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Aircraft Owner's Toolbox, Part 1

Every aircraft owner has a toolbox, whether it is the classical tote-bag, chest, or roll-away. As a series of articles, we will take some time to look to see what will be in a useful toolbox, and the proper use of those tools. As I said, this will be a series; we will cover documents, basic pre-flight tools, and preventative maintenance tools. Not necessarily in any particular order, as there will be quite a bit of overlap.

Manufacturers and FAA Documents.

Although not carried around in a toolbox, proper documentation is vital to maintenance of an aircraft. Some of these documents are available on-line, others may be better to obtain either in print, or in other electronic format. I recommend that certain ones be obtained on paper. These would include the shop, service or maintenance manual (depending on manufacturer's terminology), and the IPC (Illustrated Parts Catalog). The advantages of having these are enormous. Although a number of the published POH / AFM that we have include a section on maintenance, the Shop Manual (SM) contains many pieces of information that by sheer volume, would make the POH much too bulky. The IPC is handy for finding individual parts or as a rough guide showing interrelationships of the parts. (For true assembly order, always refer to the SM.) These documents can be ordered through your friendly-fearless shop, or direct from most manufacturers. If you order from your technician, be advised that you may be asked to pay a handling charge, as there is no mark-up on publications. However, I encourage you to consult your technician, even to ask them to confirm you get what you need. Most of these are available to order on line. A few examples of places to look:

http://www.hawkerbeechcraft.com/customer_support/technical_publications/
<https://support.cessna.com/custsupt/prop/propload.jsp?pg=254>
<http://www.tcmpowerstore.com/publications/Results.asp?category=24>

You get the idea! Now, why paper? Yup, big, hard to lug around when the lap-top can go to the hangar, and the same information is available on CD, right? All true, but occasionally, the manual may have incorrect information. When you find this, or a trick that your buddy told you about to make a task a bit easier, make a note of it in your manual. Another idea is to note your aircraft TT in the margin adjacent to a part in the IPC when it gets replaced. That can give you an idea of how often you are doing it, and maybe determine if addi-

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tional preventative maintenance or servicing of that part can extend life. Yes, you could keep a separate notebook with these notes, but then you would have to recall you had a note on the subject. Make your life easier and get the paper copy.

Other information that can go in the documentation toolbox would include these items that I would say are better found on the internet. These are things that are more likely to be revised and are not needed quite as often (a few exceptions apply – more on that later.)

FARs pertaining to maintenance and maintenance records, found in FAR Part 43, and Part 91.401—91.411:

http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgFAR.nsf/Frameset?OpenPage

Airworthiness Directives: http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAD.nsf/Frameset?OpenPage

Type Certificate Data Sheets for Aircraft, Engines, and Propellers:

http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgMakeModel.nsf/MainFrame?OpenFrameSet

Supplemental Type Certificates:

http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgSTC.nsf/MainFrame?OpenFrameSet

Information found from these sites are print what you need, or come back again, it may be different next week.

The things you may need a little more often might include copies of service bulletins. A good number of manufacturers already send those to aircraft owners of record, some have the popular ones available on their websites, others charge for them. If you can find what you are looking for on a website, this would be good to print and put in your SM or aircraft log folder. The links above for Shop Manuals and IPCs will also take you to other service information, like the bulletins.

Next time, we will discuss pre-flight tools, and the interrelationship to the tools (documentation) that you acquired here.

Engine Analyzers

I don't consider myself an old-timer, but I am continually amazed at the progress we have seen in our engine instrumentation. Steam gauges, as the old instruments are referred to, have been around virtually forever, and give us the information we need to operate our engines safely. Need, of course is the key word.

If our tach cable gets a little wear, we can see a wiggle on the reading, so what RPM are we actually running? The oil and cylinder head temperature gauges have a nice green arc we need to run in, but few have any actual numbers printed on the dials, so we really don't know what the temperatures are, other than 'in the green'. Those of us that have used a single point EGT only know what the temperature of the cylinder it is attached to is doing, although in some installations, the probe may be mounted in an exhaust collector where we are now looking at an average temperature, which actually gives us less information as to what a particular cylinder is doing.

