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Demystifying Engine Terms

A buyer's glossary to what information is being conveyed.

by Jim Becker

Navigating an aircraft transaction can be challenging, but valuing an aircraft can be even more difficult. A simple aircraft price guide look-up can give you a broad range of potential values for your aircraft, but everything - from the number of hours to the condition of the interior - affects the value. The one area that can have a substantial impact on your aircraft value is the engines.

Not only can engines greatly influence the value of the aircraft, but the terminology can be very confusing. Terms like hot section, TBO, rotables and engine programs can not only be difficult to understand, but

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each one has a bearing on how much you can realistically expect to offer or receive for an aircraft. To offer a better understanding in the buying/selling process, an explanation of some of the most common terms you're likely to encounter regarding aircraft engines follows.

TBO – TIME BETWEEN OVERHAULS

This refers to the time period specified by the manufacturer of an aircraft engine as the maximum length of time an engine should be operated between overhauls.

However, the overhaul of an engine (once it reaches its TBO hours) is not mandatory, except for certain commercial operators that have the requirement written into their operations manual.

It is important to be familiar with a particular engine's TBO. Engine overhaul costs for turbine engines can range anywhere from $250,000 to well over $1,000,000 per engine – and even though the overhaul requirement may not be mandatory, the aircraft market places a significant deduction in value that equals or exceeds the cost for overhauling the engines. Therefore, for the buyer or seller of a certain aircraft, it is critically important to know what the TBO is for a particular engine.

The TBO may vary by thousands of hours between the different engine manufacturers, and on some aircraft there is the potential to have a different TBO on two otherwise similar aircraft that use the same engine model. Additionally, some manufacturers have a calendar life on the engine, as well as a usage limit.

ENGINE OVERHAUL

As defined by the Federal Aviation Administration (FAA), a major overhaul consists of the complete disassembly of an engine, an inspection, repairs (as necessary), reassembly, testing and approval for return to service within the fits and limits specified by the manufacturer's overhaul data. This could refer to new fits or limits, or

serviceable limits. When you review the time since overhaul, it is vital to ask questions about the overhaul facility – and important to understand that not all engine overhaul facilities are viewed equally in the used aircraft market.

Although all overhaul facilities must be FAA approved, there are only a select few that are factory-owned or factory-authorized engine overhaul facilities. These will only use parts that are approved by, and manufactured for the engine maker, assuring that you are getting the highest quality parts made by vendors who meet the engine manufacturer's criteria and specifications.

The factory-owned or authorized overhaul facilities also have a greater support network with more support personnel and greater resources than an independent FAA approved repair facility would have. Thus, there are also more options when it comes to warranty service with a factory-owned or authorized overhaul facility. Keep in mind that although an engine overhaul performed by a facility that is only FAA-approved is perfectly legal, the used aircraft market will usually give a particular aircraft a reduction in value for engines having been overhauled by a non-factory owned or authorized facility.

LANDINGS/CYCLES

According to Beechcraft, a flight cycle is defined as an engine start-up with increase to full or partial power (as required during normal flight), one landing gear retraction and extension, and a complete shutdown. For buyers looking to place an accurate value on a prospective aircraft, it is important to know that landings/cycles and engine hours are usually different. An engine may have plenty of hours remaining before an overhaul is necessary, but before it reaches that point it may require internal component replacement due to the engine cycle count.

ROTABLES

This term refers to parts in the engine that have specific serial numbers tracked by the operator. They are tracked because they have a finite life and must be replaced, based on usage or age limits. It is essential to be aware of this because although you may have an engine that has been recently overhauled, it could have major components that need to be replaced before the next overhaul.

MID-LIFE INSPECTION

This is an inspection for which the scope and frequency are determined by the engine manufacturer. This is usually an inspection of the engine hot section (referring to the portion of a gas turbine engine that operates at a high temperature, including combustion, turbine and exhaust sections). Such an inspection may also be referred to as a Major Periodical Inspection (MPI), or a hot section inspection (HSI), and are again important details to know when purchasing an aircraft.

ENGINE PROGRAMS

Most aircraft engine manufacturers offer some type of an engine coverage program - basically an insurance policy/savings account for your engines. This works by having the owner pay a predetermined amount of money to the coverage provider for every hour that the engines are used which benefits the operator in a couple of ways.

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- First, it is an insurance policy against a catastrophic failure of an engine. If something unexpected (such as a turbine wheel crack) were to happen, the service provider would pay for the expense of repairing the engine and returning it to service.
- Second is that the operator doesn't have to produce a large sum of money when it comes time for the engine overhauls or mid-life inspections. Since they have been paying the coverage provider for every hour they have operated the engines, these costs are amortized over the life of the engines.

Some of the better known engine manufacturer coverage programs are CorporateCare by Rolls Royce; ESP by Pratt & Whitney; TAP by Williams International; and MSP by Honeywell. Other highly tried

