Financing for eVTOL aircraft

A helicopter lessor's perspective

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Introduction

In 1950s America it was proposed that mass-produced personal helicopters could provide the solution to an urban mobility crisis. Traffic accident rates were high. Congestion was a major issue. Roads were poor quality and too narrow. The personal helicopter seemed to offer a natural alternative to failing ground transportation.[1]

But personal helicopters never got a chance. The solution to the crisis was more mundane. Federal funding was tapped to build a new highway system for America.

The urban mobility problems of the present-day share some similarities to the 1950s, with climate change now added to the equation. We are witnessing another wave of enthusiasm for an airborne solution.

Over 200 types of eVTOL aircraft (vertical lift aircraft powered by electric engines) are currently in development, all promising low maintenance costs, quiet operation and zero emissions. eVTOL aircraft eliminate many of the drawbacks of the helicopter while still providing the convenience of point-to-point transportation.

Nobody is expecting a sky filled with personal eVTOL aircraft. But many are predicting eVTOL aircraft to revolutionise passenger and freight transportation on regional routes – i.e. routes longer than an average urban taxi ride but shorter than an average domestic airline routes. Examples are Vancouver to Vancouver Island or Manhattan to Philadelphia.

[1] The God Machine, James Chiles (2007), Chapter 8 (Page 143)

Investment into this advanced air mobility (AAM) market increased ten times in 2020 to over US$1bn[2]. In 2021 the investment base is expected to grow again to US$4bn. This funding is currently focused on the developers of eVTOL aircraft, and in particular two of the leading players - Joby (based in the US) and Lilium (based in Germany).

There is still a great deal of uncertainty about the eVTOL market. Will ground-based solutions prove safer and cheaper? How long will regulatory authorities take to certify eVTOL aircraft for commercial use? Which of the many eVTOL designs will be most effective? Will battery technology develop to meet the requirements of the industry?

Another uncertainty is how eVTOL aircraft will be financed. This article will address this question and we will consider three possible types of financing:

1. Corporate financing.

2. Asset financing (secured lending).

3. Operating lease financing.

eVTOL Developer Business Models

We must start with examining the business models of eVTOL developers as this has a significant impact on the types of financing that may be available for their eVTOL aircraft.

Mark Moore (Uber's Engineering Director of Aviation) gave a keynote speech in 2020 at a Vertical Flight Society workshop in which he anticipated that some eVTOL developers would hold eVTOL aircraft on their *"significant balance sheets"* in order to receive *"the equivalent of [a] power-by-the-hour … revenue stream that's constantly coming in"* which would offset revenues from cyclical aerospace markets.[3]

Joby have adopted this strategy and are by far the highest capitalised of all eVTOL developers (approximately USD 2.5bn). Joby intends to combine the production of eVTOL aircraft, the long-term ownership of these aircraft and the operation of the customer service all within one single business model. Lilium and Volocopter and also seem to have elements of this approach in their initial business plan (but to a lesser degree than Joby) and are the second and third highest capitalised eVTOL developers respectively.[4]

This approach is rather unusual. We would not expect Airbus to run scheduled flights or for Tesla to offer taxi journeys. But perhaps the better analogy is Amazon or Apple, where distinct components to a service are brought together under a single brand.

There is no mistaking the intent. The requirement to develop operational capability was a driving force behind Joby's recent acquisition of Uber Elevate and Lilium's partnerships with

[2] Lufthansa Innovation Hub Report (March 2021)
[3] https://evtol.news/news/transformative-vertical-flight-2020
[4] Are Air Taxis Ready for Prime Time, a data-driven report on the state of air taxis in 2021 (Lufthansa Technik)

Luxaviation Group (an experienced helicopter operator) and Lufthansa Aviation Training (a leading provider of aviation training services).

But the business model of many other eVTOL developers is more similar to that of a traditional aircraft OEM. The eVTOL developer will concentrate on sales and parts support and leave others to focus on long-term ownership and running day-to-day operations.

We can see evidence of this in recent announcements.

- United Airlines have signed a LOI for 200 eVTOL aircraft from Archer, an eVTOL developer.

