

TOM HOFFMANN

Maintaining your Way to Greater Safety



Photos by Tom Hoffmann

A Pilot's Guide to Owner-Performed Preventive Maintenance

Squeak, squeak. Click, click, click. Snap! "There, it's done," exclaims the proud pilot as he looks back to admire his first aircraft spark plug replacement. "It's a thing of beauty!"

While many Aviation Maintenance Technicians (AMT) may not share this pilot's enthusiasm for changing spark plugs, they do realize the benefits of having owners more involved with their aircraft's maintenance. Pilots who perform preventive maintenance reap the benefits of having greater knowledge of the inner workings of engines and airframes, as well as all their associated systems and components. In return, AMTs can better communicate with these pilots, who are armed with improved technical know-how, and can more accurately diagnose difficulties and properly maintain the aircraft.

But, exactly what type of maintenance can a pilot perform? What are the legal restrictions? Is training required? Does someone need to supervise? These are all questions aircraft owners face at one

time or another. This article will address these questions and give you a better understanding of what types of maintenance you can and cannot do.

Getting Started

Perhaps one of the best ways you can prepare for your first foray into the world of aviation maintenance is to have a better understanding of the basics. Start by dusting off those pilot handbooks and manuals and review the systems sections for a good refresher on aircraft engines, propellers, electrical systems, landing gear, and more. You can also track down the maintenance manuals for your specific aircraft and examine some of the diagrams and procedures in detail. There's little sense in changing spark plugs or oil filters if you don't fully understand the systems these components impact.

Other good references are FAA advisory circulars on acceptable methods, techniques, and practices (AC 43.13-1 and AC 43.13-2), now available in a print version and available at several online



One of the several preventive maintenance tasks allowed includes cleaning/replacing spark plugs and setting gap clearance (photos on left), replacing position light bulbs, and making simple repairs to cowlings (photos on right).

bookstores. This detailed, one-stop guide for all elements of aircraft maintenance can be a big help to pilots interested in learning more about the overall inspection and repair process.

In addition to educating yourself in system fundamentals, it's equally important to prepare mentally before you start turning a wrench. Maintenance is a serious and regimented activity not

In addition to educating yourself in system fundamentals, it's equally important to prepare mentally before you start turning a wrench.

to be taken lightly. Just as a pilot needs total concentration to ensure a precise and safe landing,

concentration is important for anyone who attempts to perform maintenance, no matter how seemingly minor or inconsequential the task may seem.

31 Flavors (of Savings)

Pilots, especially those who enjoy tinkering with mechanical things and interested in saving a few dollars here and there, often ask the question: Exactly what kind of maintenance can I do on my aircraft? If you hold at least a private pilot certificate issued under Title 14 Code of Federal Regulations (14 CFR) part 61 and your aircraft is not used under 14 CFR parts 121, 129, or 135, you may perform preventive maintenance on your own aircraft. To see a list of the 31 items a pilot can perform without supervision, see Appendix A in 14 CFR part 43. Examples of these approved items include:

- Removal, installation, and repair of landing-gear tires
- Replacing and servicing batteries
- Cleaning fuel and oil strainers or filter elements
- Replacing any cowling not requiring removal of the propeller or disconnection of flight controls

But before you start changing tires, there's an often overlooked detail contained in the definition of preventive maintenance that can affect your eligibility to perform these tasks. For one, 14 CFR section 1.1 defines preventive maintenance as "... simple or minor preservation operations and the replacement of small standard parts not involving complex assembly operations." The key word here is *complex*.

Due to differences in aircraft design and accessibility of certain components, a procedure

like changing an oil filter may be a simple job on some aircraft, but complex on others. Owners and pilots must use good judgment in determining whether a specific function appropriately qualifies as preventive maintenance. When in doubt, talk to a mechanic. Keep in mind also that if a job is not listed in 14 CFR part 43 Appendix A, it does not qualify as preventive maintenance and therefore cannot be performed unsupervised.

