

CREATING A TAILORED MAINTENANCE SCHEDULE PART I

By Francis Donaldson. Pictures Malcolm McBride



The more information you can find about maintaining and operating your aircraft, the better equipped you will be to tailoring a maintenance schedule to your and your aircraft's requirements.

For quite a while now, we've been promoting the idea of each LAA aircraft having a Tailored Maintenance Schedule, unique to the aircraft and its owner's individual requirements; you've probably seen references to this in Malcolm McBride's *Safety Spot* column. But what exactly does 'aircraft maintenance' consist of, and how exactly should an owner go about tailoring his maintenance schedule – if indeed he has one in the first place to tailor?

For most certified aircraft, the maintenance schedule has had to be specified as part of the certification process. In contrast, for most LAA aircraft the Permit to Fly simply requires that the owner keep the aircraft in an 'airworthy' state.

I remember when I first bought a half-share in a homebuilt VP-1, back in the late 1980s, being surprised to find that although the aircraft had been flying for more than a decade, there was nothing written down to tell us how it should be maintained – just that it had to pass an annual permit renewal inspection.

I had to cast around to find out that changing the oil in its VW engine was recommended at 25 flying hour intervals, and that it was worth checking the tappet clearances at the same time. Beyond that, it seemed, we were on our own! In those days, the Permit renewal form didn't even include a list of check items, so it was entirely at the inspector's discretion what was looked at during each year's 'annual'.

As with most owners, I expect, we quickly fixed on the CAA's LAMS (Light Aircraft Maintenance Schedule) as the most readily available source of inspiration for looking after the VP-1 and, having crossed out all the items that didn't apply to this very simple fixed-gear single seater, it boiled down to a quite straightforward schedule of 50-hour and annual inspections, with an interim oil change halfway between each '50'.

The 50-hour check included lubricating everything that moved, and we would touch up the varnish on the prop from time to time, keep a wary eye on the tension in the single chain that drove both mags, and weld up or replace the exhaust stubs when they cracked.

We never flew more than 150 hours a year so the need for LAMS's 150-hour check never came up, the 150-hour check items were simply combined with those for each year's annual, and as this was a Permit aircraft we never gave a thought to the LAMS three-yearly star annual which, for a CofA aircraft, we'd heard meant its 'ritual slaughter' by the dreaded M3 company.

Our aeroplane was in quite a neglected state when we got it, so over the next few years, in addition to the 50-hour and annual, we also had it apart, portion by portion, for refurbishment – wings off one year, tail the next, and so on. After a few years, the whole airframe had benefitted from an in-depth look over and all those 'must do, one day' items had been made good. Eventually, of course, it would need recovering – the expense didn't bear thinking about – but for now it was a thoroughly presentable, reliable and, we felt, airworthy machine.

Nowadays we have a great many more sophisticated and expensive amateur built aircraft on the LAA fleet and it's appropriate that LAA gives more guidance on how to look after them. Recognising this, a few years ago we put a generic maintenance schedule (GMS), up on the LAA website; the easiest way to find it is to write *Generic Maintenance Schedule* in the search box at the top of the home page.



Alan Turney inspects the throttle linkage on a Chipmunk. Is the wire locking secure, and has it been done correctly?

“The LAA's hands-off approach where the owner and his inspector are free to develop their own means of achieving airworthiness, reflects the bespoke nature of LAA aircraft generally”

This generic schedule is itself a derivative of the old LAMS schedule which the LAA staff have already tailored slightly for typical LAA use, taking out references to Stormscopes, combustion heaters and other things not (yet?) featuring in our fleet. We also subtly eliminated some of the high-cost items which are of marginal value to a day VFR aircraft, such as battery capacity checks and regular re-calibrations of the flight instruments.

By now more enlightened, we included in the LAA GMS the LAMS concept of a more in-depth review of the aeroplane at three-yearly intervals. Not to try to impose higher standards on the Permit fleet but rather to encourage the idea that there should be a long-term maintenance plan rather than each year just looking to keep the aircraft going through the next annual check. We had ideas (still do) that a schedule based on a three-year cycle might one day allow a lesser HQ involvement at the first and second year of the Permit renewal, and allow the owner and the inspector to take on a greater role at the local level, freeing up some HQ time for other matters, including a more detailed review at each third year. We put this generic schedule on the web as a

Word document so it could be easily tailored to suit the requirements of the owner but, as we always try to do, we presented this as a suggestion rather than a requirement.

