SQW

Supporting the development of the emerging Jet Zero Cluster in the EM3 LEP area

Evidence Report

December 2023

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Introduction

SQW was commissioned by the Enterprise M3 (EM3) Local Enterprise Partnership (LEP) to investigate the **aviation sector's transition to net zero (Jet Zero)**, and the opportunities for associated activities. This was identified as a key priority for EM3 LEP in developing its 2023/24 Delivery Plan.

The commission set out to:

- identify local **sector strengths, challenges, barriers, and new opportunities** (regionally and globally) for the EM3 region in relation to the aviation's transition to net zero (Jet Zero)
- gather evidence to produce a **business and R&D database**
- set out a compelling narrative for a **sector proposition**
- provide **recommended actions/interventions** for taking the cluster forward over the next 24 months.

This paper considers the evidence linked to the emergence of a jet zero cluster across the EM3 area. It is informed by several strands of evidence gathering (some of which are reported separately as stand-alone annexes):

- web-crawling (undertaken by glass.ai) to identify businesses within the sector and their characteristics.
- consultations with key stakeholders, assets, businesses and government agencies operating in the sector.
- a review of the research and innovation landscape in relation to the transition to net zero in the aviation sector.
- a review of official statistics available in relation to the sector, including Innovate UK data.

The evidence presented within this document will inform the development of a sector/cluster proposition document and the preparation of an action plan for EM3 LEP and partners to support the growth of the sector/cluster over the next 24 months.

Note: this evidence report is principally focused on the geography of the Enterprise M3 LEP, which incorporates parts of Hampshire and Surrey. Where relevant, activities taking place elsewhere in Hampshire and Surrey have also been included in this report (this has been made clear in the relevant sections).

1: Definitions – and the wider context for the emerging cluster

Defining the emerging Jet Zero cluster

Jet Zero is not an industry in itself. It is a set of objectives leading to a desired outcome: net zero in aviation.

What are the objectives surrounding Jet Zero?

The UK's national strategy for achieving net zero in aviation is the **Jet Zero Strategy** (Department for Transport, 2022). Parallel strategies have been developed at European and international levels*.

Across these different statements, there is a broadly shared understanding that the route towards net zero in aviation includes:

1. **System Efficiencies/ Improved Technologies:** improvements to existing aviation technologies and infrastructure (aircraft, airspace and airports) to reduce emissions in the short-term.
2. **Sustainable Aviation Fuels:** non-fossil fuel derived fuels that are used in existing combustion engines and offer lifecycle emission savings. These are expected in the mid-term to help progress towards net zero while alternative aircraft technologies are developed.
3. **Zero Emission Flight/ Next Generation Aircraft:** novel forms of aircraft powered by hydrogen and/or electric that offer the potential for no tailpipe CO2 emissions and are expected in the longer-term.

Other measures towards net zero in aviation proposed in the UK strategy include:

- carbon offsetting and improved carbon capture technologies, which will be required to meet industry targets
- actions taken to influence consumers towards more sustainable choices, and
- understanding and addressing the impacts of nonCO2 emissions.

What do we mean by the emerging Jet Zero cluster?

We are defining the emerging cluster as inter-related activity across the aviation value chain (including aviation infrastructure, manufacturing and operators) that supports the transition towards net zero in aviation, consistent with these objectives.

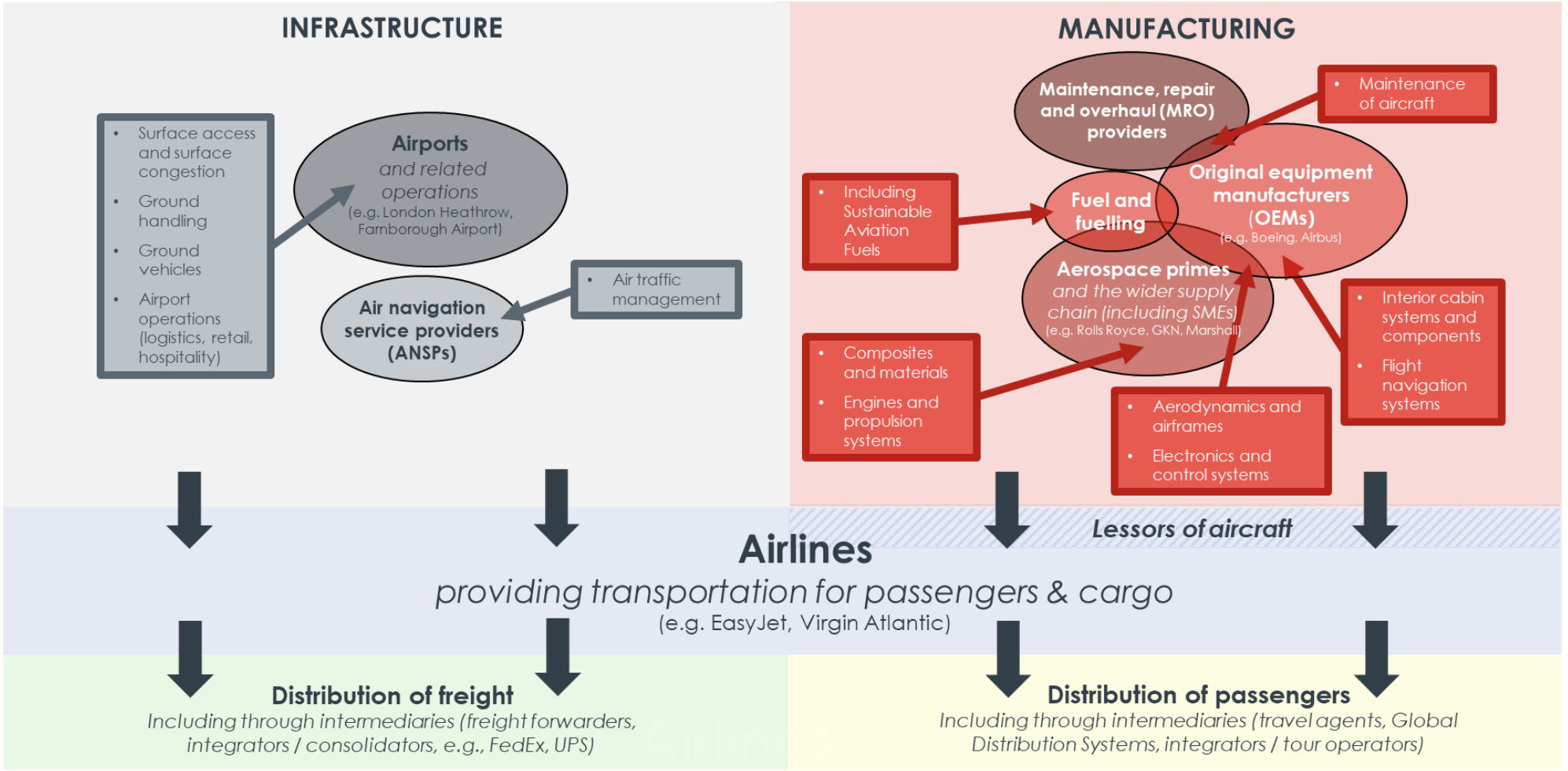
*including *Destination 2050* (NLR – Royal Netherlands Aerospace Centre, 2021), *Aviation Climate Action Plan* (US Federal Aviation Administration, 2021), *LTAG Report* (International Civil Aviation Organisation, 2022)

SQW

What is the value chain across the aviation sector?

The value chain is extremely broad in scope. It relates fundamentally to the process of making and then operating aircraft, and the hard and soft infrastructure that supports this process. It therefore includes much of the aerospace sector, but it is much broader.

In practice it is also linked to a series of regulatory systems and processes, both nationally and internationally.

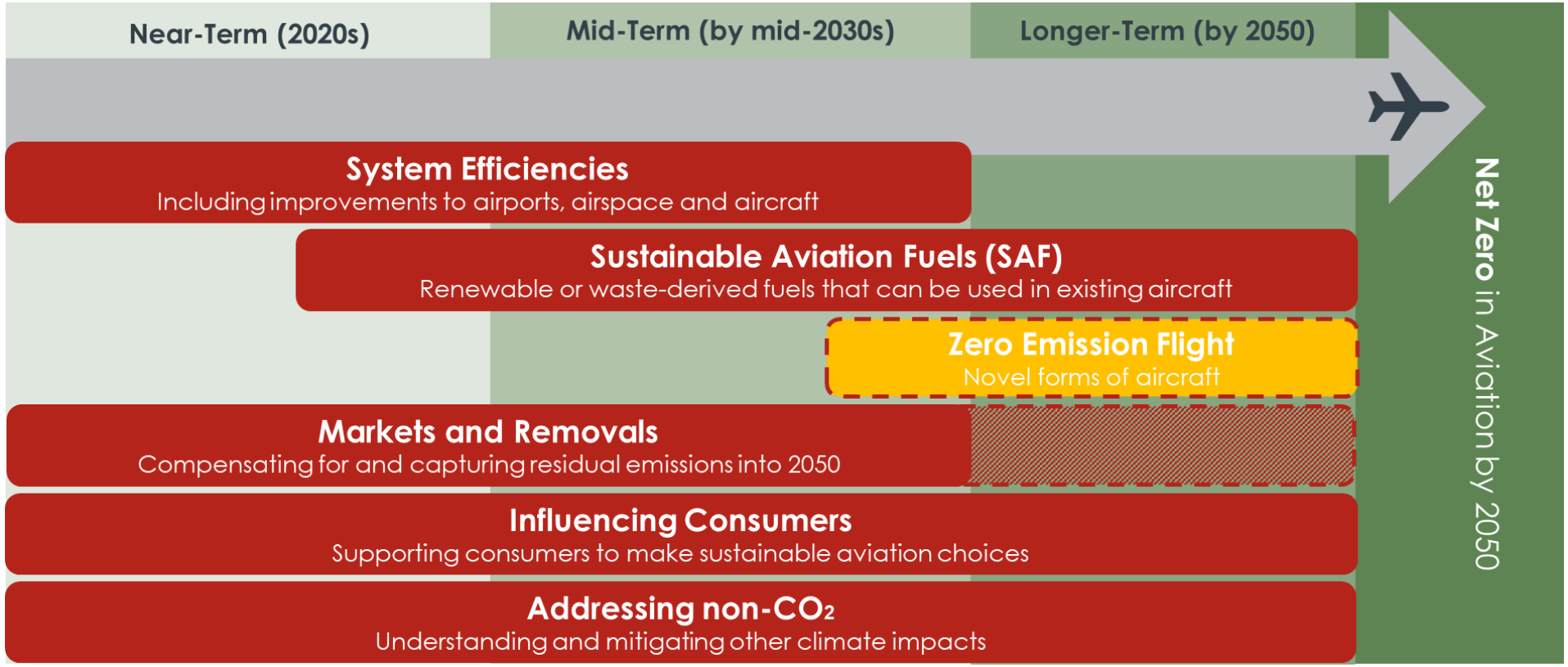


Timeline to Net Zero according to the Jet Zero Strategy (DfT, 2022)

The national Jet Zero Strategy (DfT, 2022) sets out an ambitious timeline for achieving net zero in aviation.

This is complicated. There are also many risks, uncertainties and interdependencies.

It is important to recognise that major transitions are still some way into the future. This must affect the extent to which a jet zero cluster is even possible in 2023 – and the significant journey that lies ahead.



Strategic context

National Strategic Context

Department for Transport's ***Jet Zero Strategy*** (2022) set a UK target for net zero in aviation by 2050, with associated 2040 targets for zero emissions in airport operations and net zero emissions in domestic flights.

The **Jet Zero Council** (a partnership between industry and government) was established to support these objectives, with two **Jet Zero Council Delivery Groups focused on Sustainable Aviation Fuels and Zero-Emission Flights.**

Other national partnerships that predate the Jet Zero Strategy but are instrumental to its delivery are: **Sustainable Aviation**; the **Aerospace Growth Partnership;** and the **Airspace Change Organising Group.**

The **Aerospace Technology Institute (ATI),** funded by then-Department for Business, Energy and Industrial Strategy, coordinated the **FlyZero project.** This was an independent study into zero-carbon emission aircraft concepts. It published **Technology Roadmaps (2022)** for zero emission aircraft and their associated infrastructure.

Local Strategic Context

EM3 LEP's ***Strategic Economic Plan 2018-2030*** identifies the **Clean Growth economy** as a major stimulant for growth in the region. Publication of the emerging Local Industrial Strategy approach (2020) reaffirmed prioritisation of the **low carbon and clean growth sectors** among a wider range of priority areas.

Most recently, EM3 LEP published its **Covid-19 Economic Recovery Plan, *Revive and Renew*** (2020) that draws on the Local Industrial Strategy's findings and updated Covid-19 evidence. It identified seven priority areas for the region, including:

- growth in the **low carbon economy**
- supporting business-led innovation, entrepreneurship, high-tech, scale-up businesses and international trade
- convening people and organisations in **shared projects**

Wider research and innovation landscape for jet zero

Framed by the strategic and organizational context outlined in the previous slide, the wider research and innovation landscape surrounding jet zero is extremely complex. It involves programmes and interventions at international, national and local levels.

Across the EU, **Clean Sky 2** is a major venture. It is a Public-Private Partnership between the European Commission and the EU aviation industry. It aims to reduce aviation's environmental impact by accelerating the development and deployment of cleaner air transport technologies. The total available funding is €1,716 million. Many of the industry primes that are critical to jet zero in the UK will however be participants (e.g. Airbus).

In the UK, there are major research and innovation programmes which are funded through different parts of UKRI and are aimed specifically at achieving net zero carbon in aviation.

At lower Technology Readiness Levels (TRLs), the **Research Councils** are important funders focused, for example, on sustainable energy, fuel cells, advanced materials, etc. In the main the Research Councils fund research within universities.

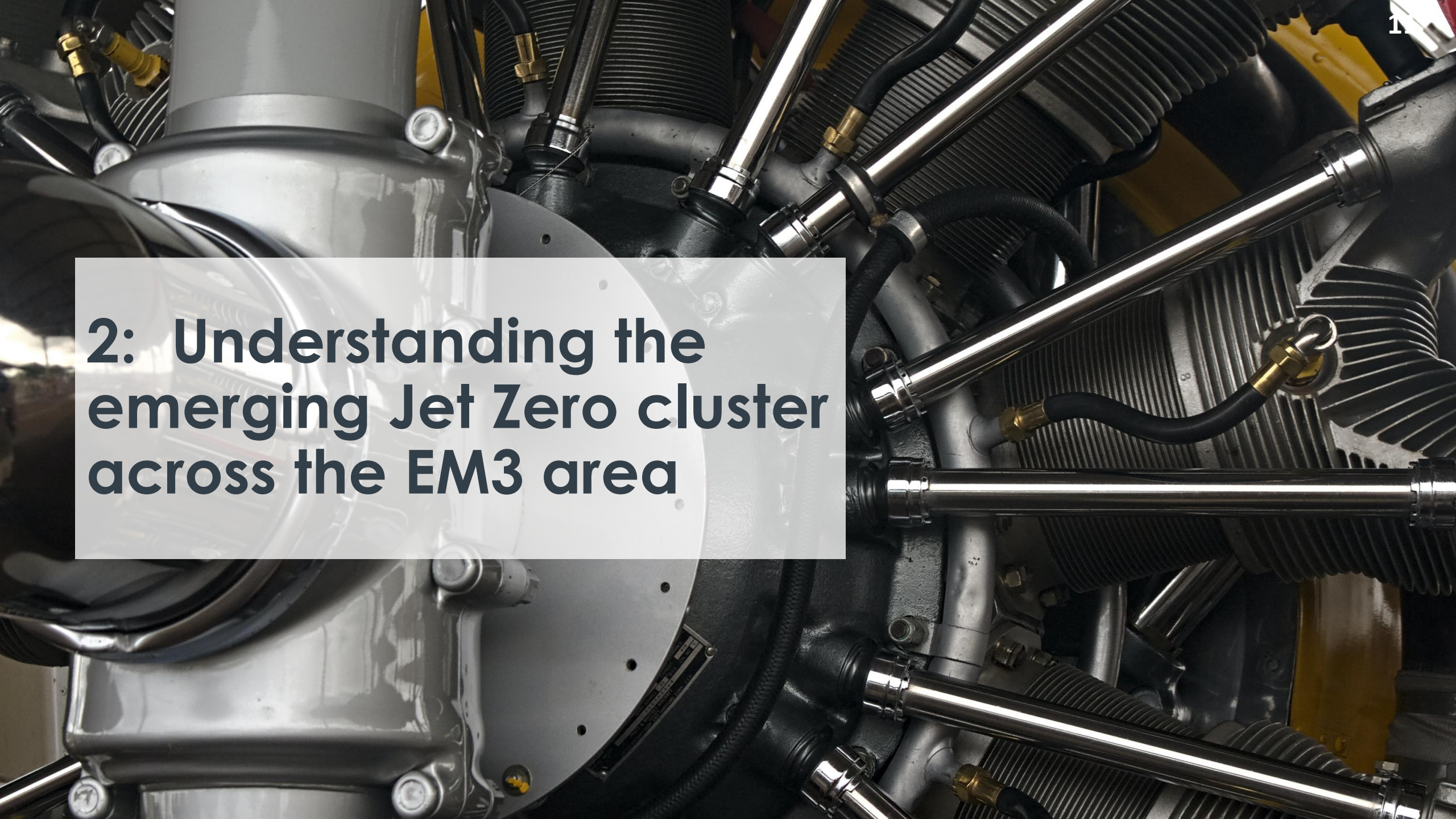
At higher TRLs, **Innovate UK** – also part of UKRI – is key. It has funded various programmes including, for example, Future Flight Challenge and Zero Emission Propulsion Challenge. Typically these are advanced through collaborations between industry and research institutions. There have been some major awards to organisations within the EM3 area.