It's Awl or Nothing

With a wrench in your hand and a brain fresh with mechanical knowledge, you're now ready to pop open the cowling and get your hands dirty, right? Not exactly. It takes a bit more than technical know-how and a desire to get some dirt under your nails to start any kind of aviation maintenance. There must also be a clear understanding of all facets of the work you plan to perform, along with careful attention to all applicable regulations.

Pilots performing preventive maintenance are bound by the same regulations as any certificated AMT under 14 CFR part 43. Among the regulation requirements is the need to make certain you have all available tools, equipment, and test apparatus necessary for any maintenance task. You'll also need all associated reference materials and manuals. In particular, 14 CFR section 43.13(a) states that each person performing maintenance—pilot or mechanic— is required to use "the methods, techniques, and practices prescribed in the current manufacturer's maintenance manuals...or data acceptable to the Administrator."

Part 43 goes on to state that pilots performing preventive maintenance must perform all work in such a manner "that the condition of the aircraft, airframe, aircraft engine, propeller, or appliance worked on will be at least equal to its original or properly altered condition." Here's a stipulation that requires a great deal of consideration before you embark on any kind of preventive maintenance. If the job seems the least bit complicated, or includes any step that is beyond your ability, put down the tool, step away, and seek help. Have someone qualified, who knows the task well, walk you through the steps.

"Learn to do it properly, before doing it at all," says FAA Aviation Safety Inspector (Airworthiness) Kim Barnette. "It might cost a little extra the first time



you have a qualified repairman or mechanic show you a particular task, but there are dozens of tips you can only learn from someone who has experience with that procedure.”

With more than 30 years of GA maintenance experience, Barnette is privy to many of the inside tips that aren't always explained in a manual and which can easily trip up a unsuspecting pilot during preventive maintenance. “Take safety wire for example,” explains Barnette. “I've seen many pilots over-tighten safety wire to where you could pluck it like a guitar string. If installed that tight on an oil filter, the safety wire could begin to cut into the filter, and within 15 to 20 hours, your engine might start dumping oil.” He's seen it happen—unfortunately with tragic results.

Another easily misunderstood concept concerns torque values. Habits picked up from performing certain automotive maintenance tasks, like hand-tightening an oil filter during an oil change, can trickle over during similar aircraft preventive maintenance tasks, sometimes with deadly consequences. Components such as oil filters, spark plugs, and fasteners typically have a prescribed torque value that must be followed using the appropriate tool or torque wrench.

Also, take care not to exceed the torque values: Tighter does not always mean better. Torque values are set just as much for preventing over-tightening as they are for making sure an item is properly secured. An over-tightened spark plug may actually damage both the engine and the spark plug, which can cause problems with the transfer of heat from the combustion chamber.

Please Sign on the Logbook Line

Maintenance record entries are another critical regulation often overlooked by pilots. Part of the duty and responsibility that comes with the privilege of doing preventive maintenance is returning the aircraft you worked on to service. This is normally a straightforward process that entails making the proper entry in the aircraft records. The entry boils down to three basic parts:

- Description of work
- Date
- Signature and certificate number

In the description of work performed the entry should indicate what was done and how it was done. If the description is extensive, reference the document containing the description, e.g., manufacturer's manual and/or advisory circular.

The signature constitutes the approval for return to service for the work performed. Forgetting this important step could find you in violation of 14 CFR section 91.407(a), which states that no one may operate any aircraft that has undergone preventive maintenance unless it has been approved for return to service with the required maintenance entry. In addition to your certificate number, include the type of airman certificate you hold. For example, PP, CP, or ATP would be used to indicate private, commercial, or airline transport pilot, respectively. Finally, remember to keep all entries neat and legible.

Can I Do More Than Preventive Maintenance?

You can perform aircraft maintenance other than preventive maintenance, just not by yourself. According to 14 CFR section 43.3(d), you must be under the supervision of a properly certificated AMT or repairman

to perform maintenance or alterations, which

the supervising mechanic has authorization to perform. The regulation also does not authorize the performance of any required inspections. Only a properly certificated AMT or repairman can do that.