The LAA's *hands-off* approach, where the owner and his inspector are free to develop their own means of achieving airworthiness, reflects the bespoke nature of LAA aircraft generally, the less regulated Permit environment encouraging greater owner-involvement in the decision-making. Interestingly, of course, with the development of the MIP (Minimum Inspection Programme) we are now seeing EASA adopt much of the same philosophy for small certificated aircraft... maybe a case of imitation being the sincerest form of flattery?

Naturally, exactly what is meant by keeping an aeroplane airworthy can be differently interpreted. Some choose to maintain their aircraft in a tip-top condition by attending to every blemish immediately it's noticed, and find part of the pleasure in ownership in constant tinkering and titivating. Others do the minimum and allow their craft to deteriorate to the point where it is only just airworthy and then, penny-pinching, try to keep it just on the acceptable side of borderline for as long as possible, at minimum cost. The risk of this approach is that the aeroplane eventually reaches the stage where not only will no LAA inspector renew its permit, there's also so much that would need doing that it's effectively beyond economic repair.

Fortunately, this doesn't usually mean the end of the road for the aeroplane, as such worn out and neglected craft are usually snapped up for a song by an amateur enthusiast-restorer who relishes the chance to breathe new life into the old bones. The aircraft is then returned to a thing of beauty in his spare time over a long period, the drip-feed of cash probably being written off as justified in pursuit of his artistry, or perhaps as the only means of owning an aircraft that he otherwise couldn't afford.

Between these extremes, most owners and their inspectors find some middle-



I suspect most people don't check their generator until it stops charging! A deep inspection of the electrical system at say, three yearly intervals, could include cleaning and inspecting the generator.

ground approach to keeping their aircraft airworthy, dealing with potentially dangerous snags as they arise and taking a very good look at each annual, keeping the aeroplane in as good a state as possible within the scope of an often limited budget.

The LAA is all about promoting aviation at an affordable cost and fortunately, in many cases, the actions needed to keep a tidy aircraft from deteriorating are often not in themselves expensive. They are more to do with good husbandry and exercising all the normal measures required to look after things mechanical.

You often find that serious and very expensive damage can be avoided by regularly doing a few minutes' work - the timely intervention of a grease gun, an anti-corrosive spray, or a wipe over with an oily rag for example. Adjusting the tappets may only take a few minutes but may save thousands of pounds on a new pair of cylinder heads. Keeping those engine compartment baffles and hoses in good nick may just save you a fried magneto. Changing the brake pads in good time might save damaging the much more expensive discs - or worse, save you from groundlooping the aeroplane into that ditch alongside the runway.

Provided you keep it airworthy, it's your choice how you manage your aeroplane but from our rather unique vantage point at LAA HQ, our bread and butter, steady flow of incident reports, repairs, and refurbishments, time and time again illustrate how scrimping on routine maintenance has cost a great deal more in the long term. Moreover, keeping your aircraft spick and span will enhance your pleasure of ownership and the aircraft's serviceability.

Inspectors inevitably vary in where they draw the line between airworthy and un-airworthy, so the sale of an aircraft that's rough around the edges often leads to accusations and recriminations. The previous inspector will probably have had the benefit of seeing the aircraft aging gracefully in the preceding years, and knew that the many things he's been keeping an eye on, year by year, are in fact fairly static in their decline and unlikely to give up the ghost anytime soon. Seen through the eyes of the new inspector, the same features may represent a host of unacceptable defects, rendering the aircraft grossly unairworthy and the previous inspector's judgement 'beyond the pale'.

SO, WHAT'S THE TMS ALL ABOUT?

In a nutshell, the aim of a maintenance schedule is to specify a programme of work which will keep the aircraft in the state you want it to be in, preserve its value and avoid any nasty surprises both in terms of safety issues and unforeseen costs.

All mechanical devices deteriorate if they are not looked after - moving parts wear, highly stressed components crack. If the various protection systems break down, then metallic components corrode and wooden parts rot, glues come unstuck. Rubber hoses harden and crack, Perspex crazes, cowlings fret and scorch - oil gets contaminated in engines, and oil that leaks out soaks into wooden structures, destroying the integrity of the wood.

Composites delaminate if abused. The strength of fabric degrades with time and exposure to UV and airborne pollution. Given half a chance, rodents nesting in flying surfaces

will eat through rib stitching, and their urine triggers disastrous corrosion in aluminium. Standing water inside your structure can cause havoc, whatever material it's built from. Mould, once started, can be very difficult to treat.

