AEROSPACE TECHNOLOGY INSTITUTE

pwc

Funding Growth in Aerospace

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About this report

Funding Growth in Aerospace provides a consolidated overview of the funding landscape in aerospace today and highlights opportunities for private investment to capitalise on the growth potential inherent in the Net Zero transformation of the sector. This report is published as a collaboration between Aerospace Technology Institute (ATI) and PwC, referenced throughout the report as “we”. The ATI is responsible for setting out the technology strategy for the UK aerospace sector and funding R&D within industry while PwC is a globally recognised international professional services network. We are pleased to jointly present this report for the benefit of the UK aerospace sector and its funding ecosystem.

EXECUTIVE SUMMARY

The aerospace sector is preparing for its most significant transformation since the jet age, driven by the need to achieve Net Zero in aviation by 2050. This will require the development of new and in some cases radically different aircraft types, which represent a significant market growth opportunity for UK aerospace companies. The Aerospace Technology Institute (ATI) estimates the global market for new aircraft deliveries at £4.6 trillion from 2022 to 2050.

Capturing this market opportunity will require unprecedented levels of investment into aerospace. This report highlights a number of funding opportunities available to the UK aerospace sector. These include government grants via channels such as the ATI, Innovate UK and various regional organisations, alongside multiple sources of private financing, including bank lending, corporate debt, public equity, and various types of private equity and venture capital.

However, the aerospace sector faces several hurdles in relation to private financing, including a funding gap for companies within the ‘growth economy’. We have identified three key challenges for innovators in the UK aerospace sector:

1. The UK lags behind the best-in-class in terms of private investment in deep-tech and R&D intensive companies.
2. Capital intensive-industries are less attractive to many investors
3. Aerospace requires patient capital.

Nonetheless, we believe that aerospace represents an attractive sector for investors who are comfortable with capital intensity and long product development cycles. Large funds or high-net-worth-individuals looking for purpose-driven investments in low carbon technologies will find opportunities within the emerging landscape, while strategic industry investors and corporate venture capital funds will also increasingly find value in aerospace.

Meanwhile, there are actions that aerospace companies can take to attract private investment. For example, capital intensity and product lifecycles can be reduced through the adoption of new development methodologies and Industry 4.0 technologies. Companies can also leverage government funding to attract private investment, using it to demonstrate successful technology validation.

Realising the UK’s aerospace market potential will require investment now, and there is a clear appetite among ‘growth economy’ companies to invest in the R&D, product development and scaling that will enable them to generate growth. For the right profile of patient investor, this represents an opportunity for significant long-term returns in a space that has traditionally been little understood and therefore underinvested by private finance.

INTRODUCTION

The aerospace sector is becoming familiar with disruption. Following a decade of growth from 2008-2018, the industry has faced recalled orders, demand volatility, supply chain disruption and a rapidly rising cost base as the effects of aircraft recalls, COVID-19 and then an increasingly unstable geopolitical and economic environment have taken hold. The subsequent rebound, with global revenue from product deliveries growing from £42bn in 2021 to £61bn in 2022, has shown the industry's resilience and agility.

While grappling with these challenges, aerospace companies have also been preparing for the sector's most significant transformation since the jet age. This transformation is driven by the need to achieve Net Zero in aviation by 2050, which will require the development of more efficient and, in some cases, radically different aircraft types. Where today's fleet is powered by kerosene, tomorrow's will increasingly be powered by batteries, hydrogen fuel cells, hydrogen gas turbines, and sustainable aviation fuel (SAF). In addition to the technologies that will power this change, supporting infrastructure for energy production, distribution and storage will be needed.

The growth opportunity associated with this transformation will be unprecedented. The ATI estimates that the global market for aircraft deliveries in 2050 will be £220 billion per annum, with zero-carbon aircraft representing a 41% share. To achieve this share, we expect the value of zero-carbon aircraft deliveries to grow at 34% CAGR through the 2040s.

The zero-carbon technologies required to deliver this growth are currently at very low levels of technology readiness. Achieving technology maturity and market readiness will need high levels of investment, and the timelines associated with developing and certifying aerospace products mean that investment must begin now if the sector is to achieve its Net Zero ambitions. However, this capital will need to be patient, with aircraft unlikely to be delivered at scale until the late 2030s.

Demand for funding will come both from large, well-established players within the sector who are seeking to lead the development of the next generation of technologies, but also from a new generation of aerospace start-ups seeking to develop technology while growing and scaling their businesses. For the latter, the traditional barriers to entry have been brought down by the availability of new, low-cost digital engineering tools and the absence of incumbents in emerging zero-carbon technologies. Meanwhile, the thousands of established small and medium-sized enterprises (SMEs) are a key element of the aerospace supply chain need to identify ways of funding research and product development to prepare themselves for the transition.

While the funding environment for innovation in aerospace can appear challenging, as this report makes clear, there is a wide variety of financing available to the UK aerospace sector. This includes debt, equity and government grants, and ranges from seed funding of start-ups to multi-million-pound investments in technology development programmes that create thousands of high-value jobs. However, more funding will be needed to accelerate growth, and the sector can play an important role in highlighting the opportunity to investors seeking attractive long-term returns in technologies that will enable Net Zero 2050.

This report outlines the major growth opportunities within aerospace to 2050, and summarises the key sources of funding available to UK companies. In undertaking research for this report, PwC and the ATI identified a number of challenges that must be overcome to unlock the growth opportunity for the UK, including a private funding gap for growth economy businesses that will impact aerospace start-ups and SMEs.

Our work on this report has highlighted that there is real ambition for technology development and growth within the UK aerospace sector. For the right profile of patient investor, this represents an opportunity for significant long-term returns in a space that has traditionally been little understood and therefore underinvested in by private finance.

GROWTH OPPORTUNITIES

Achieving Net Zero in aviation by 2050 presents a major economic opportunity to the aerospace sector, with a global commercial market of £4.6 trillion from 2022 to 2050 to develop lower emission aircraft. The ATI has modelled how this growth is achieved in three primary segments:

- Zero-carbon emission aircraft which focus on battery, hydrogen, and fuel cell technologies to enable zero-carbon tailpipe emissions. This represents an annual market of £91 billion globally in 2050, or 41% of the total global market.
- Ultra-efficient aircraft focusing on ultra-high bypass turbofan engines and a generational light-weighting of aircraft structures and systems. This represents an annual market of around £64 billion globally in 2050, or 29% of the total global market.
- Advanced air mobility – new architectures which enable electric vertical and conventional take-off & landing as well as smaller unmanned aircraft systems. This new market is expected to reach around £27 billion globally in 2050, or 12% of the total global market.

With the longer development times associated to aerospace, there is an opportunity for investors to innovate in the construction of new financial instruments and products that will further enable patient capital.