Specifically in relation to the aerospace strands of Jet Zero, the **Aerospace Technology Institute** is another key part of the R&I landscape. It has links to Innovate UK and runs R&I programmes, some focused more on the industry primes and some with a stronger SME emphasis.

The **Catapult network** also plays an important role. Three Catapults – High Value Manufacturing, Energy Systems and Connected Places – all have particular specialisms in relation to the wider agenda linked to jet zero.

Wider research and innovation landscape for jet zero

	Aerospace and aeroplanes	Fuels and energy	Airports	Airspace and regulation
EU	*Clean Sky 2, the new Clean Aviation Joint Undertaking*			
Government / UK Regulators		• DESNZ - Net Zero Innovation Portfolio • DfT - Advanced Fuels Fund competition; and Green Fuels, Green Skies competition (closed)	• DfT: Transport Research and Innovation Grants	• DfT: Transport Research and Innovation Grants • Civil Aviation Authority: Airspace Modernisation Support Fund
UKRI & Research Councils / Innovate UK	• Innovate UK: Future Flight Challenge (with ESRC); Zero Emission Propulsion Challenge • Innovate UK is the delegated budget holder for ATI (with a series of major R&I Programmes focused on net zero in aerospace)	• Innovate UK Faraday Battery Challenge • Innovate UK KTN: Sustainable Aviation Fuel Innovation Programme		
Catapults	• High Value Manufacturing Catapult – with seven centres • Digital Catapult	• Energy Systems Catapult • Catapult Network (Energy System, Offshore Renewable Energy) focused on hydrogen	• Connected Places Catapult	
Partnerships	• Strategic Aerospace Research Forum • Aerospace Growth Partnership • UK Aerospace Research Consortium			• Airspace Change Organising Group



2: Understanding the emerging Jet Zero cluster across the EM3 area

Introduction

There are many different definitions of clusters (including those from Alfred Marshall and Michael Porter). One definition that is especially useful was developed by Rosenfeld in the late 1990s. He argued that clusters could be understood simply as:

"concentrations of firms – and related institutions – that produce synergy because of their geographic proximity and interdependence"*

From this vantage point, the key point is that a 'concentration' of firms is necessary but not sufficient in relation to the identification of a true cluster. What also matters is evidence of synergy through interdependence.

In principle, this may take many different forms. It could potentially include:

- *evidence of a shared labour market – with, for example, workers moving between firms and taking knowledge and understanding with them*
- *evidence and formal and informal collaborations, in relation to research and innovation*
- *evidence of specialist providers of business support that have developed locally because there is a local market*
- *active business networks – where different businesses/organisations come together, because they have shared interests.*

In economic terms, characteristics of this nature may translate into a particular form of agglomeration benefits. These are different from those associated with scale (as in a major city, for example). The major difference is the level of specialisation.

Genuine clusters take time to develop, principally because they are underpinned by networks of personal and business relationships. It is also true that once-dynamic clusters can fade, particularly given wider changes in the competitive environment – e.g. the Lancashire textiles cluster which declined after the second world war. At the same time, new clusters can be born - and the recent growth of the cell and gene therapy cluster around Stevenage is a good example.

The emerging 'jet zero cluster' in and around the EM3 area is potentially a new cluster. It has links to – but is different from – aerospace and aviation activity in the local area. The key question for this study was therefore whether (and to what extent) a real cluster exists, and how its future growth might be supported.

*Bringing Business Clusters into the Mainstream of Economic Development Stuart A. Rosenfeld European Planning Studies, Vol. 5, Number 1, 1997

Foundations of an emerging cluster?

Jet zero is a commitment for the next few decades and a journey in technological and sectoral terms. In seeking to understand why there could be the beginnings of a cluster associated with it, it is important to recognise some of the key assets in and around Hampshire and Surrey that could provide some kind of catalyst and anchor.

One key asset is **Farnborough Airport** (see case study 1). Located in Rushmoor Borough, this is long established and in many respects, it provides a focal point for wider aerospace-related activities. As an airport, it has made a very (and possibly uniquely) early commitment to achieving net zero by 2030. This is important, both symbolically and in terms of the airport's own economic role in orchestrating wider supply chains.

Farnborough International Airshow – hosted by the Airport – is another key driver. It brings together global interests in aviation. Within this context, the innovation needed to achieve jet zero is a galvanizing theme. 'Bringing together' the breadth of the value chain – from airports through aerospace and aviation fuels – could itself prove to be a plausible catalyst for cluster development.

Other important assets and drivers are nearby. **Heathrow Airport** is close to the northern boundary of the LEP area and – given its scale – it is a catalyst for change. To the south west is the **Solent area** which has strong research and commercial assets in relation to some elements of the journey to net zero in aviation – perhaps most especially in hydrogen technologies and associated fuels. Specialisms in space and energy in **Oxfordshire** and the **Thames Valley** are also relevant.

More generally, the area across Hampshire and Surrey which defines the geography of EM3 LEP has a deep pedigree in terms of enterprise, entrepreneurship and innovation. It has generally good workforce skills, a high incidence of start-ups, strong business networks, a group of early stage investors and many of the ingredients needed for the growth of knowledge-based clusters.

Case Study 1 – Farnborough Airport

Farnborough Airport is Europe's number one for business aviation and the home of British aviation, with the first UK powered flight taking off from the airfield in 1908. Today the town's airport is known across the world for hosting the pre-eminent aviation and aerospace trade event - the Farnborough International Airshow.

Passionate about its goal of becoming a global showcase for airport sustainability, Farnborough Airport was this year awarded the highest level of carbon neutral accreditation, having become the first business aviation airport in the world to achieve carbon neutral status in 2018.

Always looking for new ways to supply and create sustainable energy sources, it made Sustainable Aviation Fuel (SAF) available to its customers in 2021, in support of the decarbonisation of the wider aviation industry. While in 2022 it committed to be Net Zero for those emissions it can control by 2030 or sooner, setting some of the most ambitious targets in the industry.

As home to more than 70 tenants, including Gulfstream, Farnborough Airport is the largest employment site in the borough, continuing to drive inward investment and support jobs and economic wellbeing.

In 2022, it embarked on a £55m investment programme to significantly expand its facilities and infrastructure by developing an iconic 300m-long, four-bay hangar facility, Domus III. The landmark development was conceived in response to the growing demand and to support and enhance the Airport's international business connectivity, which in turn promotes inward investment and economic growth.

An Economic Impact Assessment of Farnborough Airport commissioned by Rushmoor Borough Council found that between 2009 and 2019 total employment directly or indirectly associated with the Airport has risen 57%. It also found that the airport's economic impact in terms of generating employment and Gross Value Added (GVA) in the region was almost double what they had previously forecast back in 2009.

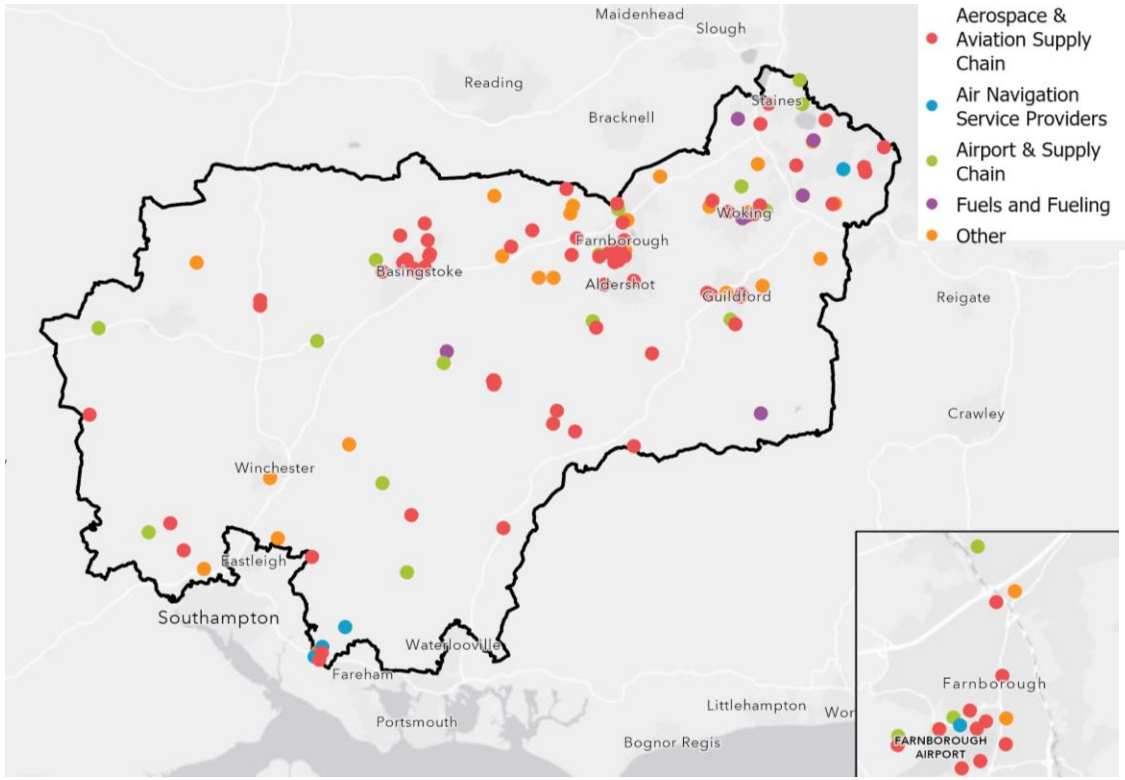
It continues to remain active in the community, with the Farnborough Airport Community Environmental Fund donating more than £850k over the last 13 years to enhance outdoor public spaces in Rushmoor, helping the area to be a welcoming place for the community. This is the success story of Rushmoor and Farnborough Airport - the home of British aviation, supporting UK enterprise, driving inward investment, and securing future economic growth.

The overall scale of business activity linked to Jet Zero in the EM3 area

From the analysis completed by glass.ai (see Annex A), some **138 business/organisations** within the EM3 geography were identified as being linked to 'jet zero'. A further **295** were associated with aviation, aerospace and defence, but without any clear credentials or activities in relation to jet zero. These might be regarded as possible future members of a jet zero cluster.

The distribution of the 138 businesses/organisations is shown in the map opposite. Spatially, this suggests:

- a strong concentration in and around Farnborough Airport (in the borough of Rushmoor) and the wider Blackwater Valley area
- a smaller concentration around Basingstoke
- a reasonable distribution of businesses/organisations elsewhere in the EM3 area – perhaps most especially in the east (close to both Heathrow Airport and Greater London) and in the south west (close to Southampton).



Source: Produced by SQW 2023 based on glass.ai data. License 100030994. Contains OS data © Crown copyright [and database right] [2022]. Note: based on sample of 158 business identified by glass,ai as having activity linked to Jet Zero

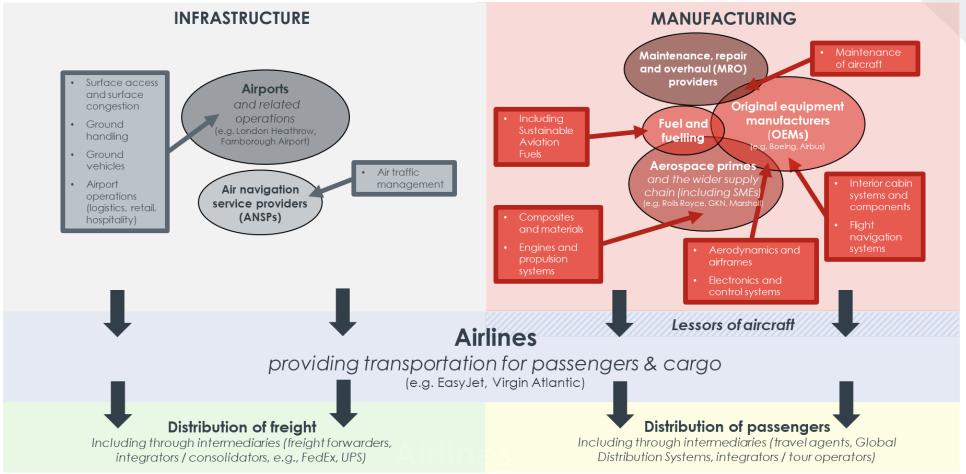
The key players within it

Within this context, there is a wide range of businesses and other organisations that are associated with the transition to net zero aviation.

The web crawling completed by glass.ai, identified major global players with at least some local presence – examples include **Boeing, Thales, Gulfstream Aerospace** and **QinetiQ.**

Through the use of LinkedIn data, glass.ai also highlighted those businesses with the biggest (in terms of employment) local presence. The five largest identified through this route were: **BAE Systems, QinetiQ, Surrey Satellite Technology** and **Boeing**.

These lists are helpful insofar as they point to the diversity of businesses which appear to be involved in the transition to net zero aviation and are active within the EM3 area. Referring back to our value chain (see opposite), some (e.g. Boeing, BAE Systems) are aerospace OEMs or industry primes, but others (e.g. Thermo Fisher Scientific and Motorola Solutions) are typically associated with other industry sectors. However there is evidence that this second group is working on products or services which are plausibly linked (directly or indirectly) to the transition to net zero in aviation. This means that they could potentially play a role within an emerging Jet Zero cluster (e.g. in relation to specialist skills, etc.)



Whilst glass.ai can only reflect on website/social media content, the key point here is **that contributions appear to be being made from across a wide range of different specialisms, such is the scale of the challenge and opportunity associated with jet zero**.

One of the major businesses identified through web crawling – QinetiQ – has a long local history. Again, its specialisms are wide ranging and they are usually associated with the defence sector. However it is working with the likes of Boeing with a growing focus on issues linked to jet zero. It is well embedded in the local area (see case study 2).

Case Study 2 – QinetiQ

QinetiQ is a multinational science and technology company with a history that lies totally in the Defence and Security sector dating back to 1908. Initially established as a government-owned entity, following a number of organisational mergers over the years, in 2003 the government spun-off QinetiQ as an independent commercial arm. Today, it generates Intellectual Property for high-end technologies that deliver capabilities to the UK and other armed forces globally. Its world-leading facilities include a multitude of laboratories and test ranges, and the largest wind tunnel in the UK. Wind tunnel users include both the University of Surrey and Boeing, who are focused on future aircraft design.

Through its Farnborough site at the Cody Technology Park, QinetiQ is well-connected in the EM3 region, working closely with Defence Prime Contractors, local universities and SMEs alike. It is also a member of Farnborough Aerospace Consortium and through this route, it has shared insight in terms of how companies can approach the Defence market.

