.

Then engage the autopilot in ALT and HDG modes. Does the autopilot hold the center of the HDG bug? Note your ground track on the GPS. Now deselect HDG mode, which places the autopilot in the "natural" lateral mode of ROLL. Does the aircraft hold perfectly wings level in roll mode? Does the aircraft ground track remain stable? Any "lean" or continuous change in ground track left or right indicates either a problem with the calibration of your autopilot and flight director (hopefully) or that your attitude indicator is getting old and may require an overhaul. Other symptoms of this problem are the autopilot holding one side of the heading bug or maintaining a full dot of left or right deflection when tracking a localizer course inbound. The STEC autopilots use the turn coordinator for roll information and the above check does not apply.

Icing Equipment

Next, check the icing equipment. I prefer to check the icing equipment in flight rather than on the ground as it is possible to damage the powerful JetProp icing equipment during extended ground checks in warm weather. In normal VMC flight you will have the pitot heat on and all other icing systems off. Watch the amps indication (you may need to turn the strobes off for a stable indication). First pull and reset the P3 circuit breaker, which heats an air line that allows the fuel control unit to manage the acceleration of the engine. You should see about a three amp drop with the P3 heat disabled.

Then pull and reset the left and right pitot heat breakers in sequence. The amp draw should drop by 5 amps with one pitot heat breaker pulled. PA46-350P installations should also illuminate yellow "LEFT and RIGHT PITOT OFF/INOP" annunciators. Next check the windshield heat (this check applies to heated windshield only, not hot-plate). You should see 18 amps increased draw on low and 23 amps draw on high. As our editor will verify, defective windshields cost around $25,000 to replace. You get a preview of the bad news with an observation of 14, 10, or 5 amps on the low setting, which means you most likely have a partially inoperative windshield

De-ice control switches

Prop ice brushes

heat. This is extremely common and easy to check.

Now press the button to actuate a cycle of the boots. A complete boot sequence is three six-second inflations of first the tail, then the bottom of the wing, then the top of the week. Check for a green "SURF DE-ICE" annunciation at the apex of each of the three cycles. The annunciator is driven by high pressure limit switches and not observing the three green annunciations may indicate that you are not achieving the desired internal boot pressure. Your de-ice valves in the nose baggage may need to be cleaned. After boot operation, check that the boots have fully deflated. It is not uncommon to have a pressurization leak from the airframe that leaves the boots partially inflated in flight.

The next check is of the prop and inlet de-ice system. First, test the prop heat ground test by pulling the CABIN PRES circuit breaker. Turn on the prop ice and no draw should be indicated. Then press the prop heat ground test button four times for about 2 seconds each press and observe the amp draw. You should see 23, 23, 29 and 29 amps in sequence. Next turn the prop heat off, reset the CABIN PRES circuit breaker and locate an easy-

Shadin showing full speed cruise

to-use timer like the one found on your ADF. Turn your prop heat on and reset your timer, and note your amp indications. You should see four 66 second cycles of 23, 29, 23 and 29 amps respectively. While plus or minus one amp is no issue, all other function must be correct. Many times I see flickering amp indications, which point to dirty prop de-ice brushes as well as timer issues.

Stormscope™

At this time check your Stormscope™ or whatever sferic device you have on board. Many airplanes have broken or static wicks of incorrect length, which manifests as "ghost strikes" at one o'clock and/or at seven o'clock. This is an easy item to fix on the ground.

Outflow valves in avionics bay

Stall Warning

Next deploy the gear, reduce power, and initiate an approach-to-a-stall with flaps up. You should hear a gear warning horn five knots or so above the stall speed and before any buffet or stall break sets. Many Mirages have stall warning systems damaged from Bonanza-style wiggling of the stall tab on the wing by well-intentioned pilots and passengers. This is verboten in the PA46-350P stall warning system. With the stall system checked, get a clearance to climb to flight level 270.