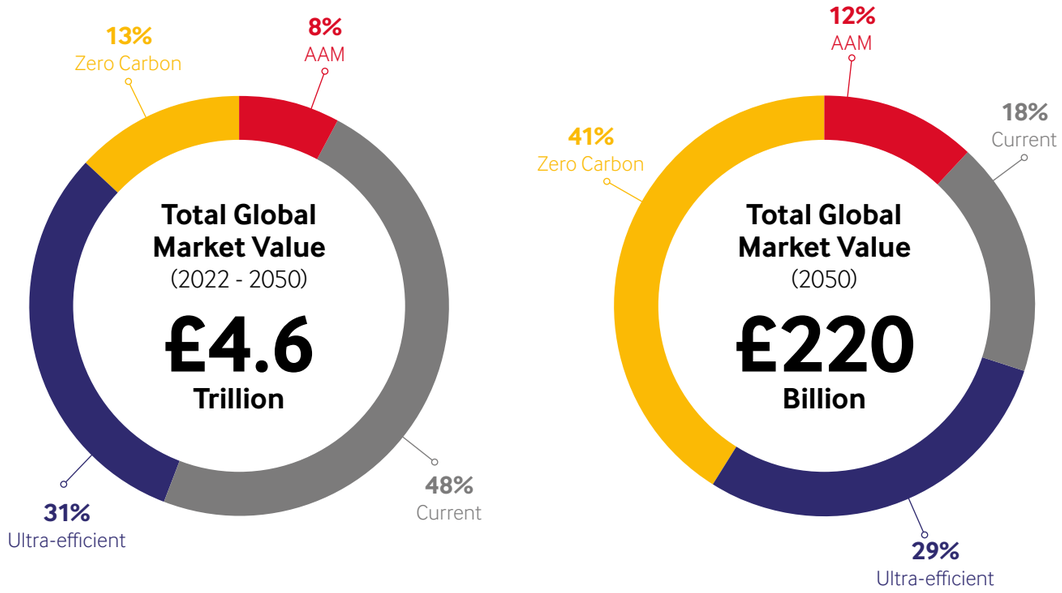


Figure 1: Total global aerospace market – new deliveries, 2022-2050

The ATI's market model forecasts that the UK could grow its market share from 13% to nearly 18% by 2050, as entire fleets transition towards zero-carbon emission technologies. However, achieving this market growth relies on early and sustained investment into the development of zero-carbon, ultra-efficient and cross-cutting technologies.

The ATI's market model assesses the global market opportunity for the delivery of new aircraft of different formats. For this report, a moderate scenario has been considered, in which a new generation of ultra-efficient 100% SAF capable narrowbody aircraft starts to enter service by the early 2030s, followed by new ultra-efficient widebody aircraft from 2040. It also anticipates that a zero-carbon hydrogen fuelled regional aircraft could enter the market around 2035, with a zero-carbon hydrogen fuelled single aisle aircraft in the early 2040s. For further information see the ATI's technology strategy, Destination Zero. These market values are based on aircraft sale price and use an USD/GBP exchange rate from September 2022.

Figure 2 shows annual growth in the aerospace sector, with the global market for the current fleet of aircraft being superseded by a market for ultra-efficient aircraft from the early 2030s. There is then a further shift towards zero-carbon aircraft from 2040 onwards.

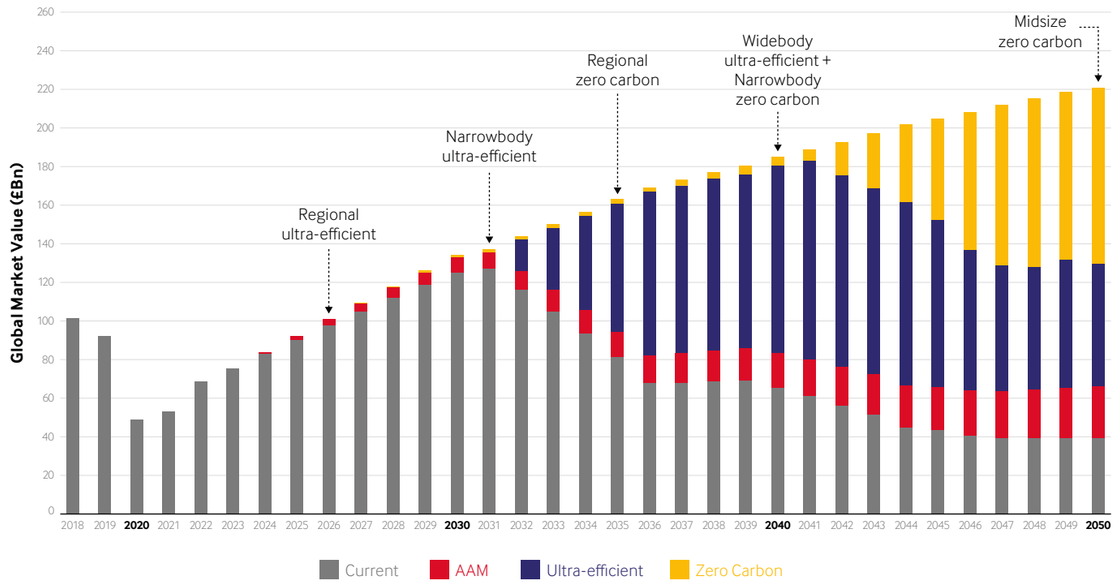


Figure 2: Global aerospace market – current, ultra-efficient and zero-carbon deliveries, 2022-2050 (Forecasted entry into service of new aircraft types highlighted above the chart)

The zero-carbon opportunity

The largest, long-term growth opportunity comes from technologies for zero-carbon emissions aircraft, for which the ATI forecasts significant growth from the mid-2030s onwards. This segment begins to dominate the market from the late 2040s. The following categories represent the most significant zero-carbon technology market opportunities:

Zero-carbon technology	Description	2050 market opportunity	CAGR 2022 - 2035	CAGR 2035 - 2050
Hydrogen turbine propulsion	The largest technology opportunity for zero-carbon aircraft including low NOx hydrogen combustors, heat management and a flight demonstration before 2025.	**£20.8 bn** (See Figure 3)	**0%** (Not introduced until 2035)	**50.2%**
Aircraft integration	Integrating hydrogen systems on to emerging zero-carbon architectures. This represents a 20% share of the total zero-carbon aircraft global market.	**£18.2 bn**	**16.6%**	**26.3%**
Aerodynamic structures	Development of lightweight fuselage, empennage, pylon and nacelle aerostructures.	**£15.4 bn**	**16.6%**	**25.7%**
Hydrogen systems	This includes fuel systems, cryogenic thermal management, and hydrogen storage.	**£9.4 bn**	**16.4%**	**22.7%**
Wings	Lightweight aero structures and integration of the above systems into the wing.	**£6.9 bn**	**16.5%**	**23.8%**

Table 1: Market opportunity for zero-carbon technologies (select technologies only)

