# What to consider when **investing in engines**

Engine investors need to be more reactive to changes than aircraft investors, as even a small change can impact the attractiveness of an asset.

Investing in engines is quite different to investing in aircraft. When investing in engines only, there is less of an emphasis on long-term contractual business, with power-by-the-hour contracts being an exception. Such contracts are risky for independent servicers, but less so for original equipment manufacturers (OEMs), which can control the parts supply. There are different customer bases to consider for engines and technical knowledge of the asset is needed to be able to spot opportunities.

Another major difference is that lessors in the engine market often do not get a chance to order engines directly from the OEMs, but instead gain most of their business through sale and leasebacks. Aircraft lessors routinely order aircraft from OEMs because the market and demand to own aircraft is big enough for lessors not to outcompete the OEMs when it comes to placing them.

Along with this, there is more volatility in the engine world compared with airframes as far as investor attractiveness is concerned. So, as an engine investor, you have to be more reactive to change, particularly when it comes to engine teardown and end-of-life solutions.

The V2500-A5, which powers the A321, is an example of a volatile engine. Although the powerplant is in high demand, if you were a company that owned it when all the airworthiness directives came out in the early noughties and more recently in 2016, it would have been seen as a poor investment.

In our annual engine poll on page 11, we sound out investors and ask their opinions on different engine types, looking at their investor appeal, remarketing value and residual values. Speaking to *Airfinance Journal* for the poll, Paolo Lironi, chief executive officer of SGI Aviation, advises against investing in V2500s unless it is a short-term investment, because he believes that shop visits for the engine type will start decreasing over the next nine months, thereby decreasing the need for spare engines.

It is hard to justify investing in an engine long term unless the asset is projected to have a steady customer base and shop visit activity over the next few years. The Pratt & Whitney PW1100 or Geared Turbofan is seen as a good long-term investment: it has a steady customer base and reached 500,000 flight hours on a fleet of 135 aircraft flown by 21 operators over the past year. That said, it has also been beset with technical difficulties since it came into service with Lufthansa in January 2016.

How to communicate an engine issue to the market as an OEM can be critical – either be open about the technical issues with the customers and accept the engine's faults, or claim that the problems have been fully addressed when they have not. The latter strategy can backfire, because it means that any technical issues make more headlines and have more of an impact on market sentiment towards the engine.

When investing in an engine, also consider the aftermarket and the role the OEM has in it. OEMs are often criticised by engine investors for being too involved in the aftermarket. The market is lucrative, but if an OEM has too much involvement in it, third-party suppliers take the hit: their material becomes less valuable and that can decrease the overall residual value of the parts.

OEMs seem to be taking more of the pie when it comes to the aftermarket and performing maintenance on the engine. Take Rolls-Royce and GE, for example. As we point out in our OEM solution feature on page 25, investors often see Rolls-Royce as being more aggressive in the aftermarket than GE Aviation, but recent financial results tell a different story. Of GE Aviation's 2017 revenue of $27.4 billion, $16.6 billion, or 61%, was accounted for by aftermarket services. Rolls-Royce's percentage of revenue from aftermarket work is lower, at 53%.

In the spare parts market, you are seeing more OEMs vertically integrate to cut out the middle man and increase their profits. For example, Rolls-Royce Partners Finance, the leasing subsidiary of Rolls-Royce, has been vertically integrating its business by more directly managing its used material department. As the lessor is the largest owner of spare V2500s, it can easily feed material into the parts business to sustain it.

For customers, there can be advantages of OEMs coming in with new products where they bundle services, but as assets trade, they want a competitive price point, and dominance of the aftermarket makes pricing less competitive.

Often OEMs will price support care packages at the newer end of the curve, leading to a disconnection between that and what others in the market are asking for.

Although many of the OEMs say they are taking steps to address perceived over involvement in the aftermarket, many engine investors are not yet convinced they will follow through with their promises.

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# LEAP reigns supreme... for now

CFM engines for the Airbus A320neo and Boeing 737 Max topped *Airfinance Journal*'s annual engine poll, but some market participants anticipate further teething problems. **Jack Dutton** reports.

Delays and technical issues dominated the headlines in the engine market last year – and the Pratt & Whitney PW1100G (Geared Turbofan or GTF) was the main culprit. Despite the manufacturer's major role in two popular joint-venture programmes – the International Aero Engine (IAE) V2500 for the A320 family and the Engine Alliance GP7000 for the A380 – the PW4000 was the last successful commercial engine Pratt & Whitney developed and marketed on its own, way back in 1984.

In August 2000, Pratt & Whitney developed the PW6000 engine – which was not part of the IAE family – for the A318. It was not a success and lost out to the CFM56 on most of the limited number of A318 sales. Given Pratt & Whitney's long absence from new engine development, then, the GTF's bumpy entry into service was perhaps no surprise.

