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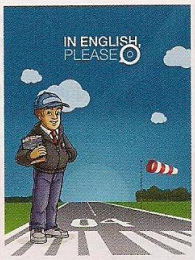


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# Behind the hangar doors - 2
# ENGINE OVERHAULS

As seen last month with the first article of the series "Behind the hangar doors", this February's "In English, please" is a shortened version of an article written by Jerry Parr for *Flyer*, one of the UK's general aviation magazine (www.flyer.co.uk).

Although a healthy engine is vital when it comes to safe and reliable aviating and a good overhaul by a reputable organisation adds value to the aircraft, the idea of needing to have an engine overhauled can bring owners out in a nervous sweat. The cost of avionics or a respray is acceptable because they give something tangible, but an engine overhaul is often regarded as one of those necessary evils – especially if the aircraft is essential to a business. That said, engine performance decay is a slow process: decreased performance tends not to be noticed until a newly-overhauled unit is installed, then one realises what full power should really mean.

### TBO (Time Before Overhaul)

Let's start with what is meant by "engine life". The engine manufacturer stipulates how long an engine can be operated before it is due for overhaul, i.e. its "life". Time Before Overhaul (TBO) is the given life of an engine and is normally specified in both engine hours and a calendar time.

The TBO recommendation is usually mandated by the regulating authorities, although some of these authorities, subject to certain conditions and the performance of additional maintenance actions, do allow certain variations.

Not all engines are created equal when it comes to TBO. The majority of Lycoming engines are lifed at 2,000 hours or 12 years, whichever occurs first. Lycoming engines that live a hard life, such as in aerobatic machines or crop-dusters are often restricted to 1,400 hours, whereas the Cessna 152/Piper PA-38 O-235 is allowed to run to 2,400 hours.

There are several options available when it comes to replace a "life-ex" engine.

### Buy new

The first decision to make is whether to overhaul or replace with new. Historically, GA aircraft engines are not replaced with new ones as it means a much larger capital outlay with little technical benefit. One of the exceptions to this rule is the Rotax 91x series of engines, for two reasons: first, due to the number of components Rotax mandates are replaced with new ones at overhaul – including the crankshaft – the overhaul cost versus the cost to replace with something new is much closer than with the "standard" aircraft engine. The second reason is that even a 91x engine at TBO still commands a decent price when sold, as they are known to carry on quite happily beyond TBO in microlights and other non-certified aircraft.

### Exchange

Normally, the original engine manufacturer will have overhauled engines ready for exchange. The newly-overhauled engine can be obtained in advance, sat on the hangar floor ready to be installed as soon as the life-ex engine is removed, minimizing downtime. One advantage of an exchange is that the unit will be built to latest specifications. For example, a relatively recent modification by Lycoming was the introduction of roller tappets to help reduce camshaft wear. To incorporate roller tappets means changes to the crankcase that cannot normally be performed during an overhaul away from the factory.

### Overhaul the existing unit

There is a train of thought of "better the devil you know" when it comes to having an existing engine overhauled and refitted to the airframe, but quite often the parts count that remain in use after an overhaul may be quite small. It is common for the crankcase halves to fret. This is where they literally rub against each other, wearing the metal away. Obviously, this can lead to issues with the alignment and running of other components. Crankshafts also suffer through wear and corrosion and occasionally have to be replaced. In decades gone by, it was common for engine cylinders – arguably the most stressed components in the engine – to be overhauled. This is no longer carried out. The cost to overhaul a cylinder is so close to the price of a brand-new assembly that there is no real value in refitting overhauled cylinders.

When budgeting for the overhaul, remember that other components may need to be replaced at the same time, adding to the expense. Magnetos, starter motors and other accessories are often included in the overhaul quote, but a propeller governor may be quoted separately. Worn or broken parts may be discovered during the engine removal and some components are specified in the aircraft's maintenance manual as a mandatory replacement at engine overhaul. These might be fuel and oil hoses, engine mounts and even engine controls.

### TBO vs zero-time

When an engine is overhauled, it is released to service to run to TBO again, for instance another 2,000 hours (or 12 years). However, as far as its personal history goes, the engine has run 2,000 hours and the future hours are effectively added to that previous total. The second time it reaches TBO, the engine will have amassed 4,000 hours. For an engine to be "zero-time", it would have to be returned to the factory and be overhauled in accordance with the manufacturer's standards.

**Vocabulary**

- Arguably ..... probablement
- Camshaft wear ..... l'usure de l'arbre à cames
- The crankcase ..... le carter
- A crop-duster ..... un avion d'épandage
- An overhaul ..... une révision
- Engine performance decay ..... diminution ..... de la performance du moteur
- A hose ..... une durite
- A quote ..... un devis, une estimation
- A respray ..... une couche de peinture
- A roller tappet ..... un poussoir de soupape à galet