- Halo (a UK helicopter operator) has ordered 200 eVTOL aircraft from Eve (a subsidiary of Embraer focused on new technologies).

- American Airlines and Virgin Atlantic have pre-ordered 200 aircraft (each) from Vertical Aerospace, another eVTOL developer.

- The Canadian helicopter operator HeliJet has been prominent in its enthusiasm for introducing eVTOL aircraft into its operations. But HeliJet clearly expects to be able to operate these aircraft itself and not to hand over operations to an eVTOL manufacturer-owner-operator such as Joby.[5]

All of these operators (and the many others to come) will likely require financing solutions to support their acquisitions of eVTOL aircraft.

It is also possible that the manufacturer-owner-operator business model might adapt to changing requirements of the eVTOL investment base and become closer to that of a traditional aircraft OEM. Investors may prefer the risks of production; of long-term asset ownership and of operations to be separated, rather than merged into a single company. If there is a significant fall in investor appetite for the eVTOL market generally, then the outright sale of aircraft might become a requirement for the financial stability of eVTOL developers.

In summary, we can reasonably conclude that the acquisition of many eVTOL aircraft will require a financing solution which is distinct from the general corporate financing of the eVTOL developer.

The nature of this financing solution will depend on two factors:

1. The useful life of eVTOL aircraft.

2. The liquidity of eVTOL aircraft for sale or lease.

Useful Life

[5] https://evtol.com/q-and-a/danny-sitnam-helijet-evtol-future/

In his March 2020 speech to the Vertical Flight Society Mark Moore highlighted the *"very significant question"* of the *"residual value"* of eVTOL aircraft. Mr Moore queried what would happen when the first generation of aircraft were replaced after five to seven years and what *"secondary markets"* would exist for these aircraft.[6]

There is an emerging industry consensus that a first generation eVTOL aircraft will have a useful life of about 5-8 years.[7] But why has this assumption gained traction when helicopters have useful lives of up to 25 years?

The short life assumption is based on the speed of development of eVTOL technology. Within a relatively short period it is probably that early designs will be replaced with aircraft with greater efficiency and enhanced safety features. The game-changer for eVTOL from a cost perspective is the transition to pilotless aircraft and this may require new aircraft designs.

But there are counterarguments to the short life assumption.

An eVTOL airframe (like a helicopter) will not suffer from the compression and expansion of high-altitude flight. There is no toilet or galley to generate corrosion issues. The main eVTOL technological development is likely to be in battery technology. But it may be possible to install new-technology batteries in first-generation eVTOLs. And even the first generation of eVTOL are being designed with avionics that can accommodate pilotless operations.

Within 5-10 years of the first-generation aircraft entering service a second generation of more efficient eVTOL aircraft should come into play as the market expands. But the value of the first-generation aircraft will not fall to zero overnight.

The high profile eVTOL passenger routes might gradually transition into the newest equipment, but the first-generation aircraft will probably find new deployment on other routes. The low acquisition cost of first-generation eVTOL aircraft may enable routes to be opened in developing nations; in lower-density urban areas or perhaps focused on freight rather than passengers (or even perhaps transitioning into roles such as firefighting and humanitarian support).

It seems likely that at least some financiers are likely to consider the useful life of a first-generation eVTOL aircraft to be at least 15 years.

Liquidity

Liquidity is the ability to sell or lease an asset within a reasonable time period.

In the eVTOL aircraft context, a liquid aircraft would be one which has achieved widespread acceptance with a variety of different operators, in different regions and ideally across different roles (i.e. passengers, freight, firefighting, EMS).

[6] https://evtol.news/news/transformative-vertical-flight-2020

[7] In this insightful report on the eVTOL industry LEK refers to a useful life of eight years (https://www.lek.com/insights/ei/advanced-air-mobility-cost-economics-and-potential)

eVTOL aircraft produced by a pure "manufacturer-owner-operator" would be illiquid. The manufacturer is the same as the operator. There is no diversified operator base. There is nobody else to whom you can sell or lease the aircraft.

eVTOL aircraft produced by "traditional OEMs" have the potential to become liquid, because we can expect to see the aircraft operated by a number of different operators.