While QinetiQ's R&D activity is primarily Defence and Security focused, the resultant technology IP has been adapted into many other applications, from the invention of the flat screen TV and computer mouse, to stealthy wind-turbine blades that employ similar radar reduction techniques to that of the F-35 Lightning II fighter jet. Likewise, some of the by-products of its research have the potential to aid the transition to net zero in aviation. For example, carbon fibre composites (ultra-lightweight materials) developed by QinetiQ are currently under further development through partnership with BAE Systems and with Boeing. In another example, QinetiQ's research into non-lithium ion batteries (i.e. batteries that use a non-conventional technology and chemistry) could soon provide new ways to power aircraft equipment or seat units.

Although civil aviation is not a focus of QinetiQ's work, its activities are very relevant, and it is willing to contribute wherever possible to the Jet Zero transition.

The importance of SMEs

Overall, glass.ai's analysis suggested a **relatively high incidence of small (and often new) enterprises** within the stock of organisations that are engaged – in some way – with the transition to net zero aviation.

This analysis required data matching (to LinkedIn sources) and was not possible for all businesses. However from the data we were able to analyse, the inference was that **about a third of all businesses linked to jet zero in the EM3 area are small, with 1-10 employees**. The incidence of micro businesses is highest in the sub-sector we identified as 'aerospace and aviation supply chain'.

Importantly, the origins of some of these small and new companies links clearly to established larger organisations.

One example is **TISICS** (see case study 3). Based in Farnborough its origins may be traced to QinetiQ. The presence of local spin-offs of this nature is usually considered to be indicative of a genuine cluster.

Size of Businesses in EM3 geography (based on LinkedIn data for global employment), by Jet Zero sub-sector

	1-10 employees	11-50 employees	51-200 employees	201-500 employees	1,001-5,000 employees	Total
Aerospace & Aviation Supply Chain	20	14	7	4	2	60
Airport & Supply Chain	7	9	2			23
Fuels and Fuelling	1	2	4			9
Air Navigation Service Providers	1	1	1	2		6
Other	11	8	3	4		29
Total	40	34	17	10	2	127

Note: based on partial sample of business (of which 127 are Jet-Zero related) identified by glass,ai who could be matched to a LinkedIn business account

Case Study 3 – TISICS

TISICS is an advanced materials company that develops high-strength and ultra-lightweight metal composites for use in planes, spacecraft and industrial equipment. TISICS was founded in 2005 from QinetiQ (a Farnborough-based R&D company focused on defence and security) to commercialise this world-leading materials technology. TISICS has locations in both Farnborough and Basingstoke; it employs 16 members of staff and has a turnover of £2.3 million. Its presence in the EM3 region is a result of a management buy-out from QinetiQ, but it also credits the region's ability to attract talent into the area.

TISICS works with customers, predominantly in aerospace, on product development and it also operates a small-batch manufacturing facility in the region. Its customers include several of the major aerospace primes, as well as the European and UK space agencies.

Given the nature of its work, TISICS requires highly-qualified individuals with specialist manufacturing and engineering skills. It has established strong links with the University of Surrey's materials department. TISICS has funded six PhD students at the University. Engagement with SETsquared, a business incubation partnership between six universities in the South of England (including the University of Surrey), has also provided helpful connections on TISICS' journey.

TISICS' specialism in ultra-lightweight materials is key to enabling system efficiencies in aviation by producing lighter aircraft components that can reduce fuel consumption and emissions. Its advanced materials technology has received support from Innovate UK and UKRI towards its development. TISICS' lightweight materials are relevant to future aircraft designs. TISICS was recently awarded an ATI programme on developing core capability for liquid hydrogen fuel tanks with other UK SMEs and the University of Derby.

Key networks

As '*concentrations of firms – and related institutions – that produce synergy because of their geographic proximity and interdependence',* the existence of networks is important in terms of cluster definition.

Networks take many forms. They can be very important as a route to sharing knowledge and, effectively, de-risking innovative economic activity (as information is shared) between firms and other organisations.

Within the EM3 area, **Farnborough Aerospace Consortium (FAC)** is a long-established network. It predates the national commitment to jet zero but it has embraced it fully, and it is now providing an important forum and resource, particularly for SMEs (see case study 4).

There are other networking organisations too – e.g. **Space South Central** which identifies itself as the largest regional space cluster in the UK. Whilst not explicitly focused on jet zero, there are overlaps and synergies. In similar vein, the developing network at **BASE Bordon** (in East Hampshire) is also locally relevant.

Case Study 4 – Farnborough Aerospace Consortium

Farnborough Aerospace Consortium (FAC) is a regional trade association that provides support to over 250 members in the aerospace and defence industry. It offers support that includes brokering to help members win new business, supporting investment into aerospace and defence into the region, acting as the principal voice for aerospace and defence SMEs in the region, developing funding sources for its members, membership services, and working with appropriate partners on skills development of the existing and future workforce.

The consortium is engaged with several key areas of Jet Zero. It helps member organisations identify Jet Zero funding streams, works with the national initiative Composites UK on making aircraft lighter, and acts as a partner in the planned Solent Hydrogen cluster.

FAC has recently relocated to new site near the FCT campus and is working in close partnership with the college. This includes early work into a potential 'market gap' in the production of infrastructure for hydrogen fuels.

Specialist local labour market

People are a critical element of genuine clusters – particularly insofar as they gain specialist skills and move between different companies, taking knowledge and expertise with them.

From our consultations (see Annex D), the quality and depth of the labour market in and around the EM3 area was widely recognised. For the businesses we spoke to, it was often the major reason for locating (and staying) in the EM3 area.

Businesses themselves have an important role in training people and creating a specialist local labour market. But within the EM3 area, there are also some specialist institutions which are relevant.

Farnborough College of Technology has a key role (see case study 5). As a source of well qualified new graduates and postgraduates, the University of Surrey is also very relevant (see case study 6).

Case Study 5 – Farnborough College of Technology

Farnborough College of Technology (FCoT) is a technical education provider that offers courses from Level 1 to postgraduate level. Originally named Farnborough Technical College, the college was opened in 1957 and soon after was incorporated into one body with the Royal Aircraft Establishment Technical School. Today, the college has campuses in Farnborough and Aldershot, is an accredited institution of the University of Surrey and has both an Emerging Technologies Centre and an Aerospace Research and Innovation Centre (opened 2021). The college has approximately 3,000 learners (young people and adult) and over 600 apprentices.

FCoT works in partnership with businesses, including those in the aviation supply chain, on both research and meeting local skills needs. Its research into the use of future aviation technologies and research on non-carbon emissions will both support the transition to net zero. Similarly, they are partnering with major aviation business, including Farnborough Airport, Gulfstream and Vistajet, to train young people to work with advanced materials and metal composites that will be used in future aircraft designs.

Research and innovation linked to Jet Zero (1/2)

The journey to net zero in aviation is a long term commitment and therefore a major focus for research and innovation (R&I). Earlier slides explained the scale and complexity of the national and international R&I landscape.

Within the EM3 area, there is evidence of significant R&I in activities and specialisms linked to jet zero.

Some of this is associated with the **University of Surrey** which is a major, research intensive, university (case study 6). It has significant relevant research specialisms, and a long history of collaborative research including in respect of sustainable fuels and advanced materials. In spring 2023, UKRI announced a £53 million investment in six research centres which will lead innovation towards a fully sustainable energy sector; the University of Surrey is involved in three of the six.

The University of Surrey also has a well-established infrastructure for translation and commercialisation – linked for example to **Surrey Research Park** and the activities associated with **SETSquared** (at **Surrey Technology Centre**, on Surrey Research Park).

Innovate UK has invested consistently in R&I projects in the EM3 area and some of these are linked to jet zero. Although precise definition and measurement is difficult. A full analysis is presented in Annex C.

Under our definition of jet zero-related funding, some **80 awards were made to organisations with addresses in the EM3 LEP area between 2003/04 and 2023/24** (as of June 2023). Of those, 75 have a known value – totaling £24.0 million. The two biggest awards accounted for 28% of the total. These were made to:

- **McLaren** (Woking) – with a project that focuses on the development of power electronics for electric vehicles; whilst this is not aviation-specific it ought to have application to net zero journeys in aviation
- **TISICS** (Rushmoor Borough, close to Farnborough Airport, and the spin-out from QinetiQ referenced earlier) – with a project to develop lightweight materials to improve aircraft efficiencies.

Research and innovation linked to Jet Zero (2/2)

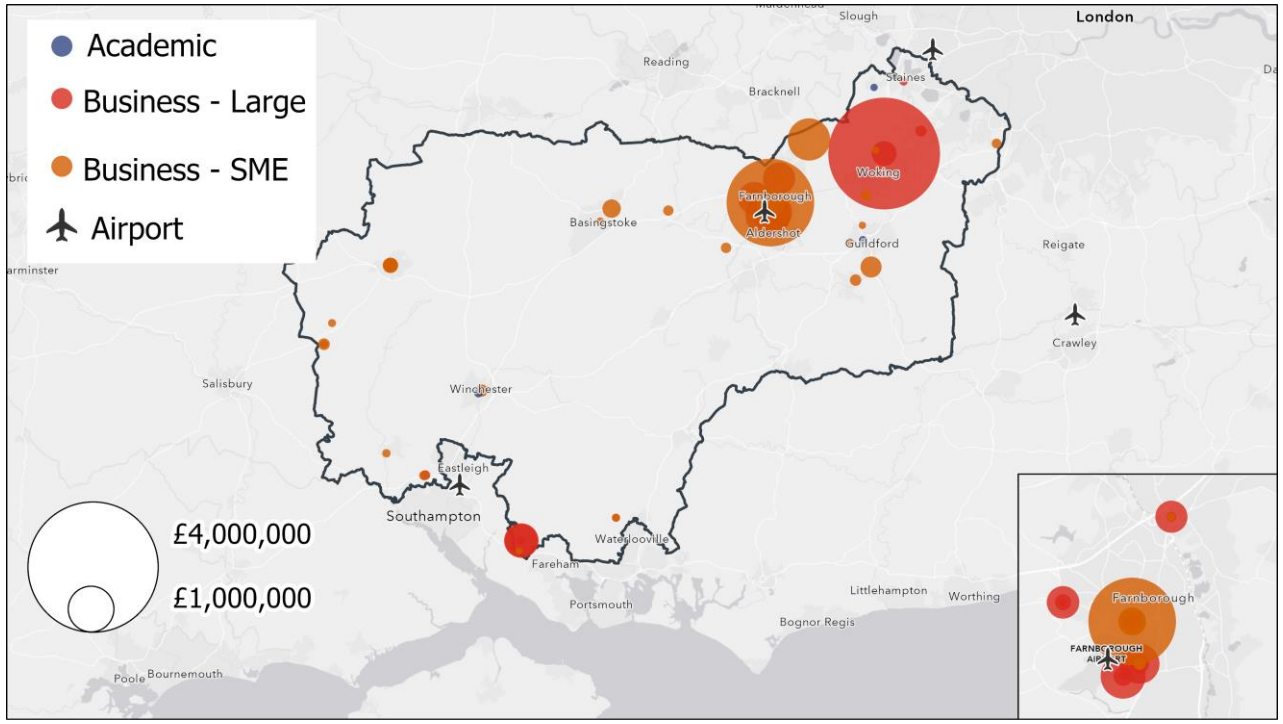
From the Innovate UK database, it is possible to map the distribution of jet-zero related innovation funding.

This shows a strong concentration in and around Farnborough airport (in Rushmoor borough) and also around Woking (linked in the main to McLaren).

The broad correlation between the distribution of jet zero businesses/organisations (from the earlier map) and jet zero innovation funding is clear.

At one level, it is also unsurprising, but it does suggest that there are clear research/innovation/business hubs across the EM3 area, consistent with the characteristics of an emerging cluster.

Spatial distribution of jet zero-related funding in the EM3 LEP area (based on Innovate UK data)



Source: Produced by SQW 2023. License 100030994. Contains OS data © Crown copyright [and database right] [2022]. Note: Data as of June 2023. Based on all jet zero-related funding since 2004. (see Annex C for definitions)

Research and innovation assets

Local universities (Surrey, Southampton and Portsmouth) all have research specialisms (see slide 73) across the whole spectrum of the Jet Zero ecosystem (i.e. creating more efficient aircraft and propulsion systems; creating lighter-weight aircraft and materials; and creating more sustainable transport systems).

All three universities have relationships with local businesses. There are many examples of local collaborations - for example the University of Surrey collaborates with the University of Southampton at the Rolls-Royce University Technology Centre).

Insight from the Knowledge Exchange Framework (KEF) 2023 shows that although they are in different clusters, the local universities rank highly in terms of sharing world-class knowledge and expertise with local communities, working with local businesses to deliver new ideas and products.

Knowledge Exchange Framework Rankings

	University of Surrey	University of Southampton	University of Portsmouth
Research Partnerships	Medium	High	High
Working with Business	Very high	Very high	High
Working with the Public and Third Sector	High	Very high	High
CPD & Grad Start-Ups	Low	High	High
IP and Commercialisation	Very high	Very high	Medium

Source: Knowledge Exchange Framework, Research England, 2023

Case Study 6 – University of Surrey

The University of Surrey is a public research university located in Guildford. It was established in 1966 but its roots go back to the Battersea Polytechnic Institute founded in the late 19th century.

The university's academic activities are divided into three faculties (Faculty of Arts and Social Sciences, Faculty of Engineering and Physical Sciences and Faculty of Health and Medical Sciences). In the 2022/23 academic year, there were around 11k undergraduate and 4k postgraduate students at the university.

The University of Surrey has several strands of research work relevant for the net zero transition in aviation. These include:

- sustainable aviation fuels (SAFs) in chemistry and chemical engineering
- battery technology
- advanced materials
- sustainable hydrogen production.

In addition, as work around jet zero technologies progresses, there is scope for bringing in researchers from the university's principal research areas such as artificial intelligence or tourism. The University of Surrey sees the jet zero agenda as a research opportunity with potential to bring in funding and industry partnerships.

With respect to hydrogen research in particular, the university engages in industry and research collaborations through its Thermo-Fluid Systems University Technology Centre, founded in 2003 with support from Rolls-Royce. It also collaborates with a second Rolls-Royce University Technology Centre at Southampton. The relationship with Rolls-Royce is seen as crucial due to its hydrogen combustion capabilities and specialist facilities as a jet engine manufacturer. The University of Surrey is part of the UK National Hub for Research Challenges in Hydrogen and Alternative Liquid Fuel (UK-HyRES) funded by UKRI.

Case Study 7 – University of Southampton

The University of Southampton is a public research university, one of the founding members of the Russell Group of universities and is ranked among the top 100 universities globally. The University's main campus is located just outside of the EM3 geography, but it works closely with local businesses and other collaborators, and Southampton Science Park is within the EM3 area.

There are many active research groups, including:

- Aerodynamics & Flight Mechanics Group – undertakes research in aerodynamics and mechanics of flight whereby technological advancements can benefit academia, industry and society.
- Astronautics Group – undertakes a range of fundamental and applied research in space physics and spacecraft engineering.
- Electrical Power Engineering – researches electrical technologies with a focus on efficient power transmission, satellite technology and renewable power generation.
- Engineering Materials & Surface Engineering – works to develop enhanced materials performance and improved designs.
- Transportation Group – undertakes research to help to secure sustainable transport for the UK and globally, including in the aviation sector.

The University of Southampton has specialisms which are relevant to the net zero transition in the aviation sector. These include:

- The Institute of Sound and Vibration Research at the University of Southampton plays host to the Rolls-Royce University Technology Centre (UTC) in Propulsion Systems Noise. The UTC consists of 20 members and undertakes a programme of research in aeroacoustics focusing on developing and improving noise technology, products and processes of application to current and future aircraft engines.
- The University has specialisms in hydrogen fuelling and the technologies associated with this. It is currently undertaking research projects examining the how hydrogen fuel can be used more efficiently.

3: Benchmarking the EM3 area in relation to jet zero activities

Why comparative perspectives are important

Section 2 showed that within the EM3 LEP geography, there are signs of activity that are consistent with the emergence of a cluster linked to the journey to net zero in aviation.