"There has been a big focus on the Geared Turbofan because of all the problems affecting the engine," says Paolo Lironi, chief executive officer of consultancy SGI Aviation. "Investors are not that eager to buy an engine now, apart from having the problem in finding a spare engine. The fact is that whoever is going to buy the engine now is going to [get one] pretty low in modification standard and therefore it is not so attractive."

The Connecticut-based original equipment manufacturer's technical hiccups helped boost the prospects of the PW1100G's competitor, the CFM LEAP-1A, over the past year. This increased focus on the latest CFM products was reflected in this year's engine poll: the LEAP-1A scored 6.6 out of seven for investor appeal, 6.4 for remarketing potential and 6.4 for residual values.

However, the LEAP-1B, which powers the 737 Max, led the way this year, scoring the highest across all three categories with 6.8 for investor appeal, 6.5 for remarketing potential and 6.5 for residual values.

This is the third year running the engine has come out on top. When it first did in 2016, it had barely entered service. But now the programme is in full swing, with CFM delivering 469 LEAP engines across its programmes in 2017. These represented a six-fold increase over the 77 LEAP-1A engines delivered to the A320neo family in 2016 and formed about a quarter of the 1,900 engines that CFM delivered overall to set a new annual record in 2017, according to CFM executive vice-president Francois Bastin.

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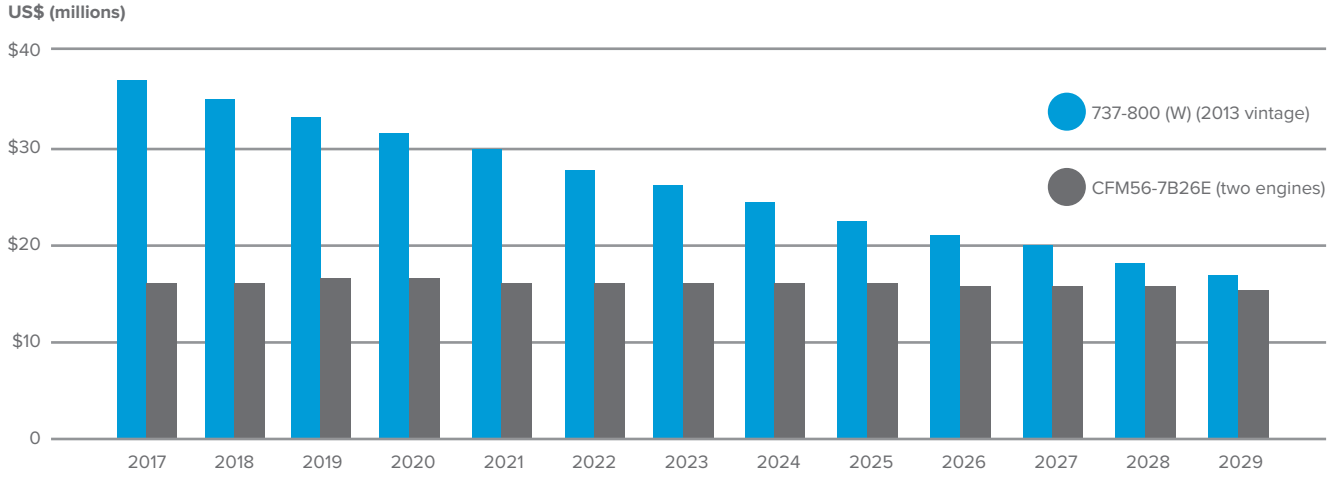
>
> **Paolo Lironi**, chief executive officer, SGI Aviation

## Total engine value relative to aircraft value

Future base values 2017-2029 at 1.0% inflation (aircraft) and 2.5% inflation (engines)




*Source:* Avitas

Although many investors are concerned by the technical problems of the PW1100, the engine still scored highly in the poll, clocking in 5.5 for investor appeal, 5.4 for remarketing potential and 5.7 for residual value.

**Addressing the issues**

"I was expecting issues with the geared turbofan, but even I'm getting a bit concerned about the amount of issues the engine is having and the capability of Pratt to cope with all these issues," says Lironi. "I feel that Pratt is really struggling with all the issues that are happening at the same time."

As well as on the A320neo, Pratt & Whitney has put the GTF into service with the Bombardier CSeries and is due to see it flying on the Embraer E2 programme– grand ambitions after a rough year for the engine.

"For an organisation that has just a few field representatives and that let go the majority of experienced engineers just three or four years ago, I think it's a huge challenge," adds Lironi. "So I'm hoping that Pratt will be able to cope with one thing at a time and solve every technical issue they're having, but the road is very bumpy at the moment for them."

Lironi says that he expects polling scores for the GTF to improve next year as Pratt & Whitney solves the engine's technical problems. Although the LEAP is outperforming the GTF on all counts in the poll, many engine investors believe the CFM product is also due a few teething problems. Others believe that over time the GTF will offer better economics than the LEAP for fuel consumption.

