

A simple guide to engine values

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Compared to purchasing a new commercial aircraft, commercial jet engines have a lower capital cost, are more easily transitioned between operators and are often more liquid assets than the host aircraft, making spare engines an asset class of interest to many investors.

Further, interest in engines from aircraft lessors increases as an asset ages, given that the proportion of asset value attributable to the engines increases from about 25% in a new aircraft to 90% or more in an engine approaching its end of life. Indeed, some industry participants casually refer to airframes of end-of-life aircraft as “engine stands”.

Engine residual values and their careful management are consequently of high importance both to operators and investors.

Multiple factors drive engine value behaviour, including maintenance costs, fuel burn, ease of remarketing, forecast demand for the associated aircraft and aircraft expected useful life.

In general, as an aircraft reaches the latter stages of its operational life, the engines comprise a much greater percentage of total asset value. As a result, investors and airlines pay close attention to residual values of their engines.

Engine value behaviour and trends

Aircraft engines may be categorized by the maximum amount of thrust they produce and, all else being equal, the values of new engines are strongly related to this parameter. Used engine values are, however, related to asset-specific considerations, together with general supply and demand for the engine model.

Asset-specific considerations

Throughout its life cycle the value of an individual engine varies significantly based on its specific maintenance condition: principally the condition of the life-limited parts in the engine and the time the engine can be expected to operate before requiring performance restoration. Other factors such as open mandatory compliance maintenance tasks, the presence of Parts Manufacturer Approval (PMA) parts or Designated Engineering Representative (DER) repairs in engines may impact values as well.

As seen in chart two, the value of a run-out engine can range from 10% to 50% of the value of a full-life engine.

General value trends over engine life cycle

The general value trends for engines can be characterized over three phases of the asset life cycle.

Phase one of the life cycle is characterized by continued strong new engine demand with used engine values increasing slightly faster than the rate of inflation in accordance with engine manufacturer escalation rates for new engines and spare

parts. During this phase spare engine supply is tight because original equipment manufacturer (OEM) production capacity is focused on supplying engines for new airframes.

As demand for the platform aircraft begins to wane and the tempo of orders and deliveries begins to ebb, the engine enters the second phase of the life cycle. This phase is characterized by a period of stable supply and demand, and the slight depreciation of engine value is more or less offset by inflation.

Engines in this phase of the value cycle tend to hold their value well. The third and final phase of the engine value cycle is represented by changes in demand for the aircraft that the engine supports. As demand falls because of the nearing obsolescence of the host aircraft type – whether from stricter regulatory standards, market references or the entry into service of new products – the engine enters the third and final phase of the value cycle. Characterized by rapid changes in prices, engines begin to lose value quickly. Eventually, it becomes more economical to disassemble the engine into parts than to undertake costly overhauls. Engine values in this phase may be extremely volatile, as the supply of engines may fluctuate depending on part-out levels.

Dynamics driving values in engine market

Multiple factors drive engine residual value behaviour, including market dynamics, evolving engine technology, OEM aircraft production rates, financing availability and market mass. Of additional consideration is the increasing presence of engine OEMs in the engines services sector through the use of Fleet Hour Agreements (FHAs), independent maintenance, repair and overhaul marginalization and reduced engine trading and spare parts provisioning opportunities, particularly on single engine choice aircraft types.

The rapid rise in jet fuel prices that started a decade ago has had a significant impact on the commercial airline industry. Prices for jet fuel have remained in the \$3 a gallon range and show little sign of abating. Between 2001 and 2008 fuel surpassed labour as the number one airline

operating cost, and now comprises one-third of total airline operating expenses for International Air Transport Association carriers.

This sustained high fuel price environment resulted in older-generation aircraft such as the MD- 80 and 737 Classics – with their less fuel-efficient JT8D-200- and CFM56-3-series engines and higher operating costs – becoming marginalized as airlines moved to reduce fuel consumption. Many of these aircraft were removed from service in favour of current-technology A320- and 737NG-family aircraft, which offered better economics with their newer-generation CFM56-5B/7B and V2500-A5 engines.

In conjunction with the replacement of older- generation aircraft with current types, airlines sought relief in the form of new aircraft programmes from the OEMs. Responding to demands for step changes in efficiency of 15% to 20%, in the mid-2000s, the OEMs began developing new generations of aircraft such as the 787 and A350, as well as re-engined versions of existing products such as the A320, 737NG and A330. While some of the efficiency gains stem from the use of weight-saving materials and an improved construction process for the airframe, the majority of the advancements are expected to come from improvements in engine technology offering reduced fuel consumption.

As engine technology has improved fuel consumption has not only been reduced but also on-wing time before the first shop visit has generally increased – in some cases substantially. It is not unheard of for a first run CFM56-7B to operate in excess of 30,000 hours – equivalent to more than eight years of operation before the first anticipated performance restoration is required.

As Airbus and Boeing have steadily increased production rates on both their single- and twin-aisle product lines, engine OEMs have had to increase their production levels to meet this demand. OEMs must carefully manage their production of spare engines for stability of used engines in the aftermarket.

The availability of financing and rates at which engines are financed also has an impact on the engine marketplace. Engines that are in the second or third phase of the life cycle can be challenging to finance, at least with less desirable rates and terms.

Older technology engines in the third phase of their lives may be particularly challenging given volatility in values that can occur in the markets. Of further note in the engine market is the market mass of the engine, which is the ratio of the number of engines in service to the number of operators. Engines supporting large fleets with broad operator bases – thus allowing for increased opportunities to place spare engines into the market – such as the CFM56-5B and the CF6-80C2 series should experience relatively improved demand and stronger pricing levels than those which are more concentrated.

The subject of term-based engine OEM Fleet Hour Agreements has generated much industry and investor discussion and has become of vital importance when discussing engine residual values. These FHAs, while quite beneficial to the operators by providing a more seamless solution to managing engine maintenance, have become a serious challenge for asset owners, particularly of mature engines. Near the end of the life of an engine its value is comprised of any green-time value, the value of the maintenance that may still be consumed before requiring repair, together with the part-out value of the engine after the green-time is consumed.

Dominating positions in the aftermarket by some OEMs has effectively meant that, for some engine types, effectively no secondary parts market exists, such that the price for the engines is effectively set by the single OEM buyer, which has not supported values well. Careful consideration and underwriting is required for investors in engines with these market dynamics, particularly in relation to potential lessee default, programme transferability between lessees and the maintenance costs of mid- and end-of-life engines.

Engine residual values – winners and losers

So what is the outlook for engine residual values given today's market environment? Like many things in the business world it still comes down to some key fundamentals.

Residual values for current-production engines – those in the first phase of the engine life cycle –continue to be strong, with engines that are sole sourced on an airframe, such as the CFM56-7B and GE90-115B, exhibiting good residual value retention, with values slowly increasing. These engines should have long lives because the fleets of the host aircraft are large with significant operator bases.

Although replacement technology aircraft and engines are scheduled to enter service in the medium term, there has been no impact on engine residual values because it will take some time for the replacement technology aircraft to enter the fleet in numbers large enough to displace existing types.

Conversely, values for what were until recently considered phase two engines have declined substantially, as many examples of the host aircraft have left the fleet, such as the CFM56-3 and CFM56-5C experiencing significant softening.

As aircraft mature and edge closer to the end of their economic lives, owners and investors must keep a close eye on market dynamics and other factors that have an impact on engine residuals. Those that manage the cycle effectively will be in the best position to extract as much value as possible throughout the engine's life.

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