However the analysis had no benchmarks and there was nothing to indicate whether the activity observed locally is, in any sense, distinctive. Is it the case that many other local areas are seeing a similar pattern of activity, or are we seeing something special in the EM3 area, even if it is 'early days'? These are important questions for the LEP and its partners as it looks ahead.

Our methodology and data sources are not ideal in seeking comparative perspectives – mainly because the glass.ai analysis was largely bespoke. However we have generated some insights which are helpful.

Comparative perspectives: (1) industrial structure

The table opposite compares the headline data for the EM3 area with those for three other LEP areas and for the UK.

On the left, data from glass.ai show that the incidence of businesses/ organisations linked to jet zero is high in the EM3 area (compared to the UK average): there are 3.1 times more businesses/organisations locally than we would expect if it mirrored the national picture.

	glass.ai estimate				Official Statistics (ONS) UK Business Count & BRES Data			
	Businesses/organisations currently linked to 'jet zero' and its sub-divisions		Total Aviation, Aerospace & Defence Sector		Aviation manufacturing & air transport activity			
	No. of busi.	LQ	No. of busi.	LQ	No. of busi.	Business LQ	No. of employ	Employ. LQ
EM3 LEP	**138**	**3.1**	**433**	**3.5**	**125**	**1.3**	**2,285**	**0.6**
Derby, Derbyshire, Nottingham and Notts. LEP (D2N2)	105	3.1	261	2.8	80	0.9	11,025	2.1
Leicester and Leicestershire LEP	62	3.4	144	2.9	50	0.9	2,450	0.9
West of England LEP (includes Bristol & Bath)	73	1.2	162	1.0	60	1.0	9,400	2.8
United Kingdom	1,473	1.0	4,008	1.0	3,270	1.0	165k	1.0

At a LEP level, it is similar to Derby, Derbyshire, Nottingham and Nottinghamshire (D2N2) and Leicester and Leicestershire LEP areas, and almost three times higher than in the West of England.

The data on the right of the graphic are estimates of employment and they have been generated from ONS datasets. These are not a precise measure of jet zero activity, but they are a proxy. These data suggest that the EM3 area has relatively little associated employment – and relatively much less than in the D2N2 and West of England LEP areas.

Comparative perspectives: (2) Innovate UK investment

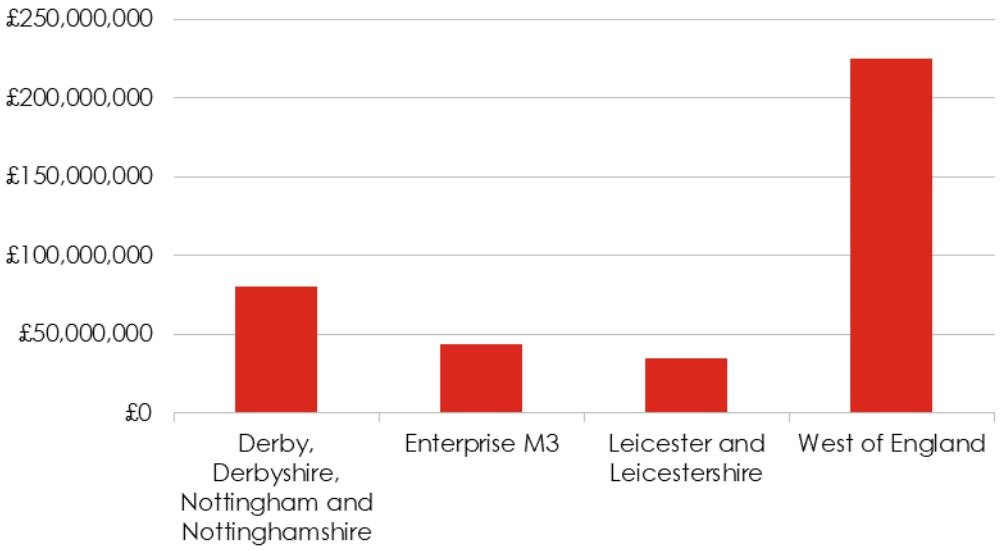
Since 2004, IUK has awarded a total of £44.3 million in aviation-related funding to organisations with addresses in the EM3 LEP area. Of this, £24.0 million (54%) has been on activities related to jet zero.

The chart opposite shows total aviation-related funding in the EM3 LEP area (£44.3m) alongside that for D2N2, Leicester and Leicestershire, and West of England. The real outlier is the West of England, which has accounted for over £220m of funding (albeit a large proportion is linked to the National Composites Centre, which is essentially a national facility).

The different LEP areas obviously differ in scale. However, on a simple weighted measure (IUK investment in aviation-related activity per local enterprise) the differences are greater again. On this weighted measure, investment in the West of England appears to be over eight times greater than in the EM3 area.

In the period from 2004 to 2023, the mean value of jet zero-related IUK awards in the EM3 LEP area was £320k. This was below the average across all IUK-funded areas (£609k). While in the last few years (since 2018/19), awards across EM3 have increased on average (mean award value of £380k), the LEP area has remained below the overall IUK average of £686k (for jet zero-related funding).

Innovate UK's aviation-related funding to organisations with addresses in four LEP areas in the period since 2004



Note: aviation-related funding per local enterprise is based on the number of enterprises in 2022 (UK Business Count data)

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4: Conclusions and implications

Conclusions

Overall, there is **some evidence of an emerging cluster** of activity linked to the transition to net zero aviation within the geography of EM3 LEP.

The evidence points to a nascent cluster that is likely to be distinctive because of:

- the relatively high incidence of SMEs that seem to be engaged in activities linked to jet zero – albeit there are some important major businesses too
- the evidence of spin-off activity in relevant fields – suggesting that new, innovation intensive, businesses are being created locally
- the potential of Farnborough Airport and Farnborough International Airshow as key wider catalysts
- the established role of Farnborough Aerospace Consortium which is a key player locally and is increasingly turning its attention to jet zero.

The emerging cluster seems to be founded on the underlying strengths of the EM3 area, particularly its strong local labour market (with good workforce skills) and its own heritage and pedigree in relation to processes of enterprise.

The importance of the University of Surrey must also be recognised – in terms of the research it conducts, the graduates it produces (some of whom are retained locally) and the innovation infrastructure it has created.

The strengths of the wider region – extending from Solent to Oxfordshire and London (including Heathrow Airport) – are also important, particularly in terms of the wider labour market.

The cluster is certainly nascent and, in some respects, it is currently quite fragile:

- one of the key themes from consultations and workshops surrounded its fragmented character: jet zero is a huge endeavour and there is currently limited knowledge of other businesses/organisations that are active locally (despite the good work of FAC)
- in terms of innovation funding, it is perhaps underpowered and – relative to elsewhere – the limited role of the Original Equipment Manufacturers (OEMs) and aerospace industry primes is probably a factor
- as in other sectors/clusters, there is competition for talent – even in the context of a deep local labour market

Implications

The journey to net zero in aviation is an important opportunity for EM3 LEP – and for the Hampshire/Surrey area more generally.

It is not an easy opportunity – and there are significant long term risks linked to it – but there are assets on which to build. The potential 'prize' is clearly a substantial one – albeit it is a very competitive environment and other local areas in the UK and internationally will also recognise the possibilities.

For the EM3 area, the **focus needs to be on some combination of enterprise linked to international profile and positioning**:

- the nascent jet zero cluster is dominated by SMEs, meaning that it is a very different proposition from that elsewhere (in the context of, in particular, an aerospace sector which is driven by major global companies)
- the EM3 area has considerable locational advantages, particularly in terms of proximity to a global city and one of the busiest hub airports in the world
- the EM3 area is underpinned by a very effective ecosystem for enterprise and innovation more generally.

Various steps could be taken to strengthen the nascent cluster. These might include:

- **networking activities**, perhaps building on the work of FAC with a particular focus on jet zero and broadening the reach from aerospace to associated activities within the wider value chain
- using Farnborough **International Airshow as a key window** on the emerging cluster, and promoting opportunities within it…
- …whilst also using some combination of the Airshow and Airport to **animate a wider national (and international) conversation** in terms of the opportunities/challenges surrounding the jet zero journey
- securing a facility that **will encourage enterprise and innovation across the breadth of jet zero (and not simply aerospace)**: this would need to be a national project, not a purely local one, but there may be real opportunities.

ANNEXES:

Annex A – glass.ai data
Annex B – Innovate UK data
Annex C – Local Skills Provision
Annex D – Consultation evidence

Annex A: glass.ai – Method and headlines

glass.ai Methodology Note

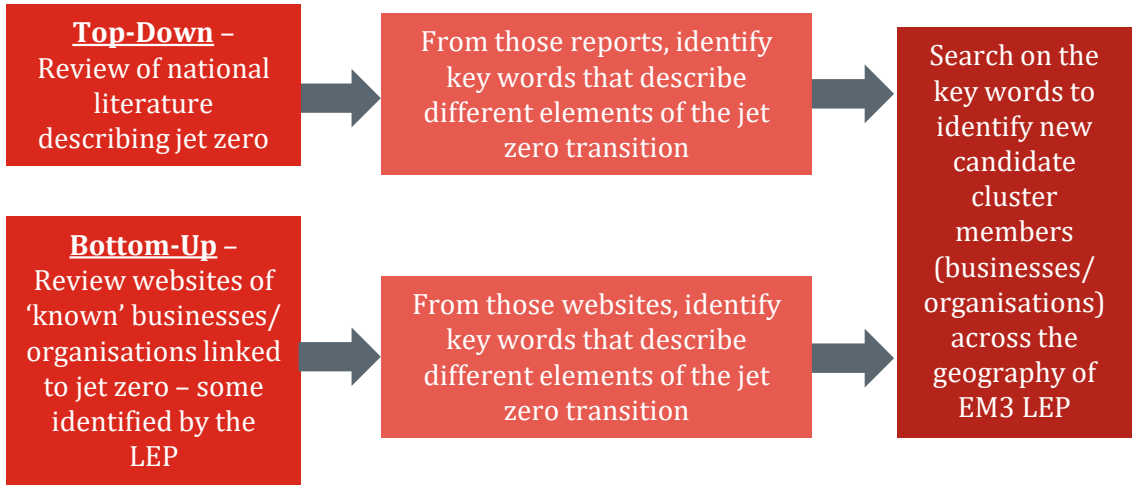
To obtain information about businesses, sectors and people, the glass.ai crawler collates and analyses data only from the open web; this includes from company websites, news & blogs, social media, official data sources and academic papers.

glass.ai has an ongoing discovery process that reads websites and classifies the site as a company website if it detects certain criteria around content (e.g. active, in English, business content) and if possible, will predict the sector and geography of the business if enough content is available on the site (e.g. a UK address). Currently glass.ai reads over 2 million UK based business websites, representing around 90% of all organisations with a web presence. This represents a significant proportion of UK businesses with a web presence.

To make this possible, glass.ai has invented AI technology that combines language understanding through semantic analysis with resource crawling at scale and the maintenance of a deep topic ontology.

However, not all UK businesses have a website, so our approach is limited to those that have an independent web presence. This may impact the representation of smaller organisations (incl. freelancers) as they are less likely to have a website than larger organisations.

To identify businesses within the Jet Zero clusters in the EM3 geography, glass.ai has identified a series of key words associated with the Jet Zero sector (as shown on the next page). These were identified through the following process:



Key Words used by glass.ai to identify businesses in Jet Zero sector

Advanced Composite Technologies	Airport Arrivals Management	Aviation Decarbonisation	Clean Skies For Tomorrow	Flightpath To The Future	Hybrid-Hydrogen Aircraft	Jet Zero Regulation	Net Zero Aviation Transition	Saf Blends	Uk Aerospace Technology Strategy
Advanced Composites	Airport Carbon Accreditation	Aviation Development	CO2	Fly zero	Hydrazine	Jet Zero Research	Net Zero Emission Aviation	SAF Certification	Ultra-Efficient Aircraft
Advanced Flight Control Systems	Airport Carbon Offsetting	Aviation Efficiencies	Composite Aircraft Materials	Flyzero	Hydrocarbon Reformation	Jet Zero Skills	Net Zero Emissions	Saf Development	Uncrewed Air Systems
Advanced Flight Navigation Systems	Airport Development	Aviation Emission Data	Composite Aviation Materials	Free Route Airspace	Hydrogen Aircraft	Jet Zero Strategy	Net Zero Flying	SAF Feedstock	Vapour trails
Advanced Fuels	Airport Emission Monitoring	Aviation Emission Monitoring	Composite Hybrid	Fuel Certification	Hydrogen Aviation	Jet Zero Transition	Net Zero Transportation	SAF Fuel	Waste Reduction
Advanced Metals	Airport Energy	Aviation Emissions	Composite Pressure Pipe	Fuel Efficiency	Hydrogen Carrier Fuel Conversion	Kerosene	Next Generation Aircraft	Saf Industry	Weight Reduction
Aero Gas Turbine	Airport Gate Electrification	Aviation Fuel	Composite Solutions	Fuel Efficiency Management	Hydrogen Combustion	Lightweight Aircraft	Nitrous Oxide Emissions	Saf Pathway	Wing Of Tomorrow
Aerodynamic Improvements	Airport Greenhouse Gas Removals	Aviation Fuel Consumption	Composite Technologies	Fuel Testing	Hydrogen Combustion Propulsion	Lightweight Aircraft Materials	Non CO2 Aviation Impacts	Saf Plant	Zero Emission Aircraft
Aerodynamics	Airport Infrastructure	Aviation Fuel Mix	Contrails	Fuel-Efficient Aircraft	Hydrogen Flight	Lightweight Materials	Non CO2 Aviation Research	Saf Production	Zero Emission Aircraft Technologies
Aeronautical Engineering	Airport Operations	Aviation Fuel Testing	Domestic Aviation Emissions	Future Aviation Skills	Hydrogen Fuel Cell	Liquid Hydrogen	Non-Co 2 Impact	SAF Production Energy	Zero Emission Airport Target
Aeronautics	Airport Renewable Energy	Aviation Greenhouse Gas Emissions	Effective Aircraft Maintenance	Future Of Flight Plan	Hydrogen Fuel Distribution	Low Carbon Aviation	Non-Co2	Saf Projects	Zero Emission Aviation
Aerospace Composites	Airport Sustainability	Aviation Greenhouse Gas Removals	Electric Aircraft	Future Transport System	Hydrogen Fuel Infrastructure	Low Carbon Fuels	Non-Co2 Emissions	Saf Sector	Zero Emission Flight
Aerospace Technology	Airspace Congestion Management	Aviation Impacts	Electric Airport Vehicles	Future-Proof Aviation	Hydrogen Hybrid	Maritime Air Operations	Onboard Hydrogen Fuel Cells	SAF Testing	Zero Emission Flight Infrastructure (Zefi)
Aircraft Battery	Airspace Management	Aviation Innovation	Electric Jet	Ga Operations	Hydrogen Innovation	Markets	Passenger Emissions	Saf Uptake	Zero Emission Propulsion
Aircraft Charging	Airspace Modernisation	Aviation Policy	Electric Motor	General Aviation	Hydrogen Power	Methane Emissions	Performance Based Navigation	Saf Use	Zero Emission Routes
Aircraft Control Systems	Airspace Route Optimisation	Aviation Regulation	Electric Propulsion	Global Aviation Emissions	Hydrogen Pressure Vessel	Methanol	Power to Liquid	Scope 3 Emissions	Zero Emission Technology
Aircraft Efficiency	Airspace Systemisation	Aviation Renewable Energy	Electric Taxiing	Global Aviation Warming	Hydrogen Tanks	Methanol Synthesis	Project Fresson	Soot Reduction	Zero-Carbon Emission Aircraft
Aircraft Emission Data	All-Electric Aircraft	Aviation Skills	Emission Reduction	Green Composites	Hydrogen-Powered Aircraft	Microplastics	Propulsion	Spaceflight	Zeroavia
Aircraft Emission Monitoring	All-Electric Plane	Aviation Software	Emission Removal	Green Fuel	Jet A Alternative	Military Aviation	PtL	Speciality Gases	Zeroe
Aircraft Maintenance	Alternative Fuels	Aviation Strategy	Emissions Trading System	Green Gas Catalyst	Jet Fuel	Military Aviation Emissions	Radiative Forcing Index	Super Catalysts	
Aircraft Materials	Arrivals Management	Aviation Technology	Environmental Impact	Green Skies	Jet Fuel Consumption	Mission Management	Rcfs	Sustainable Airport Transit	
Aircraft Navigation Systems	Aviation Battery	Biogas Upgrading	Environmental Solutions	Greenhouse Gas Removal	Jet Zero	Mtco 2E	Recycled Carbon Fuels	Sustainable Airport Transport	
Aircraft Performance Development	Aviation Biofuels	Biorefinery	Ets Cap	Greenhouse Gas Removal Methods	Jet Zero Delivery	Negative Emissions	Removals	Sustainable Aviation Fuel (Saf)	
Aircraft Performance Improvement	Aviation Carbon Neutrality	Breakthrough Energy Catalyst	Exhaust Emissions	Ground Infrastructure	Jet Zero Investment	Net Zero	Renewable Feedstock	Sustainable Aviation Fuel Feedstock	
Aircraft Software	Aviation Carbon Offsetting	Carbon	Flexible Airspace	Hybrid Electric Aircraft	Jet Zero Investment Flightpath	Net Zero Aviation	Renewable Transport Fuel Obligation (Rtfo)	Syn Gas Upgrading Unit	
Aircraft Taxiing	Aviation Carbon Reduction	Carbon Dioxide	Flight Emissions	Hybrid Fuel Cell	Jet Zero Policy	Net Zero Aviation Impact	Revolutionary Aircraft	Synthetic Fuel	
Aircraft Technology	Aviation Carbon Removal	Carbon Reduction	Flight Operations	Hybrid-Electric Propulsion System	Jet Zero R&D	Net Zero Aviation Strategy	Saf	Tailpipe Emissions	