"Watch this space," says Lironi. "The LEAP product is solid... but there are already some technical issues affecting the engine. It's not the perfect engine model yet. It does not have, at this moment in time, the same reliability of the CFM56."

The CFM56-5B, which covers the A320 current generation, performed strongly in the poll, rating 5.8 for investor appeal, 5.8 for remarketing potential and 5.7 for residual value. The CFM56-7B, which powers the 737NG, also performed well, reflecting ongoing strong demand for current-generation narrowbodies.

**Communication with the market**

The best-performing widebody engine in the poll was the GEnx, which powers the Boeing 787. It has improved on its scores from last year in all three categories, earning the praise of engine poll respondents.

"I think the GEnx is going to be a very popular engine for the leasing community," Troy Lambeth, chief executive officer of Abu Dhabi-based engine lessor Sanad tells *Airfinance Journal*. "We are seeing a lot more engagement on the GEnx front

## Airfinance Journal's 2018 Engine Poll

| | Investor appeal (out of 7) | Remarketing potential (out of 7) | Residual value (out of 7) |
|---|---|---|---|
| **BR715 (717)** | 1.3 | 1.4 | 1.4 |
| **CF34-8C (CRJ)** | 2.9 | 2.9 | 2.9 |
| **CF34-8E (E-Jets)** | 3.7 | 3.7 | 3.7 |
| **CF34-10E (E190/195)** | 3.7 | 6.5 | 3.9 |
| **CF6-80 (747-400s, 767s)** | 3.3 | 3.5 | 2.9 |
| **CFM56-3C (737 Classic)** | 2.5 | 2.8 | 2.2 |
| **CFM56-5A (A320 Family)** | 2.4 | 2.3 | 2.3 |
| **CFM56-5B (A320 Family)** | 5.8 | 5.8 | 5.7 |
| **CFM56-5C (A340)** | 1.8 | 1.7 | 1.8 |
| **CFM56-7B (737NG)** | 5.9 | 6.0 | 5.8 |
| **CFM Leap-1A (A320neo)** | 6.6 | 6.4 | 6.4 |
| **CFM Leap-1B (737 Max)** | 6.8 | 6.5 | 6.5 |
| **GE90 (777)** | 4.7 | 4.5 | 4.3 |
| **GEnX (787)** | 5.9 | 5.7 | 5.7 |
| **GP7200 (A380)** | 2.1 | 1.8 | 1.9 |
| **IAE V2500-A1 (A320 Family)** | 2.4 | 2.5 | 2.5 |
| **IAE V2500-A5 (A320 Family)** | 5.8 | 6.0 | 5.8 |
| **JT9D (747s, 767-200)** | 1.6 | 1.5 | 1.6 |
| **PW1100G (A320neo)** | 5.5 | 5.4 | 5.7 |
| **PW127F (ATR72-500)** | 4.4 | 4.5 | 4.8 |
| **PW127M (ATR72-600)** | 4.4 | 4.5 | 4.6 |
| **PW150A (Q400)** | 3.9 | 4.1 | 4.1 |
| **PW2000 (757)** | 2.9 | 3.1 | 2.9 |
| **PW4000 (747-400s, 767s, 777s)** | 3.1 | 3.1 | 2.5 |
| **PW6000 (A318)** | 1.0 | 1.1 | 1.0 |
| **RB211-524 (767, 747-300, -400)** | 1.2 | 1.3 | 1.2 |
| **RB211-535 (757)** | 2.8 | 3.0 | 2.6 |
| **Trent 553 (A340-500)** | 0.9 | 1.0 | 0.9 |
| **Trent 556 (A340-600)** | 1.0 | 1.2 | 1.1 |
| **Trent 700 (A330)** | 3.8 | 3.6 | 3.6 |
| **Trent 800 (777)** | 2.4 | 2.4 | 2.6 |
| **Trent 900 (A380)** | 1.8 | 2.1 | 2.2 |
| **Trent 1000 (787)** | 5.1 | 5.0 | 5.4 |

*Source: Airfinance Journal*, March 2018

than we're seeing on the LEAP, but we fully expect the LEAP will be coming at the leasing market very soon."

Compared with the Rolls-Royce Trent 1000, which also powers the Boeing 787, the GEnx is generally viewed as the more favourable engine for the widebody by investors because the Trent has experienced technical issues. For example, Virgin Atlantic had to lease four former Air Berlin A330-200s at short notice late last year because it had to ground some of its 787s because of issues with the Trent 1000. However, investors expect the Trent to be on the rebound next year as Rolls-Royce deals with the engine's technical faults.

Lironi says the GEnx is also viewed more favourably because of GE's better customer support.