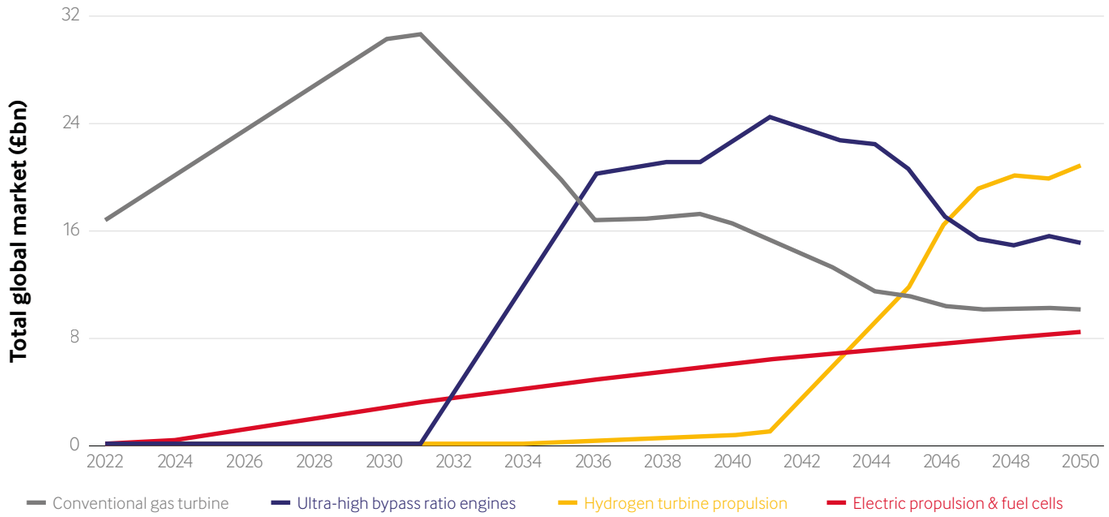


Figure 3: Annual market for propulsion technologies, 2022-2050 (£bn)

Figure 3 shows that from 2030, the global market for propulsion technologies is superseded by a market for ultra-high-bypass ratio engines. From 2040 the market sees the advent and rapid growth of hydrogen turbine propulsion. This trend is similar for all ultra-efficient technologies which begin to lead the market in the early 2030s with zero-carbon technologies growing rapidly to lead the market from the mid-2040s.

The ultra-efficient opportunity

The largest market opportunity in the short to medium-term is the development of ultra-efficient aircraft with lower fuel use and improved operational efficiency. Development of these platforms is critical for enabling technologies to be developed in the long-term for zero-carbon architectures and addressing non-carbon emissions.

The ATI estimates that the global market for the ultra-efficient aircraft will peak at around £103 billion by 2041. To achieve this share, we expect the value of ultra-efficient aircraft deliveries to grow at 23% CAGR from the early 2030s.

These ultra-efficient aircraft will enable the development of the following technologies:

Ultra-efficient technology	**Description**	**Peak market opportunity** (2041)	**CAGR** 2022 - 2035	**CAGR** 2035 - 2050
Ultra-high bypass ratio engines	Composite, gear driven fan systems for high propulsive, aerodynamic and noise efficiencies. These ultra-efficient systems aim to achieve over 10% efficiency and CO_2 emissions improvements by 2030.	**£22.1 bn**	**10.7%**	**-0.4%**
More Electric Aircraft Systems	Includes electrical power, landing gear, fuel, thermal management, flight control, communication and control systems.	**£20.0 bn**		
Wings	High aspect ratio wings, optimised for aerodynamic efficiency. These wings will be manufactured using rapid assembly, fully automated high-rate techniques.	**£9.8 bn**		

Table 2: Market opportunity for ultra-efficient technologies (select technologies only)

The advanced air mobility opportunity

By 2050, we expect the total advanced air mobility (AAM) market to be worth £27 billion per annum, representing a 12% share of the global market. This is from a base of close to zero today and has a consistent growth from the mid-2020s onwards.

Although still immature and with a high degree of uncertainty, AAM presents a more accessible entry point for many burgeoning technologies. These include advanced modelling and simulation technologies, digital twins, automated manufacturing and assembly systems, and many other rapidly advancing technologies, systems and tools. Some AAM manufacturers are aiming for an entry into service from 2025 onwards and these platforms will require key enabling technologies described in table 3 below. Use cases for AAM ranges from remote cargo deliveries to commercial passenger transport and from disaster relief to agricultural applications.

The near-term exploitation of the AAM market allows the sector to prove these technologies in an environment which will require high-rate manufacturing and high levels of automation. These technologies and methods will be critical in developing the ultra-efficient and zero-carbon platforms of the future.

AAM technology	**Description**	**2050 market opportunity**	**CAGR** 2022 - 2035	**CAGR** 2035 - 2050
Propulsion	Propulsion provides the largest market opportunity for the AAM sector, with the development of efficient and quiet electric motors.	**£9.3 bn**	**25.1%**	**4.6%**
Aerodynamic structures	Highly integrated structures, making use of high-rate, high quality digital manufacturing systems. These structures will require lightweight composite and metallic materials.	**£6.6 bn**		
Aircraft integration & assembly	The integration of structures and systems at a rate close to that seen in the high-end automotive sector.	**£5.3 bn**		
AAM systems	This includes high voltage electrical systems, safety & sensing and increased automation in the future for control and operation.	**£5.3 bn**		

Table 3: Market opportunity for advanced air mobility technologies

FUNDING AVAILABILITY

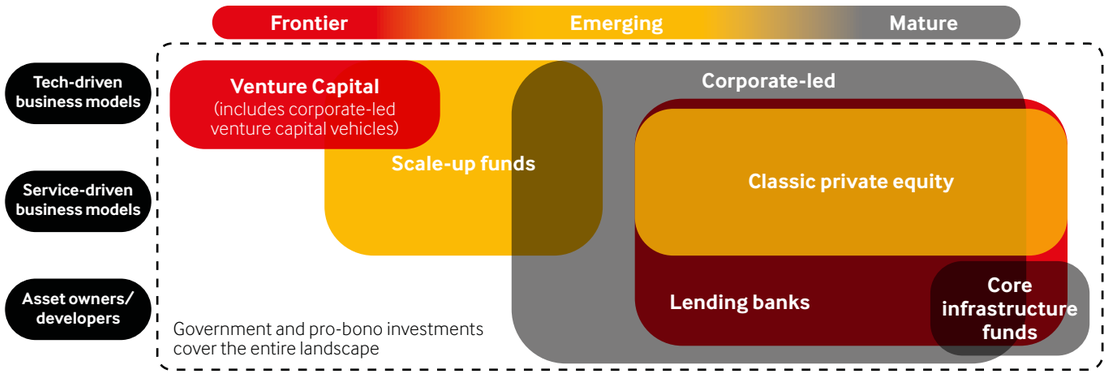
While the funding environment for innovation in aerospace can appear challenging to navigate, there is a wide variety of financing available to the UK aerospace sector, covering both near-term opportunities and longer-term, high growth opportunities in zero-carbon aircraft. This includes both public and private sources such as grants, debt, and equity, and ranges from seed funding of start-ups, R&D funding for established SMEs to multi-million-pound investments in technology development programmes. The funding providers differ in their attitude towards risk, investment goals, and amount they are willing to invest. The following section outlines key available sources of funding for aerospace companies.

Overview of funding options

The funding provider landscape

Our 'UK funding landscape' framework below provides a high-level overview of appropriate types of growth funding for organisations at different levels of maturity.