Given this depressing picture, it seems to me that the aim of the maintenance schedule is four-fold:

1 Carrying out inspections to check for new signs of problems emerging, to make sure that cracks are not developing, that there are no unwanted residents, leaking pipes, areas of corrosion, failed rivets, bent undercarriages, loose bolts etc. And, of course, rectify as necessary. Some of these inspections will need to be verified by your inspector as part of the Permit upkeep process, others are entirely up to the owner.

2 Where some deterioration or change is inevitable, to monitor, check, and where appropriate, adjust or rectify – for example engine compression checks, breakout force checks on castering nosewheels, control surface cable tensions, brake shoe wear.

3 To replace at regular intervals those items that are inevitably going to degrade and there's no easy means of checking their ongoing serviceability – engine oil and brake fluids, spark plugs and spin-on oil filters, for example.

4 To take whatever steps you can to keep things working properly and prevent or slow any deterioration in condition – greasing those wheel bearings, bellcranks and pushrod ends, keeping those drain holes clear, treating that area where the paint's started to bubble. Setting a few mousetraps and fixing that hole in the hanger roof.

INSPECT OR MAINTAIN

Owner "I paid my inspector to do the annual this year and would you believe he didn't even grease the aileron hinges..."

Inspector "The owner brought me the aeroplane to me for its annual inspection and d'you know he hadn't even greased the aileron hinges."

As a bit of an aside, another thing that sometimes causes grief between owners

“Quite a lot of useful evidence can be lost when an aeroplane gets cleaned up... stains from leaking fuel, oil, brake fluid and also tell-tale streaks of loose rivets, fretting cables and high water marks”

and their inspectors is failing to distinguish the difference between *maintenance* and *inspection*, leading to disagreements over what was expected of the inspector at renewal time. Strictly, like the MOT man with your car, the job of the LAA inspector is only to do the first bullet point above, ie the inspection element, plus, where appropriate, provide the certification signature. If he does the other three actions, which in effect, are the 'servicing' elements of maintenance, then he effectively puts on another hat and works for the owner independently of his approval by the LAA. Making clear exactly what you expect of your inspector, and the inspector what he expects of you, the owner, could avoid a lot of criticisms and disappointment.

Inspectors sometimes gripe about being presented with aeroplanes for the annual check in a dirty state, and with the inspection panels still in place. I have some sympathy with this, but actually inspection-wise (sorry about that) quite a lot of useful evidence can be lost when an aeroplane gets cleaned up. Not only stains from leaking fuel, oil, brake fluid and exhaust, but also those tell-tale streaks from 'smoking' (loose) rivets, fretting cables and 'high water marks' left by standing water – even the malodorous signature of animal life.

There's much to be said for looking at the aeroplane first in its unwashed state, and then again once it's been thoroughly cleaned and opened up.

The inspection elements of the maintenance schedule can only be effective if there's adequate access. This means at the very least, removing all the inspection panels, wing root fairings, wing tips, belly panels and so on. Maintenance schedules such as the LAMS, written with large fleets of almost identical Cherokees, AA5s and 172s in mind, tend to imply that this is as far you have to go as far as gaining access is concerned. In the more specialised, unproven, uncertified world of amateur built and vintage aircraft, the degree of access obtained this way is often not really adequate. The only way to really find out whether all's well is to do a certain amount of dismantling – removing fuel tanks, tail surfaces, wings, undercarriage legs etc. This is done both to look at the attachments of the removed components, but also to gain better access to the structure underneath, via the newly-exposed lightening holes in end ribs and so on.

Of course, unless you're into intensive low level aerobatics like the Red Bull folk, you'd not want to do all this sort of thing annually, but at longer intervals appropriate to the aircraft's design, usage pattern, storage and, frankly, decrepitude.

Some schedules (such as that for the Chipmunk in its RAF life) combined all of these 'deep inspections' into one total overhaul at every 1,500 hours or so of flying, but in the LAA world it can be more effective to schedule different zones for stripping down at each annual so that it takes a few years to work through the whole aircraft, but the amount of strip-down and 'deep inspection' in any one year is not too off-putting. This way the aircraft never needs to be off-line for too long, or run the risk of falling defunct through the amount of work and expense needed to get it all together again and back in the air. ■

Next month: how to prepare your Tailored Maintenance Schedule.



This corrosion was found because the inspector made a concerted effort to thoroughly inspect the internals of the wing. Is such an inspection on your Maintenance Schedule?