This provision in the regulations affords pilots, and even non-pilots, a unique ability to learn more about aviation maintenance and get an inside look at how their aircraft operates beyond the allowed preventive maintenance procedures.

Yet another good opportunity to become more acquainted with your aircraft is during the annual inspection. Although you cannot participate in the actual inspection, you can assist with removing panels, cowlings, seats, etc., as well as help perform some of the maintenance tasks required for the inspection. It's best to coordinate ahead of time with the AMT with Inspection Authorization (IA) or repair station performing your annual before you attempt any work. Working together to set up a

Maintenance is a serious and regimented activity not to be taken lightly.



Preventive maintenance tasks include the removal, installation, and repair of landing-gear tires, as well as cleaning and greasing wheel bearings.

source for maintenance information, as are many of the various air shows and fly-ins held throughout the year that frequently offer hands-on seminars. If you happen to be at Sun 'n Fun this year, check out Walt Schamel's presentation on owner-performed maintenance at the FAA Safety Team's National Resource Center.

Weighing the Pros and Cons

Performing maintenance on your aircraft can have several important benefits. It can save time, money, and can open doors to a new world of understanding about your aircraft. But along with this new knowledge comes responsibilities.

"Don't get lulled into a false sense of security," warns Barnette, who has seen pilots, armed with a little maintenance knowledge, try to troubleshoot problems beyond their ability. "Focusing on an incorrect solution may wind up doing more harm than good." When faced with a mechanical problem, Barnette suggests landing as soon as possible to have someone qualified check it out.

As many pilots would agree, preparation is the key to the quality and safety of a flight. That same approach applies to performing maintenance on your aircraft. With good practices, the proper tools and materials, and a professional attitude, you'll be sure to "maintain" your way to greater safety. ✈️

Tom Hoffmann is associate editor of FAA Aviation News. He is a commercial pilot and holds an A&P certificate.

coordinated schedule should allow the inspection process to proceed more smoothly, and possibly help you reduce aircraft downtime. (See Nuts, Bolts, and Electrons on page 34 for more information on IA roles and responsibilities.)

"When working with an AMT or IA, be involved and ask questions," says Walt Schamel, a FAASTeam representative and training manager

for Airline Transport Professionals in Jacksonville, Florida.

"The more you know about the condition and

work being done to your aircraft, the safer the plane will be and the more in tune you'll be to keeping it maintained safely in the future."

A procedure like changing an oil filter may be a simple job on some aircraft, but complex on others.

Tools and Training

Like most things in aviation, aircraft maintenance techniques and procedures are in a constant state of flux. The challenge for many mechanically-inclined pilots (and many AMTs for that matter) is keeping up with all the updates. Fortunately, there are several good resources to learn more about aviation maintenance. Start with the aircraft-specific service and maintenance manuals, as well as any specific equipment manuals to cover installed components such as brakes, tires, and carburetors. Also, review any applicable *Airworthiness Directives* (AD) that pertain to your aircraft.

Another worthy endeavor to make peering under the cowling a less bewildering experience is to attend a training class. Many AMT schools offer classes on preventive maintenance, some tailored specifically for pilots. Type clubs are another good

For More Information

Advisory Circular (AC) 20-106 "Aircraft Inspection for the General Aviation Aircraft Owner;" AC 43-12A "Preventive Maintenance;" AC 43.13-1B "Aircraft Inspection and Repair: Acceptable Methods, Techniques, and Practices;" AC 43.13-2B "Aircraft Alterations: Acceptable Methods, Techniques, and Practices;" and AC 91.59A "Inspection and Care of General Aviation Aircraft Exhaust Systems"
http://www.faa.gov/regulations_policies/advisory_circulars/

Title 14 CFR part 43 Appendix A paragraph c – List of allowable preventive maintenance tasks
http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=ab9209d5338e00128fa564d7a59e8d8a&tpl=/ecfrbrowse/Title14/14cfr43_main_02.tpl