While there is no 'one size fits all' answer for a given stage of development, and there is overlap in the types of company that investors will target, it is helpful for organisations to have an understanding of the types of investors who may be interested in them.



Maturity	Definition	Alignment to funding need
Frontier	The technologies or solutions required are still in development	Pre-formation to early-stage start-up
Emerging	Technologies or solutions have been developed that are proven to work technically, but are not seeing market uptake at scale because the commercial model is not yet attractive for widespread adoption	Start-up to scale-up
Mature	The technology or solution has been proven to work on a commercial basis and is being rolled out at scale, achieving significant penetration	Series C and beyond. Corporate and listed companies

Figure 4: The UK funding landscape

For SME innovators in the aerospace sector, the technological maturity of their product is closely aligned to the business' funding round, as the company tends to be built around a single, or small number of closely related technologies.

The funding needs of larger companies are less strongly linked to the development of a given technology, as they will likely have a whole development portfolio, and so in aggregate they align more closely to 'mature', for example, they are more likely to have the option to self-fund than SMEs.

Government funding options

Grant funding represents an important form of finance for the aerospace sector. It is an effective method to lower the economic risk associated with research, development and demonstration of new, advanced technology. The review process associated with grant funding can also help to attract further private investments following successful applications, providing an important means of technology validation for investors who may not have backgrounds in aerospace technologies.

The ATI and Innovate UK are the two key organisations in the UK that deliver government funding to aerospace companies. The ATI creates the technology strategy for the UK aerospace sector, and channels government funding into research and technology within industry via its funding programmes. ATI funding is applicable to UK registered businesses of different sizes. The National Aerospace Technology Exploitation Programme (NATEP), funded by the ATI, is aimed at SMEs with smaller projects, who are relatively new to investing in R&T. The funding helps these SMEs to develop innovative technologies to increase their ability to win new business with higher tier companies. As well as grant funding, NATEP provides high calibre technical and management resource to help companies accelerate technology development towards market readiness. Meanwhile, the ATI's Strategic Programme is suited to larger projects, typically accessing grants in excess of £1 million. For the two-stage assessment process, monthly calls for an Expression of Interest (EOI) are followed by a Full Stage Application (FSA). The ATI offers guidance and support and provides feedback on draft applications.

Innovate UK is the UK's national innovation agency, and as part of UK Research and Innovation (UKRI), it supports business-led innovation across all sectors and technologies, and runs grant funding competitions specifically for aerospace companies. Innovate UK runs the Future Flight challenge aimed at new classes of electric, hydrogen and autonomous vehicles to transform how we connect people, deliver goods and provide services. A key aspect of Future Flight involves connecting industry, government and regulators in working groups to discuss and solve issues in aerospace. Other cross-sector Innovate UK competitions include the Zero Emission Propulsion challenge, which is open to UK businesses in the aerospace, maritime, rail or automotive industry. This challenge was recently set up as part of the Future Economy Net Zero programme to support the government's drive for zero-emission transport; by creating a cross-sector platform, knowledge and capability can be shared between transport industries.

The Engineering and Physical Sciences Research Council (EPSRC) is one of the seven research councils of UKRI with a focus on funding research and training in engineering and the physical sciences. The EPSRC invests more than £850 million a year in a broad range of subjects, with funding aimed at fundamental, low TRL (technology readiness level) technologies.

- *ATI Programme Funding Streams: Funding - Aerospace Technology Institute (ati.org.uk)*
- *UKRI Funding Finder: Opportunities (ukri.org)*
- *UKRI Future Flight challenge: Future flight (ukri.org)*
- *UKRI Zero Emission Propulsion CR&D, Collaborative R&D (ukri.org)*
- *Engineering and Physical Sciences Research Council: EPSRC (ukri.org)*
- *Made Smarter: Amplifying UK innovation (madesmarter.uk)*

Made Smarter, a government backed initiative for the UK manufacturing sector, is driving the transformation of UK manufacturing through digital technologies, innovation and skills. The Made Smarter innovation programme offers an opportunity to rapidly prove, develop and scale digital technologies, including additive manufacturing and robotics and automation, through access to powerful cross-sector networks, centres and innovation funding.

Aerospace businesses may also look to the **Devolved Administrations** who provide grant funding to support innovation in regional areas. Key examples include, but are not limited to; SMART Innovation, a programme led by the Welsh Government and funded by the EU with the aim of supporting innovative growth in Welsh businesses. Similarly, SMART Scotland provides grant funding of up to £100,000 for Scotland-based SMEs working on high-risk, highly ambitious projects which represent an advance in technological innovation. Invest Northern Ireland also provides a range of financial support, including innovation vouchers and grants for R&D.

UK organisations are also eligible to apply for funding and partnership opportunities through the €95.5 billion research and innovation programme, **Horizon Europe**. While the UK's association is still in the process of being formalised, UK-based researchers and innovators can still apply to all Horizon Europe competitions, with the UK Government guaranteeing funding for successful applicants to cover all Horizon Europe calls that close on or before 31st December 2022.

For aerospace, the primary Horizon Europe programme is the Clean Aviation Joint Undertaking (JU), which focusses on developing disruptive new aircraft technologies to achieve climate neutrality by 2050. With the EU committing funding of €1.7 bn to 2031, it funds collaborative projects developing technologies and demonstrators that will deliver net greenhouse gas (GHG) reductions of at least 30%, compared to 2020 state-of-the-art. The Clean Hydrogen JU, responsible for the creation of cutting-edge hydrogen technologies, also has interest for those investing in fuel cells and liquid hydrogen tanks for aviation.

Government loans represent an additional form of funding support applicable to the aerospace sector. Innovate UK will offer loans between £100k and £2M to micro, small and medium-sized enterprises (MSMEs). These loans are for highly innovative late-stage research and development projects which have a clear route to commercialisation and high economic impact. Innovation loans aim to provide flexible and patient capital to support business growth through innovation.

UK companies may also look to the British Business Bank for funding support. The state-owned economic development bank was established by the UK Government and aims to drive sustainable growth across the UK and to enable the transition to a Net Zero economy by supporting access to finance for smaller businesses. The British Business Bank works with over 180 private sector partners, including banks, leasing companies and venture capital funds, and the new 'Finance Hub' interactive finance finder encourages SMEs to find the finance support best suited to their needs.