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Limitations of the glass.ai Approach

There are some considerations that should be observed when interpreting and using the data:

- The presentation of results within the glass.ai dataset will deviate from those captured in official statistics or surveys. This is linked to a number of factors, including the known limitations of ONS datasets, which offer restricted disclosure of economic activity (based on business size, reporting thresholds, focusing on main site operation and an inability to differentiate between headquarters and local trading locations).
- The nature of material on the open web is highly dynamic and constantly changing. While the crawl represents a real-time view of the sub-regional business base and associated activities, it is a snapshot in time, which may change. Given the methodology used, this web-crawl will not pick up business activity which does not have a web presence.
- The matching of results to a local authority is based on postcodes, to support spatial analysis. In some cases, the crawl may have collected partial addresses for the business only, so these have not been matched to a local authority, although the location is confirmed as being within the sub-region.
- Sector tagging is linked to only those businesses who were identified through the web crawl. As such, some companies may be missed due to the way they describe themselves or due to a lack of a web presence entirely. There is likely to be variation across these too, based on our experience of delivering focused sector studies. Factors determining this will be the relative size of business within the sector and the extent to which certain activities are governed by security considerations, thus activities are deliberately clandestine in nature.
- The employment numbers are estimates of total UK jobs based on the employees in the organisations listed on LinkedIn and provide an alternate view of business headcount using real-time information. They can be used to augment other datasets or in isolation – however they are directional values, that could be deconstructed further if needed (i.e. to look at employment directly attributable to localised geographies).

Explainer on Number of Businesses

- glass.ai uncovered 138 businesses in the level one taxonomy (a), and 295 businesses in (b) in the EM3 LEP geography. The 295 businesses are in addition to the 138 businesses who are undertaking activities within the Jet Zero sector
- glass.ai then attempted to match all of these businesses to Linkedin and Companies House records (where this is possible) to give more data relating to skills, roles and company size (LinkedIn) and incorporation date and SIC code (Companies House).
- From the total pool of businesses (433), glass.ai was able to match 320 businesses to a Companies House record and 394 business to a LinkedIn account. Data relating to employees, incorporation dates and labour market characteristics are available for those businesses for which a match could be made to LinkedIn/Companies House data. This means that estimates of the total number of businesses varies, according to the inducator.
- In the slides that follow, further explanation is provided at the bottom of each chart, including the total sample size available for analysis.

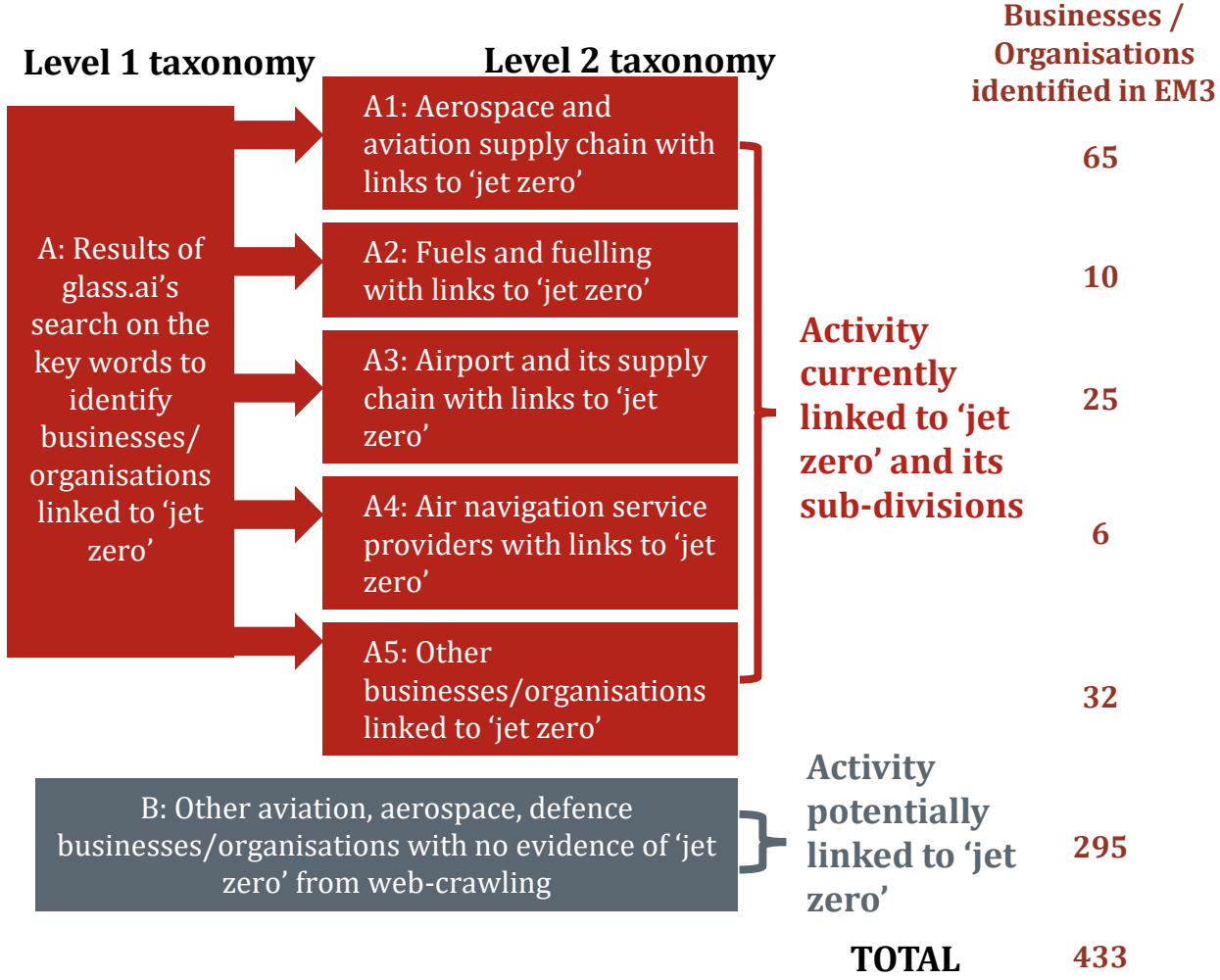
Current business activity in EM3: Insights from glass.ai

To obtain information about businesses, sectors and people, **glass.ai** undertook a web-crawling exercise to collate and analyse data from the open web, including company websites, news & blogs, social media, official data sources and academic papers. A full explanation of the methodology – and its limitations – is provided in the Annex

The headlines from the glass.ai data are:

- **138 business/organisations** have been identified as being linked to the 'jet zero' sector within the EM3 geography.
- A further **295 businesses were identified across the aviation, aerospace and defence sector** – although for these, there was no evidence of 'jet zero' from the web-crawl exercise.

Cont. overleaf

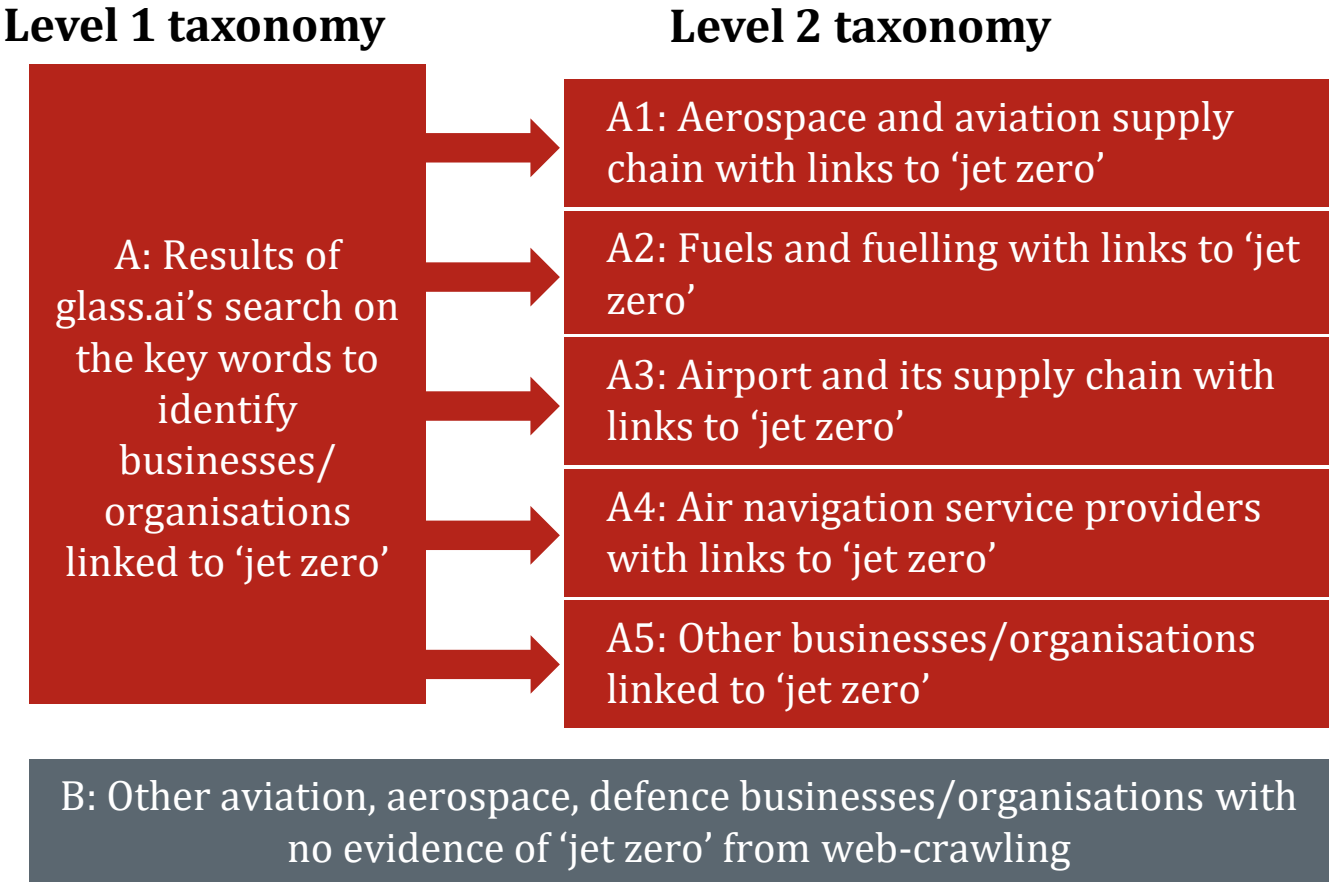


Current business activity in EM3: insights from glass.ai

- EM3 LEP area has a **high incidence of businesses/organisations** but a **low incidence of associated employment** (relative to comparator geographies – suggesting a **distinctive concentration of smaller enterprises/organisations**. Just over half of relevant businesses/organisations are micro (1-10 employees); eight (6%) have more than 200 staff locally.
- EM3 is home to a number of **internationally recognised businesses** undertaking Jet Zero activities, including Qinetiq, Thales, Boeing and Surrey Satellite Technology.
- '**Aerospace and aviation supply chain'** businesses / organisations account for 47% of total Jet Zero businesses/organisations in the EM3 LEP area, with the EM3 geography having just over **three-times** the national concentration of activity in this sub-sector.
- The **highest concentration of Jet Zero related activity is in Rushmoor**, accounting for 29 of the 138 businesses identified. Most of the businesses in Rushmoor are clustered around Farnborough Airport and are large in size. Based on LinkedIn data for these companies, it is estimated that Rushmoor accounts for half of all EM3's Jet Zero-related employment (c. 4,150 jobs identified).
- **Larger businesses** within the aviation, aerospace and defence sector have a **much higher tendency to be undertaking Jet Zero-related activity**. All of the businesses identified with more than 200 employees (in the EM3 geography) are already undertaking activity linked to Jet Zero, with many of those businesses between 51 and 200 employees also undertaking relevant activity. Smaller businesses (particularly micro businesses with 1-10 employees) **are much less likely to be undertaking activity linked to Jet Zero** (with only 36% of businesses of this size in the aviation, aerospace and defence sector undertaking activity linked to Jet Zero).

glass.ai – Data

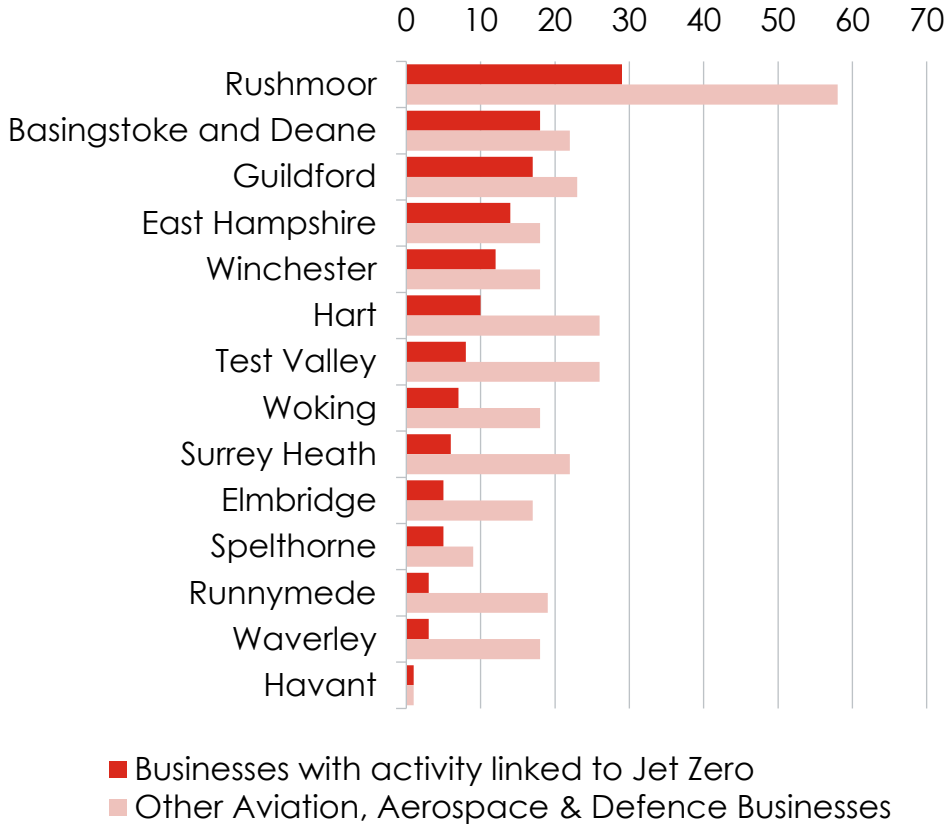
Jet Zero activity by sector



		Businesses / Organisations identified in EM3	Businesses / Organisations identified in UK
Activity currently linked to 'jet zero' and its sub-divisions	A1: Aerospace and aviation supply chain with links to 'jet zero'	65	785
	A2: Fuels and fuelling with links to 'jet zero'	10	184
	A3: Airport and its supply chain with links to 'jet zero'	25	120
	A4: Air navigation service providers with links to 'jet zero'	6	21
	A5: Other businesses/organisations linked to 'jet zero'	32	363
Activity potentially linked to 'jet zero'	B: Other aviation, aerospace, defence businesses/organisations with no evidence of 'jet zero' from web-crawling	295	2,535
TOTAL		433	4,008