VSI and Altitude Capture

Use the autopilot with the pre-selector set at a 1000 FPM vertical rate. Note the indications of all VSIs in the panel. Then use a stopwatch to time how many feet are gained in exactly one minute and you will have an objective view on the accuracy of

Power quadrant showing FL270, 950 TQ, ITT735

the pre-selector and VSIs. Finally, verify that the final altitude captured by the autopilot results in a 27,000 foot indication on the altimeter (29.92 of course), and a FL270 indication on the transponder. Any deviations here should be noted and can easily be adjusted on the ground.

Engine Performance

After you get above all the clouds, turn the Ice Door to the OFF position (blue annunciator), still climbing. There are two important checks here. First, in level flight, the engine should make 900 pounds of torque and about 170 KIAS at a density altitude of 27,000 feet (viewable on your Shadin) without exceeding 740 ITT. In warmer weather, the 27,000 foot density altitude may occur at FL260 or FL250, in which case do your power check there. You should also see a KTAS on the Shadin of 260 knots plus or minus 3 knots depending on temperatures aloft. These numbers apply to -34 and -35 engines; -21 engines have lower temperature

Power turbine and flange covering propeller gearbox

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Views from a JetProp

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JetProp during maneuvers

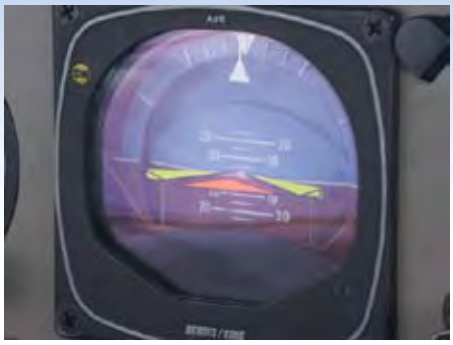
limits and less power output at altitude. The MT composite prop is perhaps three KIAS faster than the earlier props, but this difference is only slightly noticeable in the above performance check.

Pressurization

For your last high altitude check, turn your pressurization controller down to FL230 (intentionally requesting over-pressurization). With the cabin rate needle stable at zero, note the maximum differential obtained. You should get 5.5 PSI and close to a 9,500 foot cabin. Any failure to achieve max differential should be noted. Failure to reach maximum differential at high power settings often indicates dirty pressurization outflow valves rather than raw cabin leaks. Next check the cabin's ability to hold pressurization at reduced power settings. The cabin is always leaking a little bit, so this check will see how much you can reduce the inflow of pressurized air before the leaks overcome the pressurization. Set 600 pounds of torque and look for any climb in the cabin rate needle. If zero rate, reduce to 500 pounds, then 400 pounds, then 300 pounds. A tight PA-46 cabin should hold pressurization easily to 400 pounds and the best cabins will hold or climb very slightly at 300 pounds torque. Having a tight cabin that makes maximum differential is important, or you will have cabin dumping occur during normal 1500 fpm descents.

Instrument Approaches

Fly a coupled ILS (and WAAS GPS approach, if equipped) on your return from the test flight. Pay particularly careful attention to localizer tracking



KI256 out of calibration

inbound, and normal glide slope capture. Leave the autopilot coupled all the way to the decision height and watch for any unfavorable pitch oscillations during the last mile of the approach. The narrow beam width on the end of an ILS is an excellent test for autopilot pitch performance. A well calibrated and properly adjusted autopilot will not show any unpleasant indications during this most critical time of your approach. Does the flight director snugly nest with the command bars during the approach? Any sustained gap between the command bars and flight director should be adjusted out, and the autopilot calibrated afterwards.

Buyer Beware

While there are certainly more things that can be checked, the above items will uncover the most common and expensive pilot-observed defects. These simple checks will give you a great list of items to discuss with the mechanic who will be performing your pre-buy inspection.

For new buyers of used JetProp aircraft, I strongly recommend here as I have done in the past the use of a qualified pre-purchase service. Choose one that fits your needs and personality. I have had great experiences with Bynum and Associates, but ask around and you can find others as well. The investment in a good expert pre-buy test flight will pay for itself many times over during the first few months of operating your new JetProp.

JetProp pilot John McGwynne focusing on his checks