- *Business Wales:, SMART Innovation (gov.wales)*
- *Scottish Enterprise: SMART: Scotland (scottish-enterprise.com)*
- *Invest Northern Ireland: Funding for innovation and R&D (investni.com)*
- *EU: Clean Aviation (clean-aviation.eu)*
- *UKRI: Innovation loans (ukri.org)*
- *British Business Bank: Finance options (british-business-bank.co.uk)*

	Funding available	Audience	Timescale	Benefits
ATI Programme				
Strategic Programme	£685 million funding available 2022-2025 (includes NATEP and call for smaller business)	Industry-led collaborations with operations in the UK.	Ongoing, programme confirmed until at least 2031.	– Monthly calls for Expressions of Interest where ATI offer support and feedback on funding applications. – Typically for larger, more strategic projects.
NATEP	£5 million per annum	UK registered SMEs.	Ongoing, period calls announced on website.	– Technical and management mentoring offered throughout the whole project's lifetime. – Access to industry professionals and tech managers to support funding applications. – For project sizes up to £300,000.
Call for smaller business	£5 million per annum	UK registered SMEs.	Ongoing, period calls announced on website.	– For project sizes up to £1.5 million and therefore bridges the funding gap for projects in between Strategic Programme and NATEP scope. – Enables collaboration.
Innovate UK grant funding				
Future Flight	£125 million	UK registered business of any size.	Single challenge running from 2019 to 2024 with two funding phases.	– Connects industry, government and regulators in working groups to discuss and solve issues across the sector. – Working groups will provide input and insight into government strategy and regulatory policy.
Zero Emission Propulsion	£10 million	UK registered business of any size.	October – December 2022.	– Creation of a cross-sector platform so knowledge and capability are applied to adjacent transport sectors.
Horizon Europe grant funding				
Clean Aviation JU	€1.7 billion	Any organisation who can meet call criteria, including UK entities.	Calls in 2 waves: Wave 1 2022 (now closed), Wave 2 expected 2024 (tbc).	– Connects world class expertise and key technical skills. – Routes to demonstrators' programmes and supply chain collaboration. – Sustainability driven programmes.
Clean Hydrogen JU	€300.5 million	Business of any size.	Call was open from March 2022 to September 2022.	– By enabling innovative competitive clean hydrogen technologies to be scaled up and expanded.

Table 4: Grant funding options relevant to the aerospace sector

Private funding options

While public funding tends to support R&T for businesses of all sizes, and can function as a springboard for private investment, particularly for smaller businesses, achieving rapid growth and commercial scale often requires raising private capital.

Below we have highlighted the key options for businesses to access third-party capital.

1. Bank lending: Typically used to fund working capital and smaller / low-risk needs.
2. Asset finance: Funding secured against a company asset.
3. Corporate debt: Financial instruments such as bonds and commercial paper that raise debt financing in a similar manner to individual bank loans. In this case the lending party can be a bank, an institutional investor or an individual.
4. Venture debt: Loan to an early-stage company that provides liquidity to a business for the period between equity funding rounds.
5. Private external equity investments: This category is split into the following types of investors according to the size and risk profile of the investment:
    a. Crowd funding: The practice of funding a project or venture by raising money from a large number of people, typically private individuals via an internet-based platform.
    b. Business angels: Wealthy individuals with a business background who invest at the earliest stages and add value by providing seed funding and experience.
    c. Venture capital (VC): Funds that invest in early-stage businesses. They accept significant risk on individual investments as the returns on successful investments tend to be high.
    d. Corporate venture capital (CVC): VC owned by a corporation. CVCs target similar companies to traditional Venture Capitalists, but their investments are also driven by the strategic goals of the parent company, rather than purely by financial returns.
    e. Private investment funds that invest in larger, more stable and generally profitable companies.
6. Public equity: A company sells a portion of its equity in public markets to raise funds. Public companies tend to be much larger than private companies. There is greater liquidity in public equity markets, but the reporting requirements are more onerous.

External financing for UK SMEs has traditionally been dominated by bank lending (Figure 5), required primarily for the management of working capital. A large increase in 2020 was caused by the issuance of government-backed loans to support businesses through the COVID-19 pandemic, such as bounce-back loans. This has now returned historical levels as these schemes have been wound down.

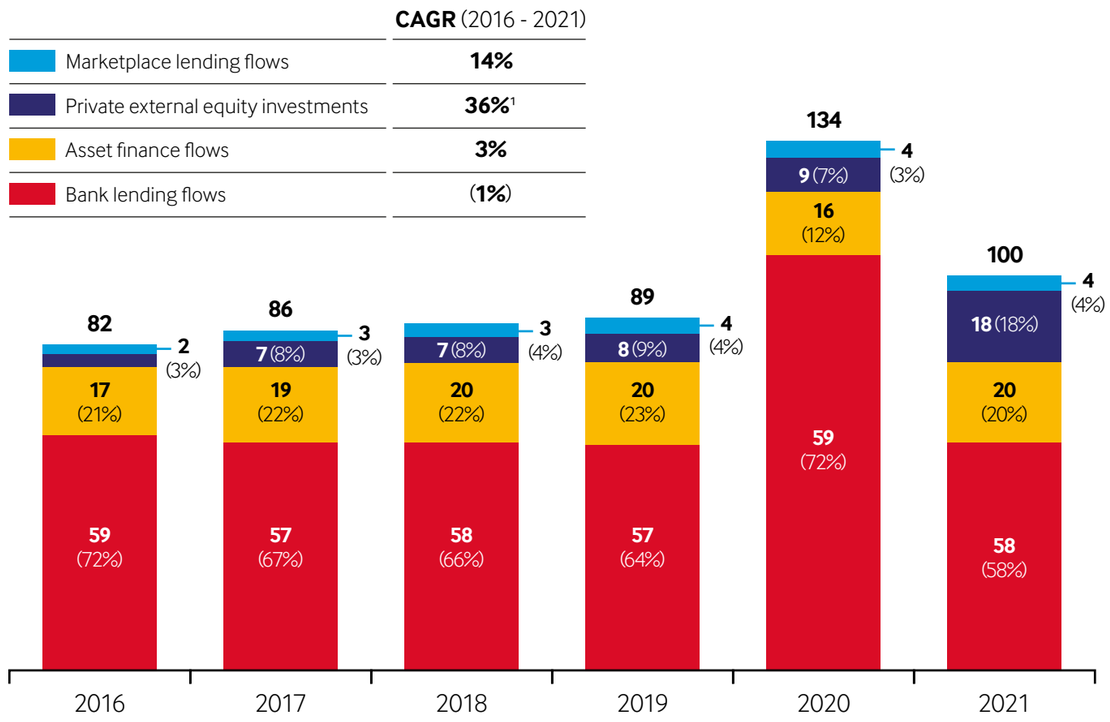


Figure 5: External annual finance for UK SMEs, 2016-2021 (£bn)

The UK has one of the most developed capital markets in the world and is well placed to provide venture capital (VC) and private equity (PE) funding. In 2021 UK PE and VC funds raised a total of c.£3.7 billion, or c.22% of the global total. In the same year the UK PE and VC industry made a total of £34.8 billion of equity investments across all sectors, with half (£17.3 billion) going towards UK companies. Approximately two-thirds went towards buyouts while the remaining third funded start-up and growth companies.

Private equity investments grew at c.36% p.a. from 2016 to 2021 and now account for c.18% of all external private finance for SMEs. The large increase in 2021, approximately double the previous year, was driven by growth across venture, growth and buyout sectors as the industry rebounded and additional capital was required to support growth. There was a degree of pent-up demand following the reopening of the economy after the worst of the COVID-19 restrictions. However, with interest rates increasing and the cost of debt therefore on the rise for private equity firms, this trend may have reached its peak.