It is impossible to say at this stage which types will achieve this potential. But it is reasonable to assume that the most liquid eVTOL aircraft would be those produced by the largest eVTOL developers and those which adhere closest to the traditional OEM business model.

Financing Solutions

We can now consider various possible financing solutions.

Corporate financings

Corporate financings are based on the historic and projected financial performance of a company and its general corporate balance sheet. Corporate financiers will likely take mortgages over eVTOL aircraft as part of a corporate financing (together with other assets such as factory equipment and intellectual property). But they are not looking to the value of these assets to fundamentally underwrite the financing.

Within the "manufacturer-owner-operator" business model, corporate financing seems to be the only way to finance the production and long-term ownership of eVTOL aircraft. The aircraft are illiquid, so a financier cannot rely on their resale value. Banks may provide "portfolio asset financings" to eVTOL companies operating this business model. But these transactions are really corporate financings.

Corporate financing is so far removed from the value eVTOL aircraft itself than the issues of aircraft liquidity and useful life are hardly relevant. This is not really a financing "of an eVTOL aircraft", but rather a financing of a particular eVTOL design or business model.

The eVTOL industry can expect corporate financing to be made available on attractive terms. Governments are keen to support projects that resolve regional transportation issues in a climate-friendly manner. State support may be available either through export-credit agencies (to the extent the product is exported) or through industry-incentive schemes. Furthermore, investors (institutional and private) are generally willing to accept lower risk-adjusted returns for climate-friendly projects (so-called "ESG" investing).

However, things can change. It is possible the current high levels of enthusiasm for eVTOL solutions may not be sustained in the long-term. The size of the market and its growth timetable are both uncertain. Corporate financing terms would be particularly hard hit by any change in market attitude to eVTOL as they are tied to particular eVTOL companies and business plans.

Asset financing

An asset financing is a loan specific to an asset (or a pool of assets) which is secured against the asset(s). If the loan defaults, the financier has the option to recover the asset, sell it, and use the sale proceeds to repay the loan.

Asset financings are heavily focused on the credit risk of the debtor. However, the intrinsic value of the underlying asset allows an asset financing to be provided at a higher value and/or on more attractive interest and repayment terms than would apply for a corporate financing.

The eVTOL industry can expect corporate financing on attractive terms (see above). Asset financing for the eVTOL industry should be provided on even better terms.

Asset financings require an asset to have some liquidity. An asset financier must have at least some opportunities to sell the asset for a reasonable value if the loan defaults. In the eVTOL context, liquidity for all aircraft types is currently unproven but is likely to develop first for aircraft produced by large-scale "traditional OEM" developers (see above).

An asset financing is generally provided for a period of 6-8 years, irrespective of an asset's useful life. However, the useful life will have a dramatic effect on the repayment terms.

- If the asset itself has a useful life of only 6-8 years, then the asset financing must fully amortise during the term because the asset effectively ceases to exist at the end of the financing.

- If the asset has a longer useful life, then the asset financing could have a substantial balloon payment reflecting the residual value at the end of the financing. This will result in a more affordable asset finance lease due to the shallower rate of principal repayment during the term.

A question for eVTOL asset financing is whether financiers will wait for liquidity and useful life to be demonstrated, or will they proceed to fund deals based on unproven assumptions.

Operating Leasing

An operating lease financier owns the asset and stakes their ability to make a good return on the liquidity and useful life of the asset.

In an asset financing, liquidity is only required in a default scenario. In an operating lease, it is expected that the aircraft will have to move to another operator at some stage.

An eVTOL operating lease financier must therefore have confidence both in the long-term useful life of eVTOL aircraft and in the future liquidity of the aircraft. Again, the question comes as to whether financiers will wait for these conditions to be demonstrated, or forge ahead now and hope for the best.

We can see some evidence for the latter.

Avolon, one of the largest operating leasing companies for commercial jets, has recently ordered up to 500 VA-X4 eVTOL aircraft from Vertical. It is unclear whether Avolon intends to

offer these aircraft as part of an asset financing or operating lease product. But as Avolon's core business is operating leasing, it's reasonable to assume the latter.