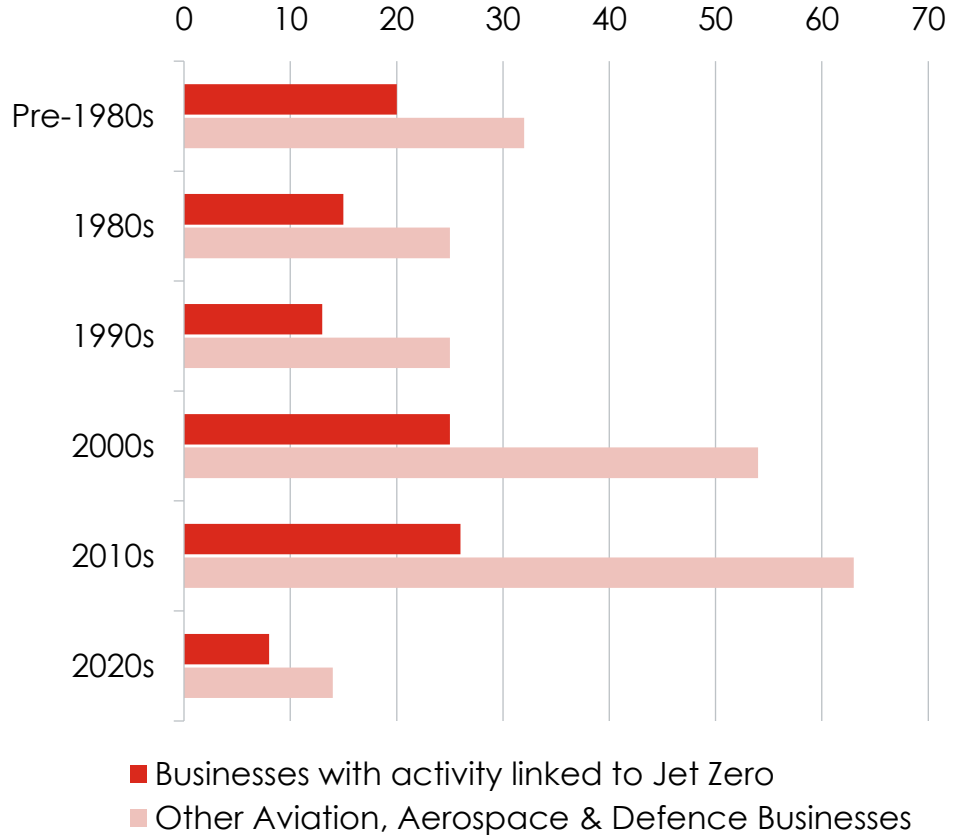
Jet Zero activity by Local Authority District & age of business

Number of businesses/organisations by Local Authority District



Note: based on full sample of 433 business identified by glass,ai

Year of Incorporation



Note: based on partial sample of 320 business identified by glass,ai who could be matched to a Companies House record

Source: glass.ai data and analysis undertaken by SQW

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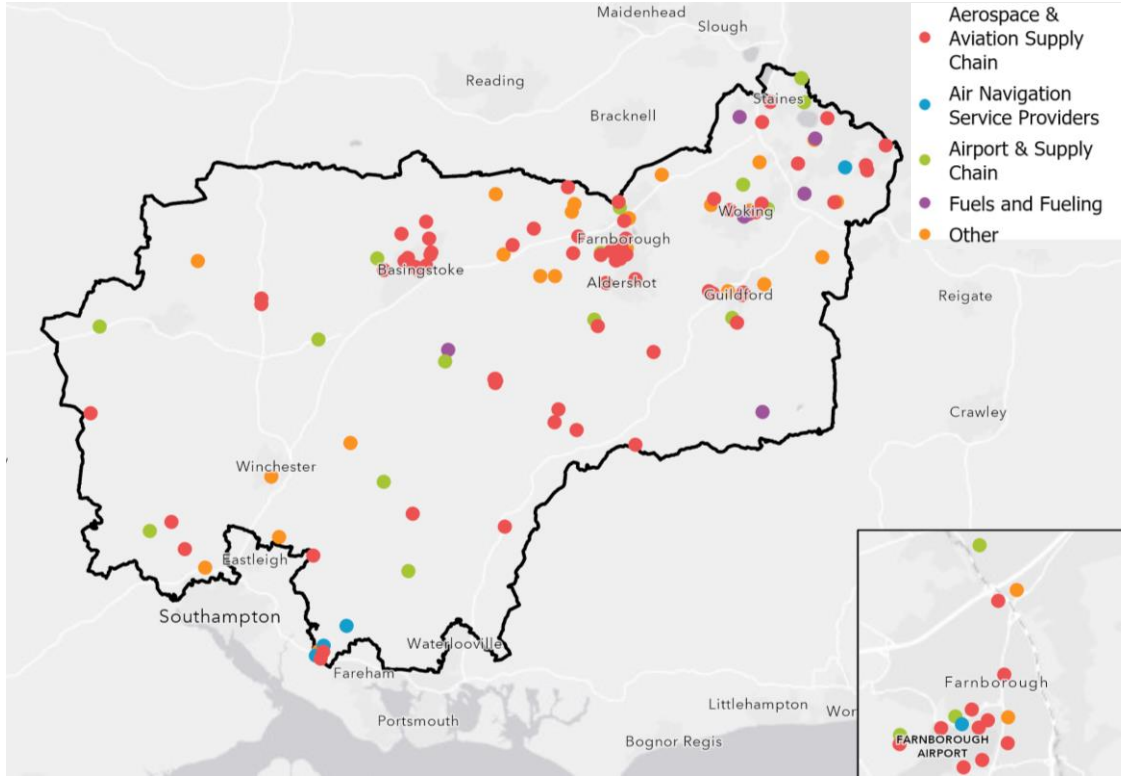
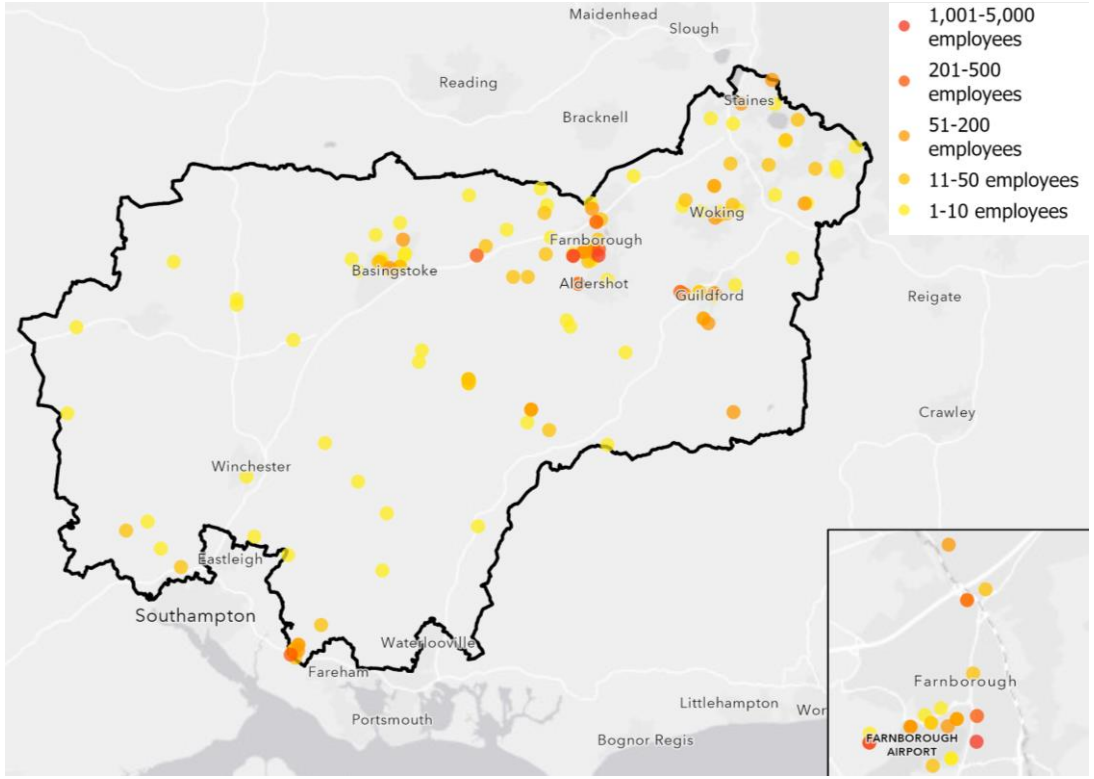
Jet Zero business activity across the EM3 LEP area

Location of Businesses with activity linked to Jet Zero by sub-sector



Location of Businesses with activity linked to Jet Zero by size of business



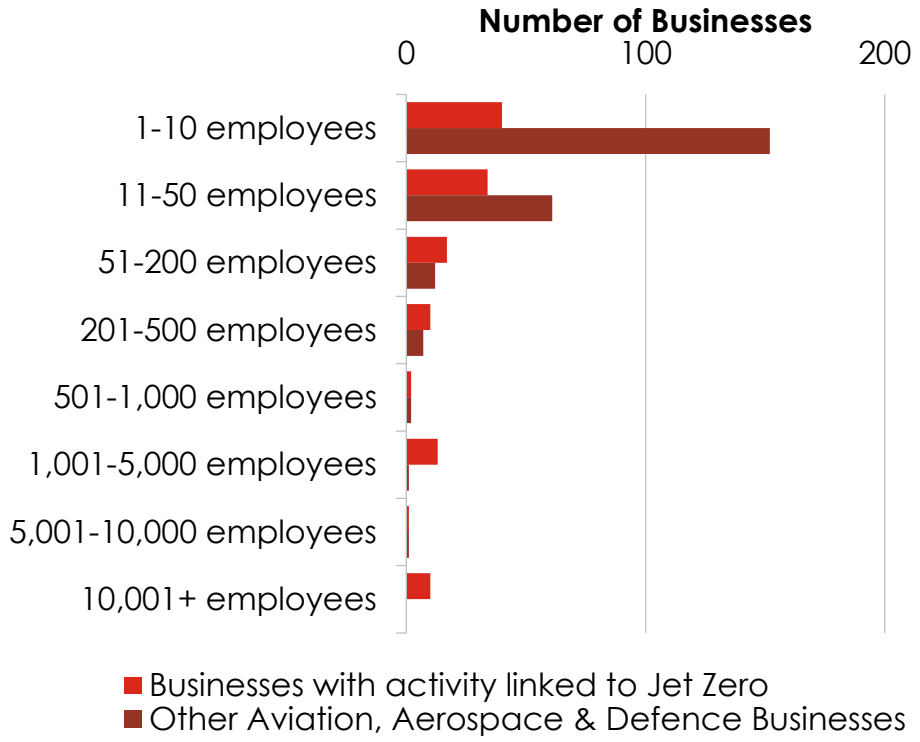
Source: Produced by SQW 2023 based on glass.ai data. License 100030994. Contains OS data © Crown copyright [and database right] [2022]. Note: based on sample of 158 business identified by glass,ai as having activity linked to Jet Zero

Jet Zero activity by business size

Size of Businesses in EM3 geography (based on LinkedIn data for global employment), by Jet Zero sub-sector

	1-10 employees	11-50 employees	51-200 employees	201-500 employees	1,001-5,000 employees	Total
Aerospace & Aviation Supply Chain	20	14	7	4	2	60
Airport & Supply Chain	7	9	2			23
Fuels and Fuelling	1	2	4			9
Air Navigation Service Providers	1	1	1	2		6
Other	11	8	3	4		29
Total	40	34	17	10	2	127

Size of Businesses in EM3 geography (based on LinkedIn data for global employment), by sector



Note: based on partial sample of 363 business (of which 127 are Jet-Zero related) identified by glass.ai who could be matched to a LinkedIn business account

Source: glass.ai data and analysis undertaken by SQW

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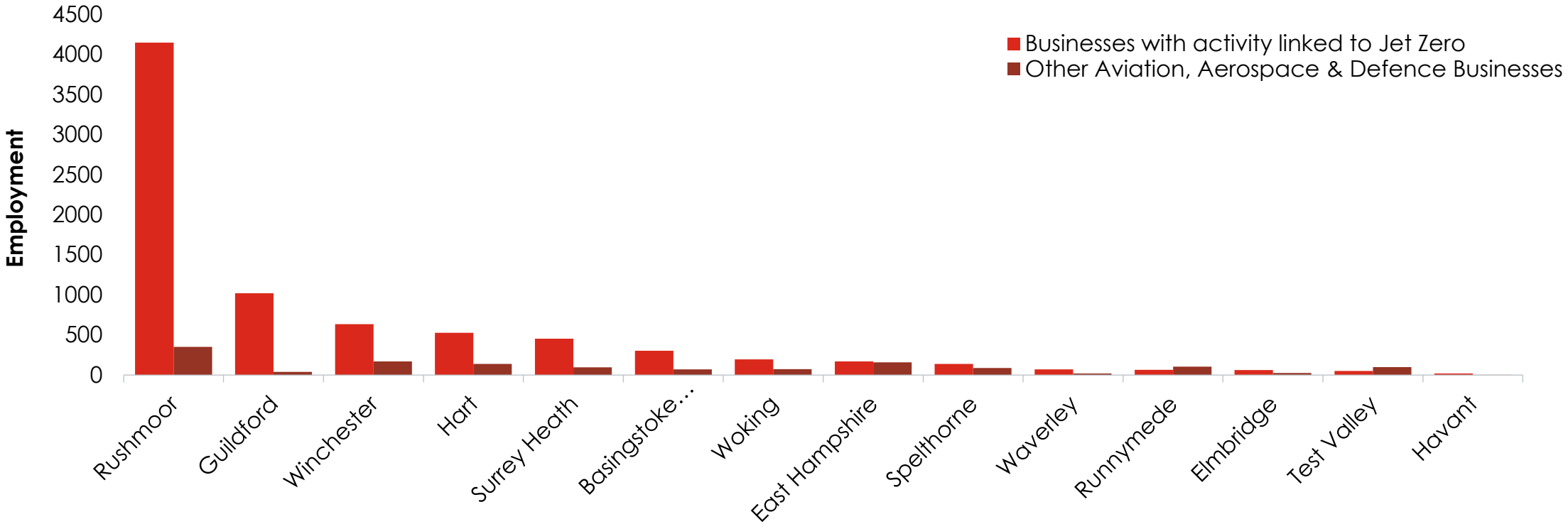
Jet Zero activity by number of employees & Local Authority District

Number of Employees (based on LinkedIn Data) by Local Authority District



Note: based on partial sample of 363 business (of which 127 are Jet-Zero related) identified by glass,ai who could be matched to a LinkedIn business account, Data shows only those employees located in EM3 geography, and not total employment for each business.