Private equity investments have been annualised from £14bn in Q1-Q3 2021, source 'Small Business Finance Markets 2021/22

The strength of the UK Aerospace ecosystem beyond funding

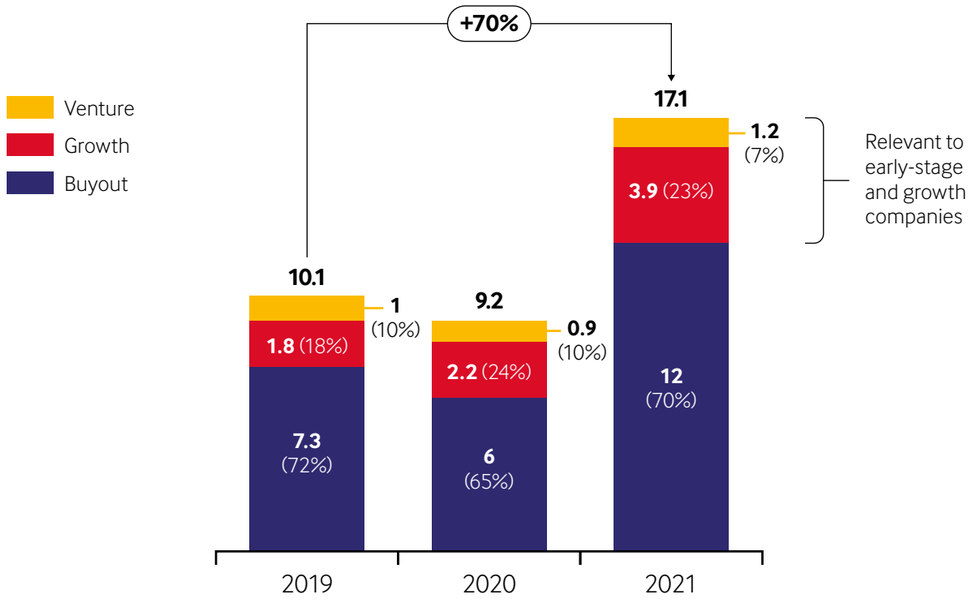


Figure 6: UK VC and PE total investments by stage, 2019-21 (£bn)

The UK has always been an attractive place to locate aerospace companies, ranking 1st within Europe in PwC's 2021 aerospace manufacturing attractiveness rankings. This is driven mainly by the quality of the highly-skilled labour in the sector and the maturity of the UK's aerospace industry and associated infrastructure.

The UK aerospace sector also benefits from the presence of major aerospace organisations and aerospace OEMs who offer a strong route to market for the aerospace supply chain. The industrial footprint, coupled with a strong research ecosystem and an established supply chain, makes the UK a prime location for innovators who are looking for the network, customer base and support to develop their ventures.

The differences in data between figures 5 and 6 is a result of them being drawn from different sources; figure 5 is from the British Business Bank 'Small Business finance Markets Report 2022', while figure 6 is from the British Venture Capital Association 'BVCA Report on Investment Activity 2021'.

CHALLENGES IN THE UK FUNDING LANDSCAPE

As our modelling indicates, there are significant growth opportunities within aerospace over the period to 2050. However, despite a well-developed funding landscape, there remain significant challenges in funding growth within UK aerospace, particularly for smaller SMEs.

There is a funding gap in the UK's 'growth economy' – the section of SMEs that broadly falls between scale-ups and large companies. In the UK this market comprises over 20,000 companies, generating revenue of over £400 billion across a broad range of regions and sectors. Estimates of the size of this funding gap vary, with the UK government's Department for Business, Energy and Industrial Strategy (BEIS) identifying an 'annual equity gap' of £6.5-12 billion, and the Scaleup Institute suggesting a funding gap of up to £15 billion. This may result in the under-capitalisation of many high-growth, technically innovative companies.

Recent market volatility and other structural changes may see this gap widen further over the next 5-10 years. Increasing inflation, interest rates, and disruptions such as the war in Ukraine are all serving to both increase demand for funding (e.g. to cover increasing costs), and reduce supply (investment cases become more difficult).

To gain better insight into this funding gap, we conducted a 'deep dive' survey and set of interviews with a number of smaller aerospace organisations to determine the challenges that they face, and what can be done to help reduce the barriers to investment.

Our survey demonstrated that there is demand within the aerospace industry for investment into sector growth opportunities. A high proportion of our survey respondents (82%) said that they were actively looking for funding, with 59% saying that they would like to secure funding in the next 12 months.

This appetite for funding is explicitly tied to the growth opportunity: 85% of respondents reported that the main reasons that they have sought funding in the recent past is for R&D and product development, with 40% seeking to take on funding to support growth in employees. This demand for funding will need to be met if the UK aerospace sector is to realise its growth opportunity.

This research identified the following funding challenges for innovators in the UK aerospace sector:

1. The UK lags behind the best-in-class in terms of amount invested in deep-tech and R&D intensive companies.
2. Capital intensive-industries are less attractive to many investors.
3. Aerospace requires patient capital.

Survey Methodology

We surveyed start-ups and SMEs that have signed up to various ATI initiatives over the past two years, receiving 60 responses with the majority (72%) at seed or growth-stage. Our respondents were also mostly small businesses, with over half (52%) employing 10 people or fewer. To better understand the experiences of hardware companies in particular, we supplemented the survey with 8 telephone interviews. The fieldwork was conducted from mid-September to mid-October 2022.

— *BEIS: Equity Finance and the UK Regions (gov.uk)*
— *ScaleUp Institute: Access to Growth Capital (scaleupinstitute.org.uk)*

The UK lags behind the best-in-class in the amount invested in tech-intensive sectors

The British Business Bank compared UK VC investment in deep tech and R&D intensive sectors as a proportion of GDP with those in peer countries. They found that the picture is mixed. UK investment in technology is lower than that of countries including the US and Israel, and the comparison between UK and US private investment was the most frequently cited by our respondents. As well as the general level of financial firepower available to US funds it was felt that US investors had a higher degree of risk tolerance and a willingness to let companies fail faster i.e., were more comfortable in giving companies more funds to develop their ideas faster therefore reducing the time taken to judge if the idea is a success or not.

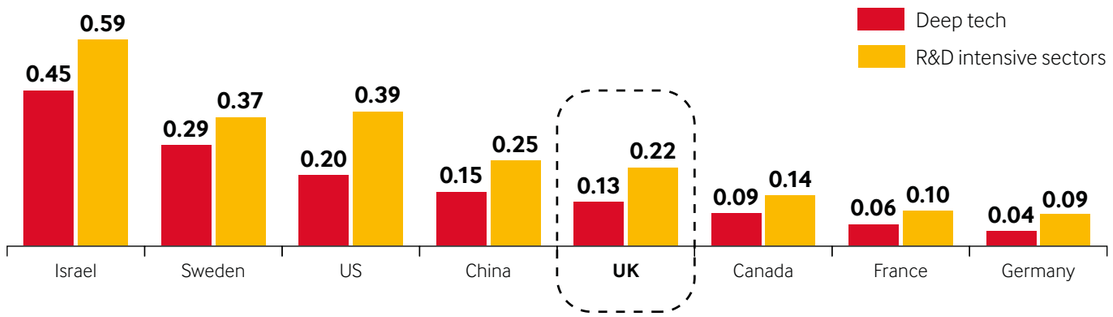


Figure 7: VC investment as a % of GDP for deep tech and R&D intensive sectors

Between 2011 and 2021 there have been 1,628 academic spinouts in all sectors, with the average equity investment increasing by 69% from 2020 to £6.70 million in 2021. During this time, the number of UK spinouts has lagged behind international peers, such as the US, which can be attributed to the risk-aversion of UK investors providing smaller investments in earlier stages than their US rivals.