"The GEnx is also affected by some serious technical issues," says Lironi. "The difference between Rolls and GE, though, is GE is quite open about it, keeps informing the operators, and is more reactive and capable of coming up with a solution quicker than Rolls."

When there is a technical fault, GE makes a recommendation to replace certain parts or invites the operators to remove engines quickly and this usually does not make big headlines in the press, says Lironi.

An engine investor adds: "The normal Rolls-Royce approach is to say that there is no problem. If there is a problem, it's denied, then once they can't sustain their position anymore, it's already too late and operators are grounding aircraft. They get in the news; they get a bad reputation for it. It's mainly caused by Rolls' mentality and approach to the market rather than the product itself."

Although some investors believe Rolls-Royce is improving its communications about engine issues, many also feel that the UK original equipment manufacturer (OEM) is still behind its US competitor in this respect. The two OEMs' different design philosophies and relationships with the Federal Aviation Administration also come into play.

**V2500 resurgence**

The V2500-A5 significantly outperformed its older stablemate the V2500-A1 in the poll, nearly doubling its score in all three categories. There was a surge in V2500 shop visits last year dictated by scheduled overhauls and technical issues. More unscheduled removals increase demand for spare engines.

"That's what is happening on the V2500. Two years ago, the V2500 was really decreasing in value, but now, because of technical issues, has really increased in value, surprisingly," says Lironi.

He adds that SGI has seen plenty of trades on V2500s over the past year because of engine issues.

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>
> **Troy Lambeth**, chief executive officer, Sanad

"Personally, I don't recommend long-term investors to buy V2500s, but if they have a short investment term, it could be a good engine to invest into. We believe that the number of shop visits on the V2500 will start decreasing in the next nine months, and therefore the need for spare engines will also decrease, decreasing the value of spare engines."

**OEMs' aftermarket role**

OEMs have differing strategies when it comes to managing the aftermarket of their engines and allowing non-OEM parties to perform maintenance on the assets. Some OEMs tend to be more third-party-owner friendly while others tend to be more protectionist. The more protectionist manufacturers want their own kit to be put into repairs, meaning that if you are a third-party supplier which owns those assets, your material becomes less valuable. This can put pressure on residual values.

An engine's residual value is driven by the value of its parts. If there is no market for those parts, an investor cannot sell the engine and the value will sharply decrease. If there is an open market for maintenance, shops competing for business often will seek to lower costs by installing second-hand parts and therefore the value of used parts coming from engines being parted out will increase.

For engine types such as the Rolls-Royce Trent 700, the aftermarket has opened up in the past year. But there are many engine types where the OEM dominates the aftermarket, such as the Trent 800, Trent 900, Trent 1000 and the GEnx. However, many of these engines are still scoring well because they have large installed bases, large orderbooks and are young and in demand, making them attractive to invest in.

"The OEMs all have MRO [maintenance, repair and overhaul] strategies and they swell or shrink. I think sometimes it's dependent on the orderbook," says Sanad's Lambeth.

Comparing the approaches of GE and Rolls-Royce to the aftermarket, one engine investor says: "You saw how complex it became for Rolls in terms of how they tended to control everything in the aftermarket. GE, on the other hand, has always had a more open approach to let the market drive which direction they take, and I think the latter model, to be honest, is far more endurable as a model. We saw this with the ERJ145 engine, when Rolls really hit the cliff edge in terms of potential exposure."

OEMs can run into trouble if they get caught up in the euphoria of some of the initial deals for new engine types and do not adequately address the ability of second- and third-tier operators to take over the product later on in its life.

"Airlines want choice and airlines love choice," says one engine investor. "They will actively push for choice and do not like to think they are subservient to one source. I think some of the OEMs are forgetting this in the approach to the market."

**Volatility in older types**

The worst-performing engines in the poll are those for the aircraft in the most illiquid markets. For example, the Trent 900, which powers the A380, performed poorly, scoring about two out of seven in all three categories. The PW6000, which powers the increasingly obsolete A318, scored about one out of seven in all three categories.

One engine investor cautions: "These ratings, especially for the more mature engine types, can be somewhat volatile. For example, the V2500-A5 is in very high demand right now (which implies it is a strong investment); however, if you owned these when all the ADs [airworthiness directives] and other issues came out, your investment in them would have been negatively affected with exposure to the same.

"Another example: it would be great to have an RB211-535 in the current market, but owning them not too long ago would have been rough."

Older engine types experience more volatility in investor attractiveness than new types. These assets are a great investment if you own them when demand increases, but would be bad if you invested in them and saw demand drop thereafter, which could be triggered by anything from a slight uptick in oil prices to an OEM addressing delivery delays on new-technology engines. As a result, it can be much harder to predict what the market will be like for these engines in the long term than airframes.

The volatility in the more mature types of engine shows that investors must do their homework before investing in these assets.