Source: glass.ai data and analysis undertaken by SQW

Largest Jet Zero businesses in the EM3 LEP area

Largest Businesses/organisations currently linked to 'jet zero' – based on employment in EM3

Business	Jet Zero Taxonomy	Number of Employees (on LinkedIn) in EM3	% of business' global employees in EM3
BAE Systems	Aerospace & Aviation Supply Chain	2,001	6%
Qinetiq	Aerospace & Aviation Supply Chain	1,007	21%
Serco	Other	425	1%
thales	Air Navigation Service Providers	395	1%
Boeing	Aerospace & Aviation Supply Chain	360	0%
Farnborough College of Technology	Other	281	82%
Surrey Satellite Technology	Aerospace & Aviation Supply Chain	275	64%
Dxc Technology	Airport & Supply Chain	269	0%
RSM UK Holdings	Other	259	5%
MMM LIVE	Airport & Supply Chain	163	0%
Boc	Fuels and Fueling	121	8%
Aquila Air Traffic Management Services	Air Navigation Service Providers	116	53%
Motorola Solutions	Aerospace & Aviation Supply Chain	105	1%
Galliford Try	Airport & Supply Chain	92	3%
Aeronautical Society	Other	91	19%
Gulfstream Aerospace	Aerospace & Aviation Supply Chain	87	1%
Dnata	Airport & Supply Chain	86	1%
Telent	Airport & Supply Chain	86	3%
Farnborough Airport (Holdings)	Airport & Supply Chain	80	81%

Note: based on partial sample of 363 business (of which 127 are Jet-Zero related) identified by glass,ai who could be matched to a LinkedIn business account

Source: glass.ai data and analysis undertaken by SQW

Largest Jet Zero businesses globally with presence in EM3 LEP area

Largest Businesses/organisations currently with a presence in EM3 linked to 'jet zero' – based on employment globally

Business	Jet Zero Taxonomy	Number of Employees Globally (on LinkedIn)	% of business' global employees in EM3
Boeing	Aerospace & Aviation Supply Chain	111,236	<1%
Thermo Fisher Scientific	Aerospace & Aviation Supply Chain	93,731	<1%
Dxc Technology	Airport & Supply Chain	87,767	<1%
thales	Air Navigation Service Providers	67,927	1%
MMM LIVE	Airport & Supply Chain	65,608	<1%
BAE Systems	Aerospace & Aviation Supply Chain	35,473	6%
Serco	Other	28,351	1%
Motorola Solutions	Aerospace & Aviation Supply Chain	20,103	1%
Dnata	Airport & Supply Chain	16,939	1%
Gulfstream Aerospace	Aerospace & Aviation Supply Chain	11,877	1%
Ifs	Aerospace & Aviation Supply Chain	7,154	1%
RSM UK Holdings	Other	4,755	5%
Qinetiq	Aerospace & Aviation Supply Chain	4,709	21%
Belcan	Aerospace & Aviation Supply Chain	4,428	<1%
Flightsafety International	Other	4,395	1%
Access Technology Group	Aerospace & Aviation Supply Chain	4,110	2%

Note: based on partial sample of 363 business (of which 127 are Jet-Zero related) identified by glass,ai who could be matched to a LinkedIn business account

Source: glass.ai data and analysis undertaken by SQW

Jet Zero activity comparison

	glass.ai estimate				Official Statistics (ONS) UK Business Count & BRES Data			
	Businesses/organisations currently linked to 'jet zero' and its sub-divisions		Total Aviation, Aerospace & Defence Sector		Aviation manufacturing & air transport activity			
	No. of busi.	LQ	No. of busi.	LQ	No. of busi.	Business LQ	No. of employ	Employ. LQ
EM3 LEP	**138**	**3.1**	**433**	**3.5**	**125**	**1.3**	**2,285**	**0.6**
Derby, Derbyshire, Nottingham and Notts. LEP (D2N2)	105	3.1	261	2.8	80	0.9	11,025	2.1
Leicester and Leicestershire LEP	62	3.4	144	2.9	50	0.9	2,450	0.9
West of England LEP (includes Bristol & Bath)	73	1.2	162	1.0	60	1.0	9,400	2.8
United Kingdom	1,473	1.0	4,008	1.0	3,270	1.0	165k	1.0

Source: glass.ai data and analysis undertaken by SQW

Jet Zero activity comparison

	Aerospace & Aviation Supply Chain		Airport & Supply Chain		Fuels and Fuelling		Air Navigation Service Providers		Other		Other Aero	
	No. of busi.	LQ	No. of busi.	LQ	No. of busi.	LQ	No. of busi.	LQ	No. of busi.	LQ	No. of busi.	LQ
EM3 LEP	**65**	**2.9**	**25**	**8.0**	**6**	**11.0**	**10**	**2.1**	**32**	**3.5**	**291**	**4.4**
Derby, Derbyshire, Nottingham and Notts. LEP (D2N2)	71	3.9	4	1.4	0	-	4	0.9	26	3.1	156	2.6
Leicester and Leicestershire LEP	24	1.2	3	2.0	1	3.8	19	8.3	15	3.3	82	2.6
West of England LEP (includes Bristol & Bath)	39	4.0	7	1.5	1	1.2	8	1.1	18	1.2	89	0.9
United Kingdom	785	1.0	120	1.0	21	1.0	184	1.0	363	1.0	2,535	1.0

Source: glass.ai data and analysis undertaken by SQW

Labour Market Characteristics

Most Commonly Referred to Skills by Employers working in EM3 Businesses/organisations currently linked to 'jet zero' (according to LinkedIn Data)

Skill on LinkedIn Profile	Number of Profiles
Aviation	605
Aircraft	548
Aerospace	515
Business Development	497
Sustainability	414
Financial Services	399
Electrics	370
Middle East	351
Supply Chain	257
Helicopters	243
Jets	241
Private Equity	222
North America	219
Human Resources	218
Computer Science	215
Climate Change	214
Project Management	213
Mechanical Engineering	210

Most Common Roles in EM3 Businesses/organisations currently linked to 'jet zero' (according to LinkedIn Data)

Job Role on LinkedIn Profile	Number of Profiles
Manager	2297
Engineer	1835
Director	565
Business	406
Systems	379
Engineering	297
Analyst	276
Technical	260
Consultant	258
Operations	258
Software	253
Design	214
Specialist	203
Sales	201
Quality	166
Mechanical	161
Controller	159

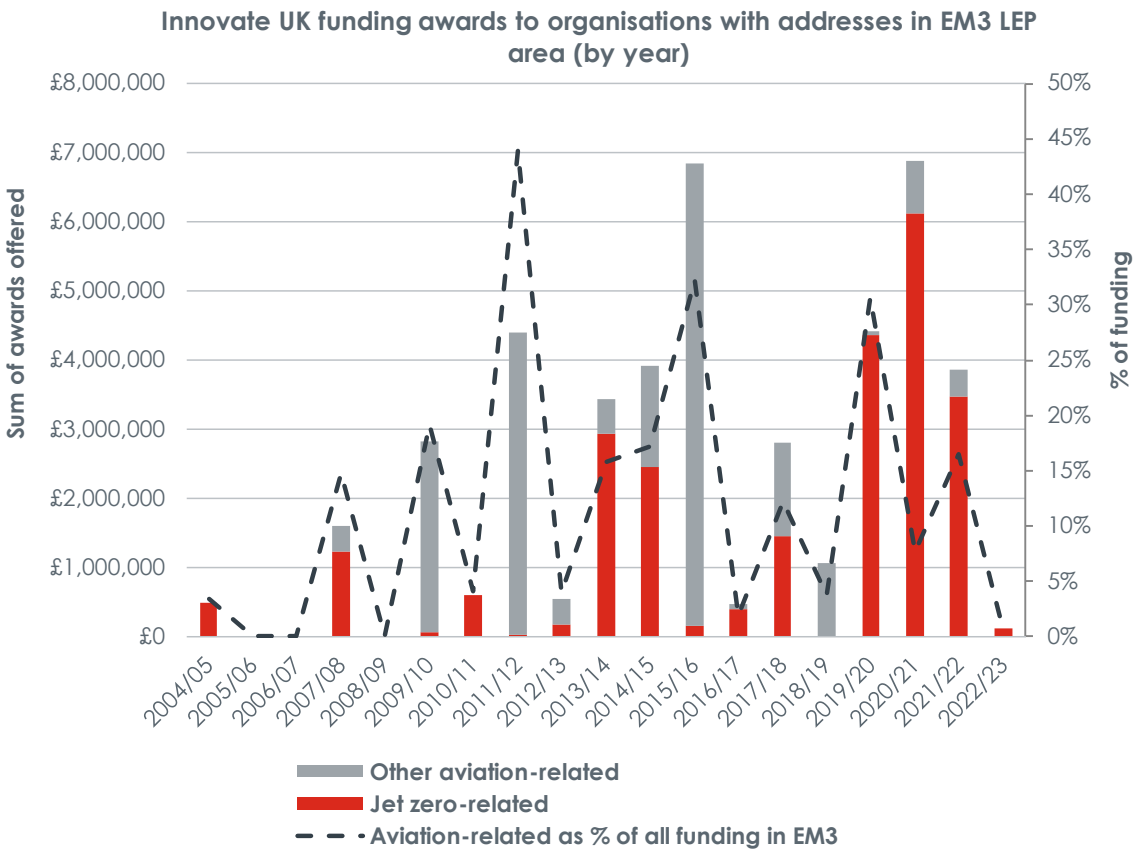
Note: based on partial sample of 337 business (of which 139 are Jet-Zero related) identified by glass,ai who could be matched to a LinkedIn business account

Source: glass.ai data and analysis undertaken by SQW

Annex B: Innovate UK Data

Current innovation activity in EM3 linked to Jet Zero

- **Innovate UK** (IUK) has major programmes focused on net zero – some cross sectoral (e.g. **Zero Emission Propulsion challenge**) and some focused on aviation (e.g. **Future Flight challenge**).
- Since 2004, IUK has awarded a total of **£44.3 million in aviation-related* funding** to organisations with addresses in the EM3 LEP area. Of this, **£24.0 million (54%) has been on activities related to jet zero***. In percentage terms, this is below the overall IUK average (where jet zero has accounted for 63% of aviation funding).
- However, **in recent years, most aviation-related funding has been on jet zero-related activities** (between 89% and 100% since 2019/20).
- **On average 11% of all IUK funding in the EM3 LEP area has been on aviation-related activities** since 2004 (compared to the average of 9% across all IUK-funded areas). There has been much year-on-year variation, with peaks in 2011/12 (44% of all funding), 2015/16 (32%) and 2019/20 (31%).
- The average proportion of IUK funding spent on jet zero-related activities has been the same in the EM3 LEP area as across all funded areas (6% since 2004).



Note: Data as of June 2023. In 2003/04 and 2023/24 there were no aviation-related funding awards in EM3 LEP area.

*Aviation-related and jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Aviation-related includes (any of): aviation, aerospace, airspace, airport
- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

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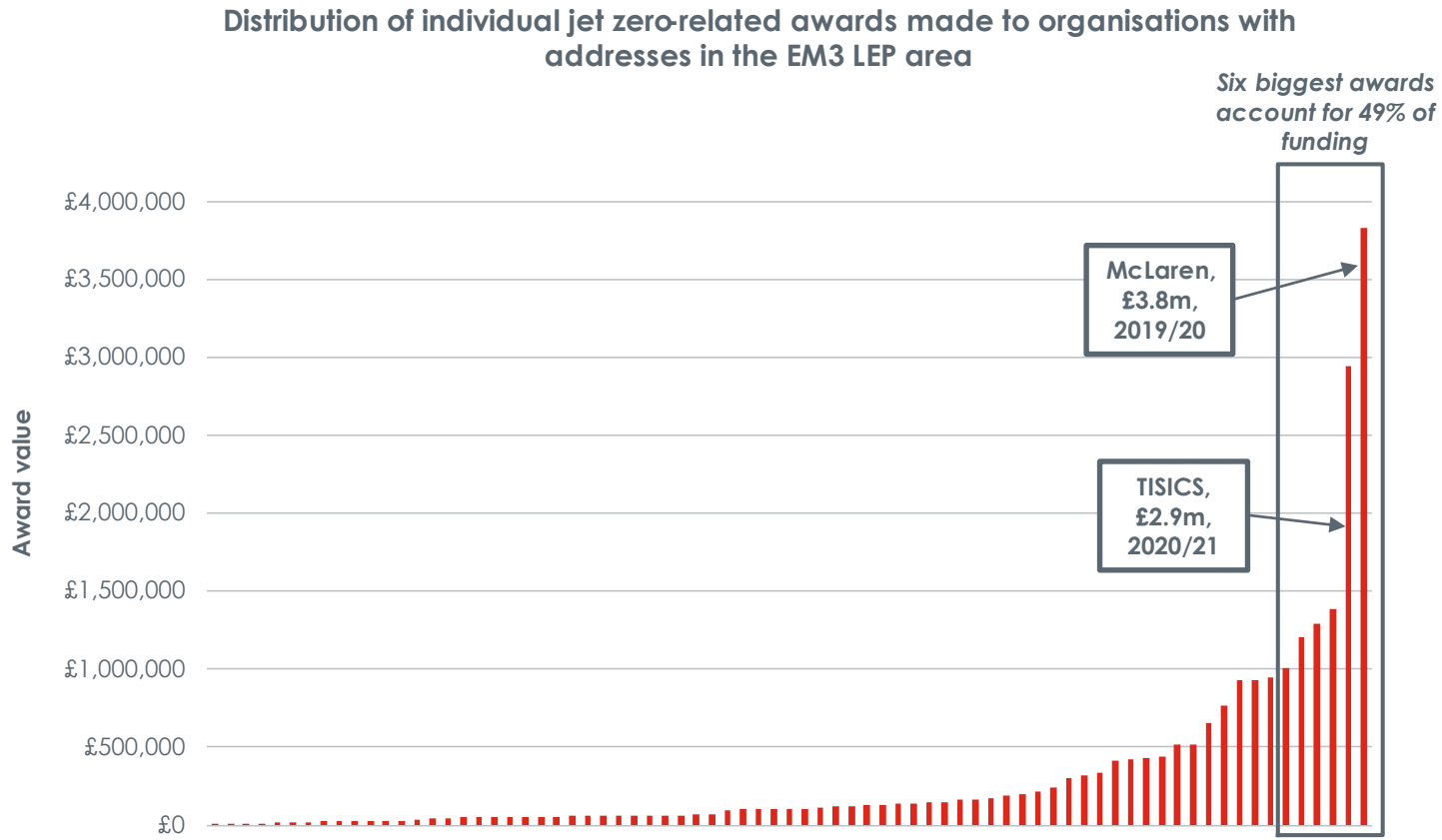
Current innovation activity in EM3 linked to Jet Zero

- In the period from 2004 to 2023, **the mean value of jet zero-related IUK awards in the EM3 LEP area was £320k**, **considerably below the average across all LEP areas (£609k).** While in the last few years (since 2018/19), awards across EM3 have increased on average (mean award value of £380k), the LEP area has remained below the overall IUK average of £686k (for jet zero-related funding).
- Over 2004 to 2023 (up to June), **individual jet zero-related IUK awards ranged from £3k to £3.8 million, with a median value of £101k**. Top funding recipients (by sum of awards over that period) included TISICS, McLaren, NATS, QinetiQ and BAE Systems. More recently (since 2018/19), companies such as MSC Software, Custom Interconnect or Trax International have also received jet zero-related funding exceeding £300k.
- **The distribution of jet zero-related IUK funding in EM3 was skewed towards businesses rather than academic, research or public sector organisations** (compared to the average jet zero funding distribution across all funded areas). Over 2004-2023, nearly 100% of funding was awarded to businesses, compared to 72% across all areas. This pattern remained consistent over time.
- Over 2004 to 2023, over half (54%) of jet zero-related IUK funding was awarded to large businesses, with 39% going to micro or small businesses and 6% to medium-sized businesses. However, **the percentage of funding awarded to large businesses decreased over time** – in the period from 2018/19, SMEs accounted for 50% of funding.
- Within the EM3 LEP area, **jet zero-related IUK funding has been concentrated in the districts/boroughs of Rushmoor and Woking**. Together, they accounted for two-thirds (67%) of funding over 2004-2023. This was largely driven by the group of aviation-related businesses around Farnborough Airport (in Rushmoor) and McLaren's headquarters in Woking.

*Aviation-related and jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:
- Aviation-related includes (any of): aviation, aerospace, airspace, airport
- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

Current innovation activity in EM3 linked to Jet Zero

- Under our definition of jet zero-related* funding, we have identified **80 awards made to organisations with addresses in the EM3 LEP area between 2003/04 and 2023/24** (as of June 2023). Of those, 75 have a known value – totaling £24.0 million.
- **The two biggest awards – made to McLaren (Woking) and TISICS (Rushmoor, around Farnborough Airport) – account for 28% of all funding.** The McLaren project, currently ongoing, focuses on the development of power electronics for electric vehicles and is not aviation-specific. The TISICS project developed lightweight materials to improve aircraft efficiencies.
- **There were six awards exceeding £1m** (made to McLaren, TISICS, BAE Systems, COREteQ Systems, QinetiQ and NATS). **Together they accounted for nearly half of all funding**. Three of those were located around Farnborough Airport.



