



KING SCHOOLS Over 90 Courses—
For Beginner to Pro!

Garmin 430 / 530 and G1000 Courses—
Get Proficient Before You Fly! [Go to Garmin Courses](#)

1-800-854-1001 • www.kingschools.com



flight
TRAINING

[FREE STUDENT RESOURCES >>](#)

Search [»](#)

HOW TO PRE-FLIGHT AN AIRPLANE



FREE Student Resources
6 Issues of *Flight Training*
PLUS exclusive training resources
to keep you informed & prepared

100% FREE!
Get NOW!

[Free Student Resources!](#)

[Students: Join AOPA](#)

[AOPA Member Log In](#)

Understanding how is as important as actually doing it

By Ray Heyde

Did you preflight? This is a question flight instructors ask students countless times every day. A better question might be, "Do you understand how to preflight?"

A student once told me during a preflight that the "dark oil" on the brake cylinder was not brake fluid, because "5606 brake fluid is bright red." What the pilot didn't realize is that the oil is not going to be bright red after a few hours of use, especially when it's dripping over a brake covered with brake-pad soot. That student had more to learn about preflighting.

Inadequate preflights result from either insufficient training or complacency—pilots may not have learned the hows and whys of a good preflight, or they may have the necessary knowledge but voluntarily or involuntarily ignore it.

As an experiment, I held a preflight contest with a "bugged" trainer. I reversed the rigging on the ailerons so their movement was contrary to control inputs. Every one of the contestants checked control movement and freedom, but no one caught the problem. I also switched the colored lenses in the navigation lights; about half of the contestants caught that one. I could almost hear the contestants thinking: "The aileron moved, so it must be rigged correctly;" and "there is a lens on the position light, so it must be in the correct position."

The key to a good preflight is understanding what you are checking and why you are checking it. You must know what is normal and abnormal, what is airworthy and what is not. What follows is not a comprehensive guide to preflight inspections—the aircraft's pilot operating handbook (POH) or approved flight manual (AFM) gives this information—but a review of some commonly overlooked details.

Organization and attention to detail are important. When preflighting, always follow the aircraft's written checklist. One overlooked switch (such as a boost pump) can make the difference between safety and disaster. You should also double-check everything if the airplane has just come from maintenance. With all this in mind, let's preflight a typical general aviation trainer.

The "once over"

As you approach the aircraft, give it a "once over." From a distance you can see the whole airplane, and this vantage point can reveal such problems as flat tires and bent or damaged wings, gear struts, fuselage, or empennage. Do not assume that the airplane is okay because you just flew it 10 minutes ago. One of my students, during a 15-minute stop at another airport, did not notice that another airplane had damaged his airplane's rudder in a taxi accident until he saw the note attached to the damaged airplane's control yoke.

ARROW check

When you reach the cockpit, check first for the necessary documents—the FAA says an airplane cannot legally fly without them. Make sure the airplane has an ARROW, the acronym that helps you remember the required documents: airworthiness certificate, registration, radio station license, operating limitation documents, and weight and balance information. You will most likely find them all in a clear plastic pouch attached to a cockpit wall.

The airworthiness certificate tells who built the airplane and when. It stays with the airplane throughout its life in the United States. It must be displayed so that it is visible to crew and passengers.

Even though the registration is commonly used as evidence of ownership, it merely gives the airplane's nationality. A new registration is required when ownership changes; the "pink" temporary registration is good for only 90 days.

A radio station license is issued by the Federal Communications Commission and is good for 5 years. The license may be



STUDENTS: 6 FREE ISSUES
Plus FREE training
resources from AOPA!

[GET RISK FREE NOW](#)

Advertisement



OVER 90 PILOT COURSES
FOR SMART, SAFE, FUN FLYING

KING SCHOOLS [Find Out More >](#)

1-800-854-1001
www.kingschools.com

The best and worst of 2012

Please enter *at least one* value in the fields below and press the **Search Database** button

City:

State:

[Search Database >>](#)

issued to an individual aircraft or a fleet. Rental and flight school aircraft often have fleet licenses; the license kept in the airplane gives the number of aircraft in the fleet, not the particular airplane's N-number.

Documentation on operating limitations includes cockpit placards, color coding on instruments, and the AFM or POH. These books serve the same purpose; the airplane will have one or the other, depending on when it was certificated. The AFM is aircraft-specific (it should carry the N-number or serial number), and the POH covers a particular make, model, and year of aircraft.

Weight and balance information must be for a specific airplane. You cannot substitute information from another airplane of the same make and model. An important part of the weight and balance information is the equipment list, which details everything installed in the aircraft. You should be familiar with this paperwork because it is the only official source of information for computing weight and balance.