Universities will typically take an equity stake in spinouts, but if this is too large it can result in insufficient equity being held by founders, deterring VC investors who want to see founders incentivised to grow their companies. In the UK the average university stake has decreased slightly from c.24% in 2012 to c.20% in 2021, but this is still more than twice the US average. UK universities may see this as necessary given the gap in UK VC funding which is available once the venture has spun-out.

Capital-intensive sectors are relatively underserved by UK investors

While the UK has access to a considerable amount of VC and PE funding, there is a skew to its distribution by sector. In general, UK investors favour investments in low capital-intensive industries. This means that the business can be scaled without investing up front in significant technology, plant, machinery or other assets. This is not always the case in aerospace, where businesses tend to require R&D and/or investment in physical assets to grow, which have traditionally been seen as being at odds with aerospace characteristics:

- Low capital intensity
- High growth
- High profit margins
- Short pay-off periods

These preferences can be seen in investment behaviour, with consumer goods, ICT, and finance being the largest recipients of funding.

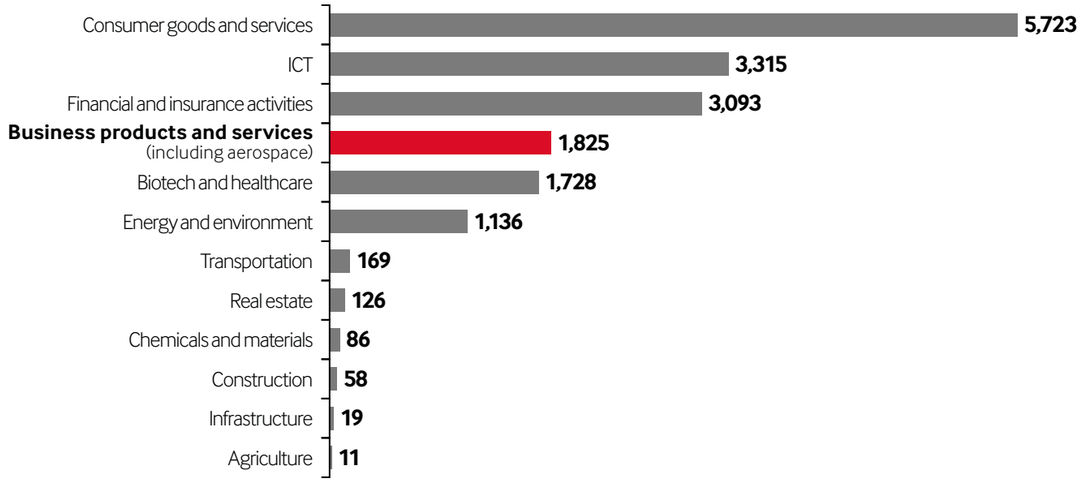


Figure 8: UK VC and PE investments in UK companies by industry (£mn, 2021)

Another reason for the skew is that many private investors have backgrounds in other sectors and may lack detailed knowledge of aerospace. This lack of familiarity makes it harder to accurately evaluate the risks and rewards, acting as a barrier to investment.

> **I was having a conversation with a VC and he said 'I really love your project but I can't tell if it's a good one or a bad one.'**
>
> – Survey respondent

The majority of our respondents (56%) thought it was harder to raise funding in aerospace compared to other sectors and the evidence above suggests they may be right.

> **Aerospace is a notoriously cash-intensive sector, especially given the length and complexity of the certification process. Unless a company can show that it has made substantial progress in this area, investors are wary of providing funding.**
>
> – Survey respondent

> **Fintech and consumer tech get the limelight and rapid returns. Aerospace is a slow burn. Investors want certainty if money will be locked away. That means that SME projects with perceived risk are not attractive.**
>
> – Survey respondent

To validate this view, we have taken a sample of 12 PE and 10 VC small-to-mid size funds, as they are more likely to invest in smaller companies, and compared their deals by sector through the period 2013 to Q1 2022.

Aerospace made up a small proportion of deal activity, accounting for c.0.5% of the number of deals over the period. This stands in contrast to less capital-intensive sectors such as business/productivity software (12%) and media and information services (B2B) (5%), and financial software (3%). When aerospace is compared to similarly capital-intensive industries such as automotive, it becomes less of an outlier, although even here recent years show an overall lower appetite for aerospace investment.

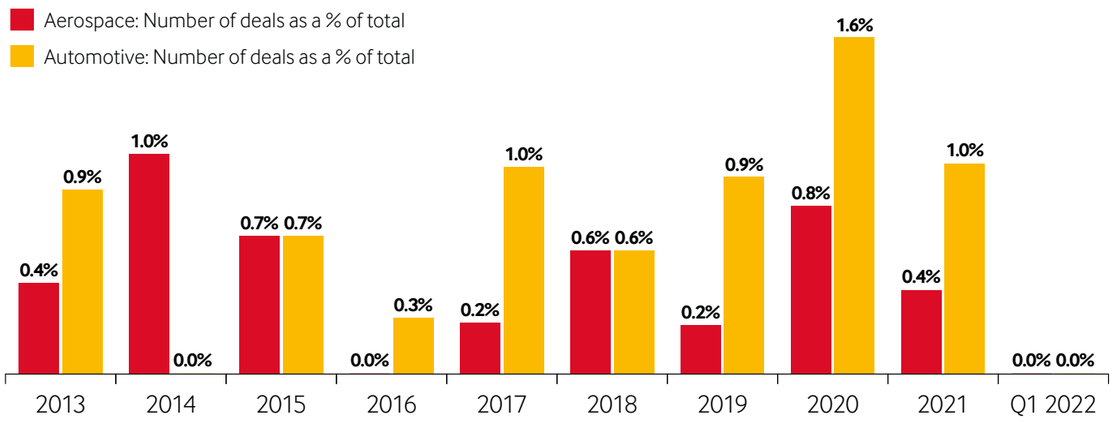


Figure 9: Aerospace and automotive sectors as a % of total deal volume (2013-Q1 2022)

Aerospace requires patient capital

The VC / PE holding period is often c.5 years. During the holding period, the investor hopes to grow the company and develop the equity story such that it can sell its stake (whole or in part) to the next round of investors at an acceptable return. All else being equal, there is an incentive to hold a stake for less time, in order to realise profit more frequently. This can create a tension between the optimal product development pathway and the shorter-term pressures of investor exits.