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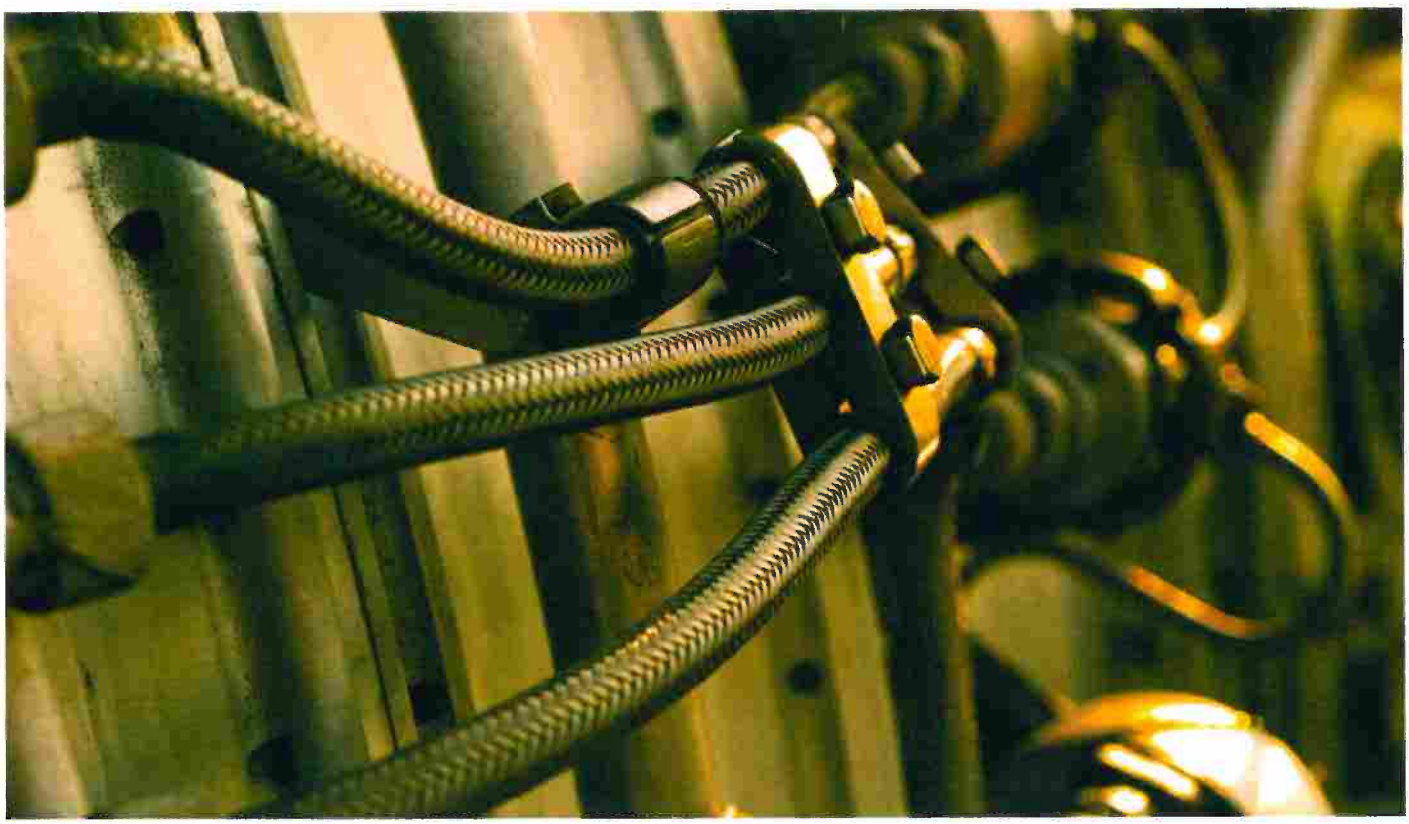

and tested plans that are not sponsored by engine manufacturers include Tip-To-Tail® by Jet Support Services, Inc. (JSSI) and Power Advantage from Cessna Aircraft.

When assessing an aircraft's value it is important to note whether the engines are enrolled in a coverage program, and if so what that program covers. Most engine coverage programs do not cover engine corrosion, or external foreign object damage (FOD). Some programs cover only the actual parts used to overhaul an engine, leaving the operator to pay the remaining portion of the bill (usually averaging 20-30% of the total cost).

Also worth note: Several coverage programs allow the operator to enroll the engine at anytime, regardless of the time since the last overhaul. Often, it is not required for the operator to pay for the hours used before the enrollment offering them the benefit of the insurance program with a pro-rated amount of coverage at overhaul, depending on when in the cycle the engines were enrolled. For a prospective buyer, however, it is essential information to ascertain because although an aircraft might be advertised with its engines on a coverage program, a significant contribution could be found owing at overhaul time to cover the deficit – which would come as an unpleasant surprise to an unwary new owner. The only way to know for sure what is covered is to obtain a copy of the service contract from the service provider, and to make sure the payments are not in arrears.

It should also be noted that if the current operator hasn't been operating the aircraft under the guidelines of the engine manufacturer, any insurance coverage program could be void. As an example, during the economic turmoil of the past several years, hundreds of aircraft have been repossessed by their lien holders, many of which were more-or-less abandoned by their previous operator. These aircraft were left unattended for months (or years) in some cases.

All turbine engine manufacturers have requirements for engine low utilization and storage. Failure to follow these guidelines to the letter is very likely to lead to engine corrosion, and would most certainly void the coverage program. For the diligent aircraft buyer, it is critically important to find out how the aircraft has been operated prior to making a purchase.

PUTTING IT ALL TOGETHER

Whether you are appraising or purchasing a used aircraft, the points of concern are the items that affect the price. Special attention must be paid to the engines as this is where a significant amount of the aircraft's value lies. A full understanding of the aircraft's engines is therefore crucial to determining its overall value.

Although we only touched on engines within the scope of this article, there are a great deal of other items that determine the aircraft value, and each one carries its own terminology. Being an expert in determining how they influence the price takes many years of experience but will ultimately get you the most out of your aircraft.

"For the diligent aircraft buyer, it is critically important to find out how the aircraft has been operated prior to making a purchase."

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For information on JSSI's Tip-To-Tail® Engine Program, visit www.jetsupport.com;

For information on Rolls-Royce's CorporateCare Program, visit www.rolls-royce.com/civil/services/corporatecare

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