I'm not sure when the first engine analyzers arrived on the scene. The first ones we sold displayed exhaust temperature (EGT) and cylinder head temperature (CHT) on a bar-graph display. Pretty cool for watching trends and comparing to one another, but still didn't give the exact temperatures we would like to know. Since then, several different manufacturers appeared; I do not recall who was first, but improvements have been made. Now most of them not only show the bar-graph for all CHT and EGT information, but also digitally display them, plus voltage, temperature difference and cooling rates. Various options to plug into the units range from oil and outside air temperature, to RPM, MAP, and fuel flow.

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Several of the manufacturers of these fine little units have made their displays larger, presenting additional information, and have had a few of them approved as primary instrumentation.*

We have installed and used these units for both primary and supplemental instrumentation in many aircraft. The purpose here is not to play *Aviation Consumer* and determine who makes the best unit for the buck. Nor is it to discuss alternate ways of running your engine for maximum gain; that is a subject better left to the professionals that claim that in their areas of specialty. Installed and operated according to manufacturer's literature, they all do a good job of presenting information to the pilot. Some have a few more bells and whistles than others, and the displays vary somewhat. That is personal taste, although we can assist you in finding the correct unit for your needs.

To gain the most from your engine analyzer, it must be installed properly. Placement in the instrument panel is key to usability by the pilot. When replacing a single point EGT with one of the newer units, look at the placement of the instrument in relation to the information it can give you. When a single point EGT was installed, the purpose was to give information to the pilot to lean the engine in cruise configuration, little more or less, so it needed to be referenced seldom in flight. The engine analyzer, on the other hand, should be prominently placed in the panel. (That said, some of the units have an external warning line that can be attached to an annunciator light to show an out-of-limit situation.)

The probes can be interesting to install. All the EGT probes should be placed the same distance from the cylinder to get the most reliable readings. Confirm the ability to install and clear other objects in the nacelle before picking up your drill. My best advise when drilling these holes is to start small and bring up to final size. Also, if the engine is turbocharged, remove the turbo and attach a vacuum cleaner to the exhaust to remove all drill shavings during the drilling process; it would be a shame to damage the turbo for something this easy.

In looking at these installations, it is easy to see if the installer read and understood the installation instructions. Clearance from magneto P-leads, high-tension (spark plug) leads, and alternator wiring is essential for the best operation of an engine analyzer. (Although we try to maintain minimum of 1" to these wires and cables; it may not always be practical. However, it is not good practice to just tie the analyzer harness to whatever is available.) And let's not forget about securing the wiring, and sealing the firewall penetration properly. Shortening the supplied harness is OK if the installation instructions authorizes it; that makes for a much neater and professional looking installation than just 'bundling it up'.

Another error we commonly find on the installations for supplemental information is the analyzer is wired to the primary electrical bus with no means of shutting it off. Recommended practice is connect to an avionics bus, or, if unavailable, install a switch or pullable circuit breaker so it can be off during engine start. (Note: Installations for primary instrumentation are required to be on the primary bus.)

Don't forget to program the unit. Most of them have a mode you can enter to change or set the limits for the various functions. This is important to do so it doesn't give you erroneous indications. If you just 'live with it', then when it does have something to say, you may just not pay attention. Get the most out of your new instrument by having a clean installation, and then you can be in tune with your engine, and get the best information possible.

*Primary instrumentation: Engine instruments that are required to be in place and operational to monitor limits prescribed by the engine and / or airframe manufacturers. Although most of the digital analyzer systems give more accurate information, the units as well as installations for a primary installation must meet higher standards than those used for supplemental information.

Customer Spotlight

Over the winter, we assisted Eric and Tammy I., of San Juan Capistrano, CA in finding their dream machine. After reviewing and dismissing a Beech Debonair in Montana, Eric found one in Oregon they went to see. They liked the airplane, and I was off to do a pre-purchase inspection. This inspection did find some discrepancies needing to be corrected. The sale was completed, and the aircraft was delivered to AVSTAR. We worked to correct those discrepancies and add a couple of 'personalizing items'.



Shortly, they will be taking their dream machine home.
Welcome to the aircraft ownership family,
Eric and Tammy!

One of the projects Eric had us perform was installation of a JPI EDM-700. As discussed in the previous article, the installation is neat, and the placement of the instrument in the panel is well within view.



Thank you for reading this issue of our newsletter. I hope you have found it interesting and informative. If you have any questions or comments, you can email them to me at avstarair@att.net. If this issue was sent to you by a friend, you may opt in to receive further issues by sending an email to me at avstarair@att.net. If you chose to opt-out of receiving further issues, please email me at avstarair@att.net with the word remove in the subject line.

Gear Green,

Mike

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