Aircraft logs

Periodically examining the aircraft's logbook is a good idea to ensure that the required aircraft inspections are current. Aircraft operated for hire have to be inspected every 100 hours of operation, and all aircraft must have an annual inspection. The transponder and altitude encoder (if installed) must be checked every 24 calendar months. If the airplane is flown IFR, the pitot/static system and altimeter must also be inspected every 24 calendar months, and VOR accuracy must be checked and signed off every 30 days. Maintenance technicians must perform all these inspections except for VOR accuracy, which you can do (and should do before every IFR flight).

Don't underestimate the importance of checking the aircraft logs. One pilot I know flew a rented airplane for his flight instructor checkride without carefully reviewing the maintenance records. In inspecting the logs, the FAA examiner discovered the transponder check was out of date. The examiner gave the pilot a choice: He could take a pink slip for a failed checkride, or the inspector could cite him for flying an unairworthy airplane. He took the pink slip (and now checks the aircraft logs before flight).

Cockpit check

After your paperwork check, make sure all the cockpit switches and valves are in their correct positions (and make sure valves, such as fuel selectors, turn and hold their settings). Turn on the battery switch and note the fuel quantities so you can compare them with your visual inspection later. Turn off the battery switch. Don't put the key in the magneto switch, if applicable, and ensure that the magnetos are OFF.

Before leaving the cockpit, remove any trash; you don't want it rolling around and possibly jamming the controls. Check the seats and seat belts for proper operation; frayed or loose belts may not function correctly in an emergency.

If the aircraft uses fuses, note the location and quantity of spares. If you have not yet learned how to read a fuse's ampere rating, ask a flight instructor or maintenance technician, then compare the spares with what the airplane requires. If you cannot read the rating on the fuse holder, call a maintenance technician for assistance.

Checklist tour

Take your preflight-inspection tour around the aircraft following the manufacturer's checklist. Pay special attention to loose or "smoking" rivets (which have a residue around them), the security of all bolts and nuts, and safety-wired devices. Two basic nuts are used on airplanes: self-locking nuts have internal features that keep them from unscrewing so they do not need safetying; and non-self-locking nuts need an external locking method. They may use lock washers, be drilled for a safety wire, or have castellations (a "castle" nut) designed for use with safety wire or cotter pins. Regardless of the type used, ensure that the locking method is in place, because it is designed to keep the nut from working loose in flight.

Stop and roll

When inspecting brakes, make sure you check all the brake pads. Acceptable pad thickness varies, so check with a maintenance technician for the applicable measurement. Inspect the brake rotor (disc) for excessive rust, grooves, and overall thickness.

Check each tire for wear and flat spots, even if it is new. This involves rolling the airplane forward or backward a bit, but it's better than blowing a tire on takeoff or landing. (Wheel pants make this task more difficult, but don't bypass it.) I once found a tire, which had been installed new the same day, with the tube showing after someone had landed with the brakes on. Airplanes with tires that have excessive sidewall cracks or bald spots with cord showing should not be flown.

Leaking oleo struts will usually be dark and oily. Assure that oleo struts are not over- or under-inflated; the AFM or POH should give the measurement for gauging this.

Rigged controls

Assure that the flight controls are properly rigged and move freely. On most aircraft you can check for proper rigging by moving the control surface and seeing which way the yoke moves (did you remember to remove the control lock?).

While you are moving the surface, check for rubbing metal by looking for wear or chafing marks on the paint. Feel for any hesitation or binding in the movement, and listen for rubbing sounds. Any unusual indications require further investigation, usually with a maintenance technician.

Check the security of control hinge fasteners, especially on piano hinges. Some aircraft have airworthiness directives (ADs) requiring periodic inspections or maintenance of piano hinges with center wires, which have been known to fall out.

Most flight controls are balanced to provide safe, predictable flight characteristics. On some aircraft, even a new coat of

paint can unbalance the controls, so if you see that any repairs or alterations have been made to a flight control, you might want to confirm with maintenance that everything is proper.

Engine and prop

Check the propeller for overall condition. Nicks can cause stress points that lead to blade failure. Check constant-speed props for oil leaks around the hub and for excessive blade movement (grab the blade and try to change its pitch). Both are signs of problems. Never push down on the spinner to check the nose strut. Spinner bulkheads crack easily and are expensive to replace—and losing a spinner in flight is not recommended.