Lift Aircraft, an eVTOL developed based in Austin, Texas, is already offering the opportunity for private capital to invest in its "Hexa" eVTOL aircraft on an operating lease basis.[8] Asset financing is described as *"what might be available to you"* and *"estimated resale value"* is left as *"TBD"*. But it's an interesting and imaginative approach.

One advantage to "forging ahead now" is that early entrants to the market can secure attractive acquisition costs. Avolon must have negotiated a good purchase price from Vertical for such a large order. The issues of useful life and liquidity should therefore matter less to Avolon than for later market entrants (who will need to pay much more for the same aircraft).

How might an eVTOL operating lease be priced?

Operating lease pricing is effectively an asset financing with a premium to compensate the lessor for assuming the residual value risk. The higher the residual value risk, the higher the premium. The rent is often discussed in terms of a lease rental factor (LRF) – the monthly rental divided by the asset value, expressed as a percentage. A narrowbody commercial jet would be at one end of the spectrum, with a LRF around 0.7% to 0.9%.

We would expect eVTOL operating leasing to be at the other end of the spectrum, with LRFs in the range of 1.2% to 1.4%. An eVTOL aircraft costing USD 4m would therefore have a rental cost of between USD 48,000 and USD 56,000 per month. But an "early bird" like Avolon might be able to offer rentals at half this amount if they purchased a 50% discount.

Will there be significant demand for operating leasing?

We can conclude by considering whether there will be a strong demand for operating leasing from eVTOL operators. This demand is taken as a given in the commercial passenger jet market, but not so much in the commercial helicopter market (where many operators prefer to own aircraft through asset or corporate financing).

There are three fundamental drivers behind operator demand for aircraft operating leasing.

1. An outright acquisition (or asset financing) is not financially viable for the operator.

2. The aircraft is only available on an operating lease.

3. The ability to return the aircraft after a certain period is highly valuable to the operator.

We will consider each in turn.

The first driver is a major factor behind the expansion of commercial jet leasing. However, as aircraft become less expensive, this driver weakens. eVTOL aircraft have an acquisition cost of approximately USD 2m to USD 5m. This is a fraction of the value of a commercial jet or

[8] https://www.liftaircraft.com/ownership

even a medium or heavy helicopter. It raises the question of whether operators will prefer to purchase and own eVTOL aircraft rather than pay the premium of an operating lease.

The second driver also underpins commercial jet leasing. The long production times for commercial jets and the requirement to make substantial pre-delivery payments years in advance of delivery makes operating leasing the only option for many airlines. This is unlikely to be the case in the eVTOL market where production timescales should be much shorter (as per helicopters). However, perhaps the recent Avolon transaction with Vertical is a move in this direction.

The third driver is critical to many helicopter lease transactions. Helicopter operators often work on the basis of fixed-term contracts. Leasing a helicopter for the same period as the underlying contract is an effective way of managing the financial risks of that contract. However, in this respect eVTOL operators are more like passenger airlines than helicopter operators. The eVTOL routes will be operated for as long as they are profitable with no defined end date. This driver towards operating leasing will be weaker for eVTOL operators than for helicopter operators.

The third driver is still likely to be the main one encouraging eVTOL operators towards considering operating leasing, but for a different reason. Because of the fast development of eVTOL technology, the ability to upgrade to new technology after a defined period should be something of considerable value to an operator. The question is how much eVTOL operators would be willing to pay to achieve this flexibility and whether can this be matched to the return expectations of an eVTOL leasing company.

Conclusion

For eVTOL aircraft produced within a manufacturer-owner-operator business model, the only financing solution is corporate financing. This financing should be available on good terms, unless investors lose enthusiasm for eVTOLs generally.

For aircraft produced within the traditional-OEM business model, asset financing is a possibility but depends on what assumptions financiers make regarding useful life and liquidity. For these aircraft, operating lease financiers is also possible and indeed appears to already be on the horizon. However, this type of financing depends but depends not only on financier assumptions regarding useful life and liquidity but also on whether operators want this kind of product.