Figure 10: UK VC and PE average holding period by initial investment stage (years, 2021)

A high level of technological sophistication and exacting safety standards mean that aerospace has one of the longest product development cycles of all sectors. The US Federal Aviation Authority estimates that certification alone can take 5 to 9 years. This results in aerospace being perceived as a less attractive investment for VC and PE funding.

Industry	Time to market range (years)	Alignment to VC/PE holding period
Energy	7 – 23	Low
Aerospace and defence	3 – 22	Low
Healthcare and pharma	9 – 19	Low
Industrials	3 – 7	Medium
Automobile	3 – 5	High
Semiconductor (2 yr clock)	1 – 5	High
Consumer goods	1 – 5	High

Table 5: Indicative times to market

OPPORTUNITIES FOR INVESTORS

While aerospace can appear daunting to some investors, the potential returns are clearly high, given the scale of the market opportunity and the level of growth forecast in the coming decades.

Aerospace represents an opportunity for stable, long-term returns given the long asset lifetimes of products entering the market, and the through-life services revenues available. New methodologies and Industry 4.0 technologies have the potential to bring down the cost of development and time to market. Sharing of research, testing and production facilities via open access institutions such as universities are also helping to reduce capital intensity. This is reducing barriers to entry within aerospace as well as changing the investment case.

> **You can partner with a specific institution and use university grads and facilities, which benefits both parties as you get to reduced labour and capital costs, and a professor's time while they get a project where the students can earn a degree.**
>
> – Survey respondent

Importantly for impact-focused investors, ATI research has shown that aerospace drives significant technical, economic and social spillovers into the wider economy. Aerospace creates significant technical spillovers in sectors including: automotive, rail, marine, rubber and plastics, machinery and equipment and scientific R&D services. In addition to the potential for cross-sector exploitation of aerospace investments, these spillovers also drive wider economic and social benefits, with the average social return on investments in aerospace R&D approximately 2-3 times the return.

Based on these opportunities, and in light of sector-specific funding requirements, aerospace is likely to be of particular interest to large, sector agnostic funds which have a higher risk tolerance and can deploy more financial firepower. Rather than viewing companies as individual risks, larger funds can manage them as a portfolio, allowing risk to be diversified. Funds with an ESG focus, in particular, are more likely to have an appetite for purpose-driven investments with longer-term payback periods. Pension funds will also be more comfortable with the long-term nature of aerospace returns. Investors also have the potential to innovate in the construction of new financial instruments that will enable the patient capital to drive long-term growth in aerospace.

In addition, strategic industry investors and corporate venture capital, for example, will understand the long-term nature of the returns from their investments in aerospace and are seeking to develop their own internal capabilities rather than looking for a quick return.

There may also be increasing interest in aerospace investments among ultra-high-net-worth individuals who are attracted by the purpose of decarbonising flight and the challenge of developing entirely new, zero-carbon aircraft types.

— *ATI: Spillovers – Revealing the broader economic benefits of aerospace R&D (ati.org.uk)*

CONCLUSION

This report has highlighted the enormous market opportunity for the development of aerospace technologies that facilitate the transition to Net Zero 2050. Aerospace growth opportunities cover a range of zero-carbon, ultra-efficient and advanced air mobility. They include both near-term and longer-term market growth – common to all is a need, and an opportunity, to invest now.

There is no shortage of entrepreneurial drive and demand for funding, but despite the variety of funding opportunities available to the UK aerospace sector, a funding gap does exist. This gap is particularly evident in the UK's 'growth economy' – the section of SMEs that broadly falls between scale-ups and large companies, resulting in the under-capitalisation of many high-growth, technically innovative companies. There is a risk that this gap will widen further over the next decade.

This is a problem beyond aerospace, with SMEs across all sectors suffering from being undercapitalised, but it is more acute in aerospace where complexity, capital intensity, and long development cycles can be seen as barriers to investment.

Specific funding challenges for innovators in the UK aerospace sector include: lower availability of investment in R&D intensive companies vs. other countries; investor perceptions of aerospace as a capital-intensive industry; the need for patient capital given lengthy development programmes; and the high percentage shareholdings typically taken by universities in spin-outs deterring venture capital investment.

But the UK aerospace sector's transformation towards Net Zero offers a very credible market to investors. Not only is the UK a hub of technical innovation and creativity but it also has access to some of the most skilled labour in the world. We have a well-developed aerospace ecosystem composed both of larger companies with a clear ability to drive emerging concepts to market at scale, as well as smaller innovators within aerospace with a strong appetite to invest in growth. And finally, we have a clarity of purpose that will drive demand, based on our ambitious Net Zero goals.

This therefore represents a significant opportunity for those with the ability and the will to provide funding. In particular, aerospace investment may appeal to large, sector agnostic funds with a portfolio approach to managing risk and reward, and in particular funds focused on purpose-driven investments with longer-term payback periods. Equally, strategic industry investors and corporate venture capital may benefit from long-term returns combined with the opportunity to develop capabilities in collaboration with companies in their investment portfolio. Aerospace investments will also be attractive to ultra-high net-worth individuals looking for strong purpose-driven investment opportunities.

Meanwhile, there are actions that aerospace companies can take to attract private investment. These will include introducing innovative technologies and development processes to reduce capital intensity and product lifecycles, as well as leveraging public funding to attract private investment.

The aerospace sector is recovering quickly from the volatility of recent years and is now gearing up for a once-in-a-generation transformation. For investors with the right understanding of the sector, an appetite for long-term growth, and a mission to invest in technologies that will help achieve Net Zero 2050, aerospace may represent a once-in-a-generation investment opportunity.

GLOSSARY

AAM	Advanced air mobility
AI	Artificial intelligence
B2B	Business-to-business
BEIS	Department for Business, Energy and Industrial Strategy
CAGR	Compound annual growth rate
CVC	Corporate venture capital
EOI	Expression of Interest
EPSRC	Engineering and Physical Sciences Research Council
ESG	Environmental, social and governance
FSA	Full Stage Application
GHG	Greenhouse gases
JU	Joint undertaking
MSMEs	Micro, small and medium-sized enterprises
NATEP	National Aerospace Technology Exploitation Programme
PE	Private equity
R&D	Research & development
R&T	Research & technology
SAF	Sustainable aviation fuel
SME	Small or medium-size enterprise
TRL	Technology readiness level
UKRI	UK Research and Innovation
VC	Venture capital

AEROSPACE TECHNOLOGY INSTITUTE

The Aerospace Technology Institute is an independent organisation that works alongside government and industry to transform aerospace through technology and innovation. The ATI is funded equally by the Department for Business, Energy and Industrial Strategy (BEIS) and by industrial recipients of project grants who pay a small levy. ATI projects are chosen and overseen through close collaboration with Innovate UK and BEIS. Our role is to establish a challenging technology strategy for the sector, and to develop a portfolio of research and technology (R&T) activity to realise that strategy, exploiting the sector's strengths to the full and creating new capabilities for the future market. Government and industry have agreed to provide funding to the ATI Programme out to 2031, creating an ongoing commitment to the development of the UK sustainable aerospace sector.

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