Remember that moving the propeller could start the engine if the magneto switch is ON—or OFF and faulty. Most magnetos have a ground wire that disables them when the switch is OFF. If this grounding wire breaks, the mag stays hot. Any movement of the prop may cause the engine to fire (if the mixture is not at IDLE/CUTOFF). Never assume you are safe in moving a prop.

When inspecting the engine, check for proper oil levels and look at the engine's overall condition. Air filters or intakes should be open and free from excess oil, grease, dirt, bugs, and other contamination. Dripping oil (some aircraft may drip oil from the crankcase breather on shutdown) and excessive soot behind the exhaust pipes could indicate problems.

Don't forget to look into the exhaust pipe. Normally it should be a dull gray or brown. If it's wet with oil, the compression rings may be worn. If the build-up is heavy and black, the mixture may not be adjusted correctly.

Fuel system

Visually check the fuel for quantity, correct octane color, and contamination. Some aircraft have supplemental type certificates that allow them to use unleaded auto fuel. If this is the case, you should learn the limitations—no alcohol, a minimum octane rating, altitude restrictions, and use of electric boost pumps (if installed).

Check the accuracy of the fuel gauges. You can use a clean, calibrated dipstick (homemade or purchased) to verify the indicated fuel quantity. You also need to know what constitutes "full tanks" on the airplane you are flying. In aircraft with long, flat tanks, such as Cessna 210s, if the fuel level is down about an inch in the filler, it may take as much as another 10 gallons.

On airplanes such as the Cessna 150/152, where the fuel tanks are connected, the fuel level will even out if one tank is fuller than another. This can happen even while the airplane is being fueled—the just-filled tank feeds the other while it is being filled. If you check the tanks after both are filled, chances are they will take a gallon or two more.

Don't forget to check all the fuel vents. If a vent is plugged, the resulting vacuum will hinder fuel flow to the engine. The AFM/POH should tell you the location and types of all the vents. Some aircraft require vented fuel caps. Many aircraft have more than one or two fuel sumps; this information should be in the AFM/POH as well.

Drain and sample fuel from all sumps. When the temperature is below freezing, don't assume the sump is bad when fuel won't come out. Ice in the tank, fuel line, or sump may be the problem—and a definite indication not to fly that airplane. After draining and sampling a fuel sump, visually confirm that fuel has stopped dripping.

Some aircraft have cockpit-activated fuel drains, so it is almost impossible to catch a sample on a one-person preflight. You can place a clean baking pan under the drain to collect the fuel, or just look at the fuel sample on the ramp. Water will show up as a bubble or bead. If you see water, rock the aircraft to dislodge any more water, wait a bit for it to reach the lowest point of the system, and take another sample. If in doubt, consult a maintenance technician.

In an airplane with bladder fuel tanks, the rubber gas bags can become folded, loosened, or stretched, and thus may not hold the specified amount of fuel. Wrinkles and folds may trap fuel or water, which can be freed by in-flight motion. Rocking the wings before taking fuel samples will help free trapped water. When fueling a gas bag, don't let the nozzle rest on the tank's bottom; it may cut the bladder and create a leak.

Preflight cleanup

Your next-to-last action on a preflight should be cleaning all the windows inside and out. Your eyes tend to focus on something close. Dirt and bugs on the windshield can lead you to miss things in your traffic scan.

Your final preflight procedure should be to review the airplane's performance data and emergency checklists. You should have computed the airplane's weight and balance, takeoff runway requirements, density altitude, fuel burn, and other essential items during your preflight planning. Take a minute to review the airplane's important speeds, such as VX or VY (the best angle or rate of climb, respectively), and best glidespeed. Go through the appropriate emergency checklists: engine fire on engine start, aborted takeoff, and engine failure after takeoff. While you may have this information committed to memory, reviewing it before takeoff will put it in your short-term memory for quicker recall.

After awhile, some pilots start to consider the preflight inspection a waste of time. Their feelings would likely change if they experienced an in-flight problem that they should have discovered on the ground. This is the essential purpose of the procedure—to leave potential problems on the ground.

Advertisement



KING SCHOOLS Over 90 Courses—
For Beginner to Pro!

Garmin 430/530 and G1000 Courses—
Get Proficient Before You Fly! [Go to Garmin Courses](#)

1-800-854-1001 • www.kingschools.com



PRINT: *AOPA Pilot / Flight Training*

ONLINE: AOPA Online / LetsGoFlying.com / *ePilot* & *ePilot Flight Training Edition* eNewsletters / AOPA Internet Flight Planner / AOPA Airports / AOPA Live

EVENTS: AOPA Aviation Summit

©1999-2011 Aircraft Owners and Pilots Association | 421 Aviation Way Frederick, MD 21701 | [Privacy Policy](#)