*Aviation-related and jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Aviation-related includes (any of): aviation, aerospace, airspace, airport
- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

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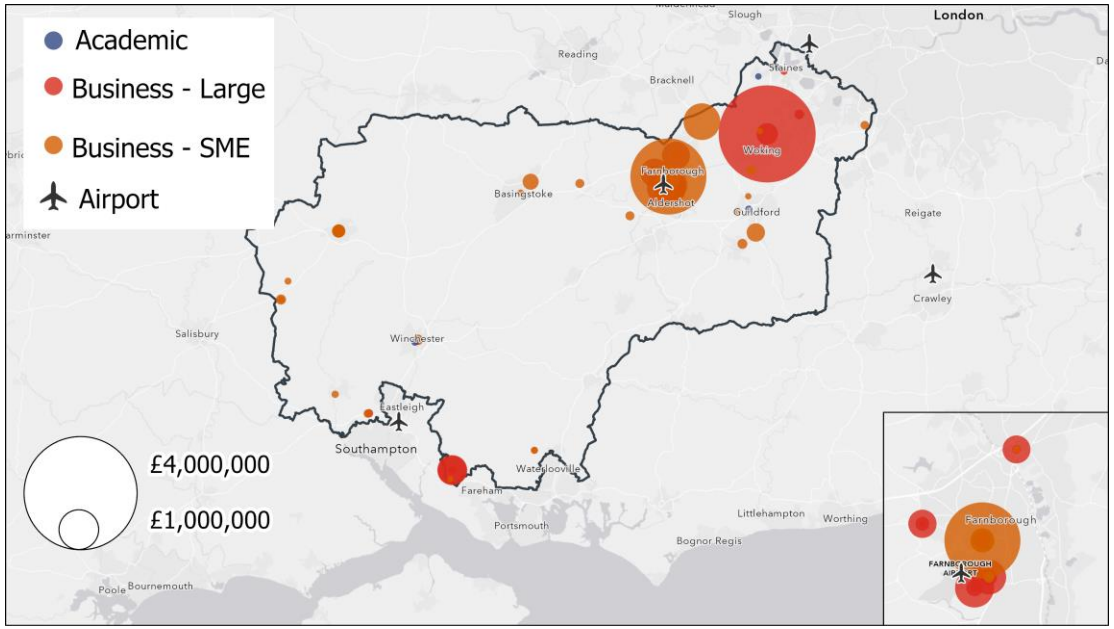
Current innovation activity in EM3 linked to Jet Zero

- **The 80 awards were made to 36 unique recipients.** There were four organisations which received more than three awards between 2003/04 and 2023/24 (as of June 2023): TISICS (19 awards), QinetiQ (7 awards), NATS (4 awards) and BAE Systems (4 awards). **The majority (21, or 58%) received one award**. Average award values (by organisation) varied from around £3k (J&B Hopkins) to £2.2m (McLaren).
- Of the 36 recipients, **five – TISICS, BAE Systems, QinetiQ, Saab and I6 Systems – were located in direct proximity to Farnborough Airport. Together they accounted for 42% of all funding (by value) and 45% of awards made (by number)** in the 20-year period. Funding was also concentrated in Woking but this was largely driven by one award of £3.2m made to McLaren.
- **Some of the awards identified as jet zero-related were aviation-specific, while others were more general in nature (but with applications in or benefits for aviation)**. Of the 80 awards, 35 (44%) mentioned the words 'lightweight', 'composite' or 'advanced materials' in the project description. Of those, 33 had a known value and totaled £10.8m (45% of funding). In comparison, 24 awards worth a total of £11.0m contained the word 'electric' and four awards (£3.8m) contained the word 'hydrogen'.

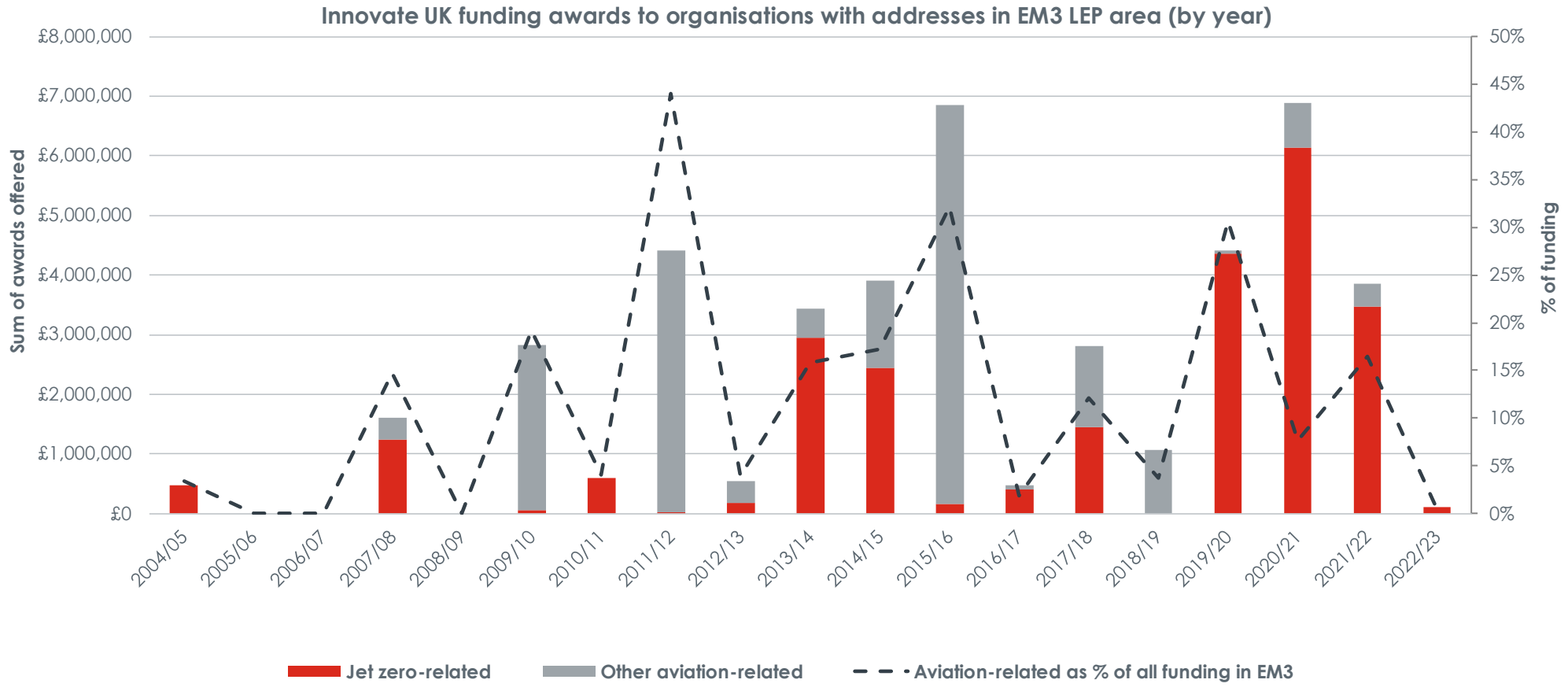
Geographical distribution of jet zero-related funding in EM3



Source: Produced by SQW 2023. License 100030994. Contains OS data © Crown copyright [and database right] [2022].
Note: Data as of June 2023. Based on all jet zero-related funding since 2004.

*Aviation-related and jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:
- Aviation-related includes (any of): aviation, aerospace, airspace, airport
- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

Innovate UK Data: distribution of aviation- and jet zero-related funding in the EM3 LEP area over time



Note: Data as of June 2023. In 2003/04 and 2023/24 there were no aviation-related funding awards in EM3 LEP area.

Aviation-related and jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Aviation-related includes (any of): aviation, aerospace, airspace, airport
- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

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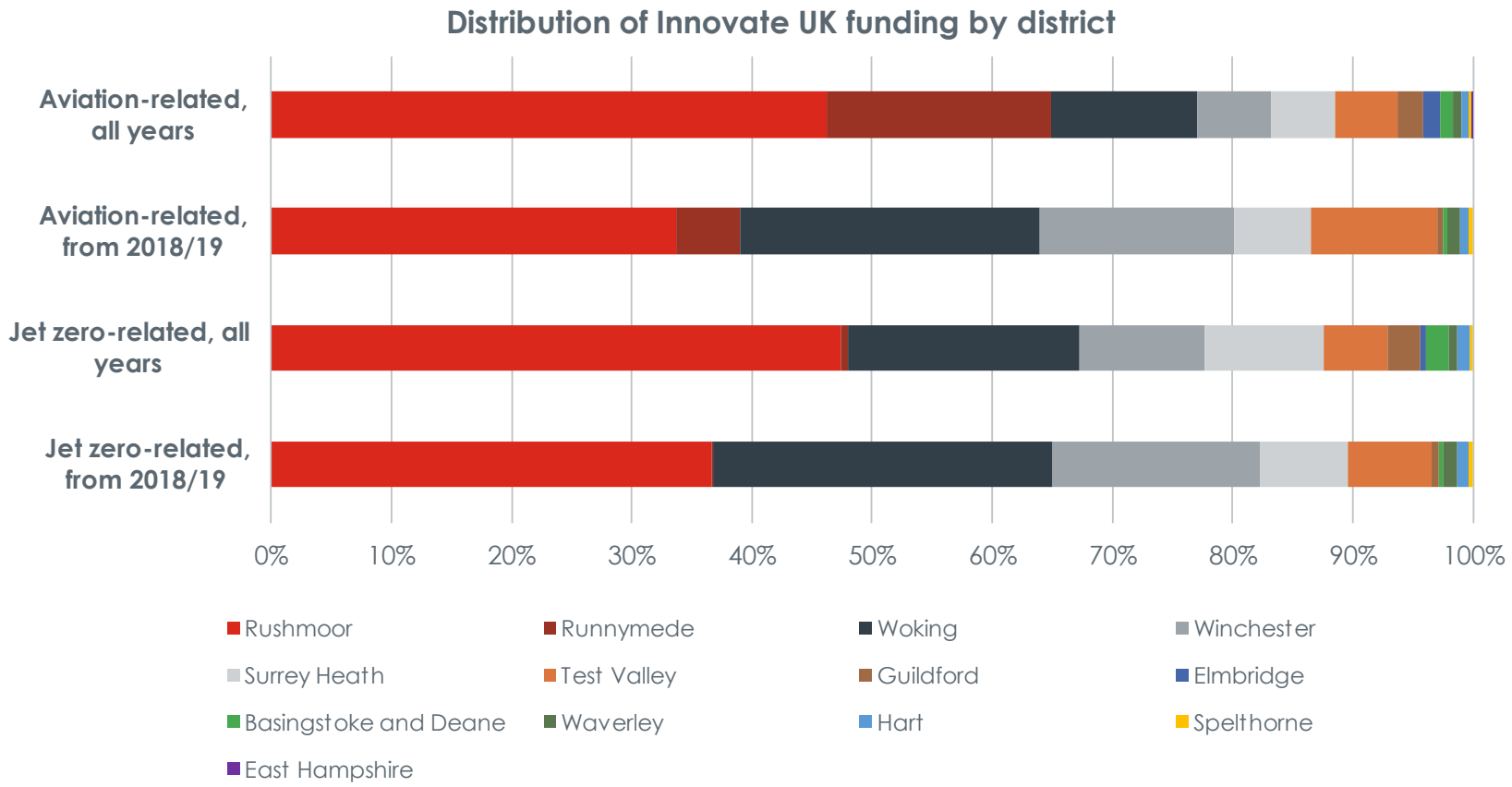
Innovate UK Data: distribution of aviation- and jet zero-related funding in the EM3 LEP area by district



Note: Data as of June 2023. 'All years' refers to the period from 2003/04.

Aviation-related and jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Aviation-related includes (any of): aviation, aerospace, airspace, airport
- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

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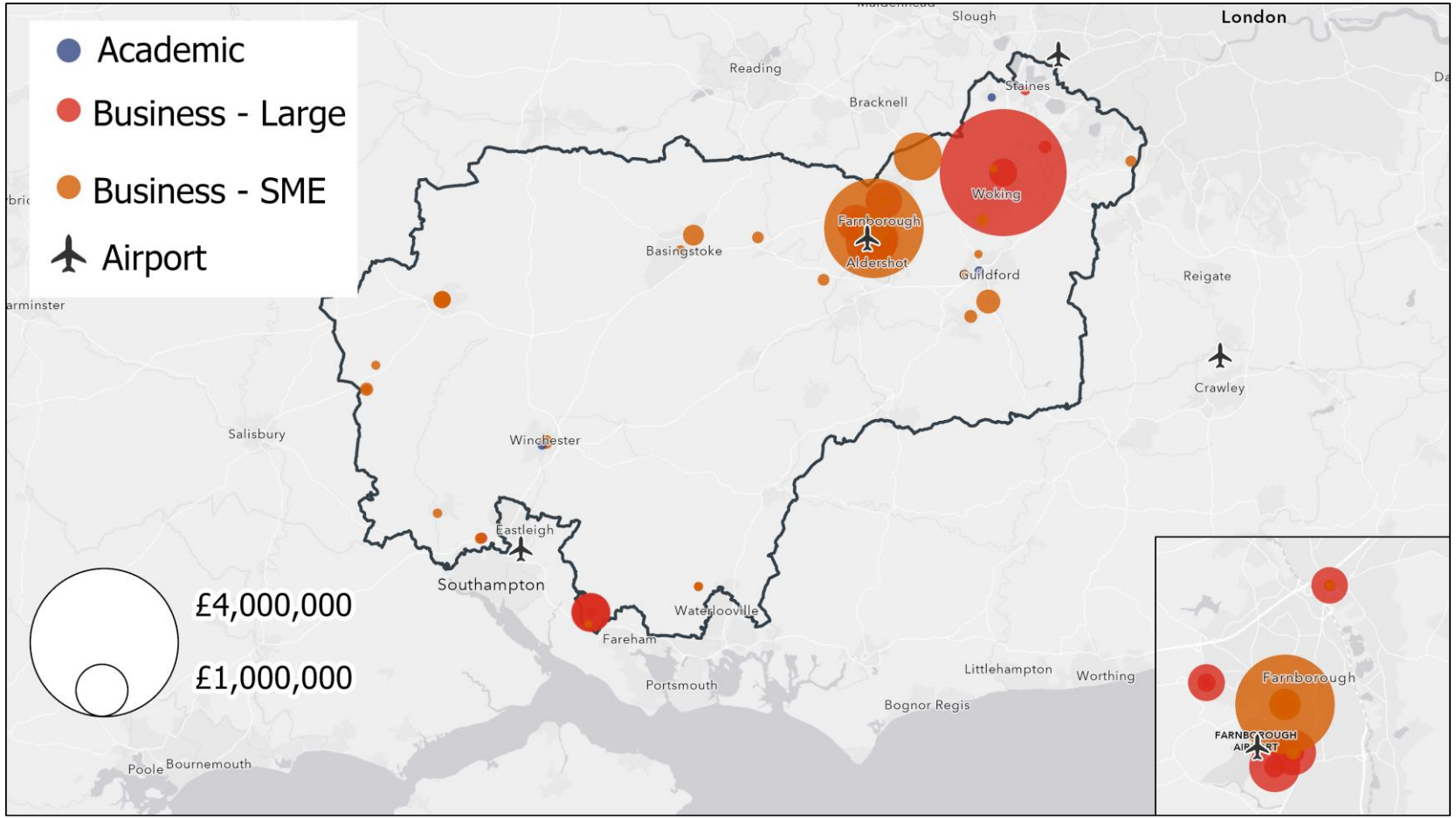
Innovate UK Data: geographical distribution of jet zero-related funding in the EM3 LEP area



Source: Produced by SQW 2023. License 100030994. Contains OS data © Crown copyright [and database right] [2022].
Note: Data as of June 2023. Based on all jet zero-related funding since 2004.

Jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

where aviation-related includes (any of): aviation, aerospace, airspace, airport

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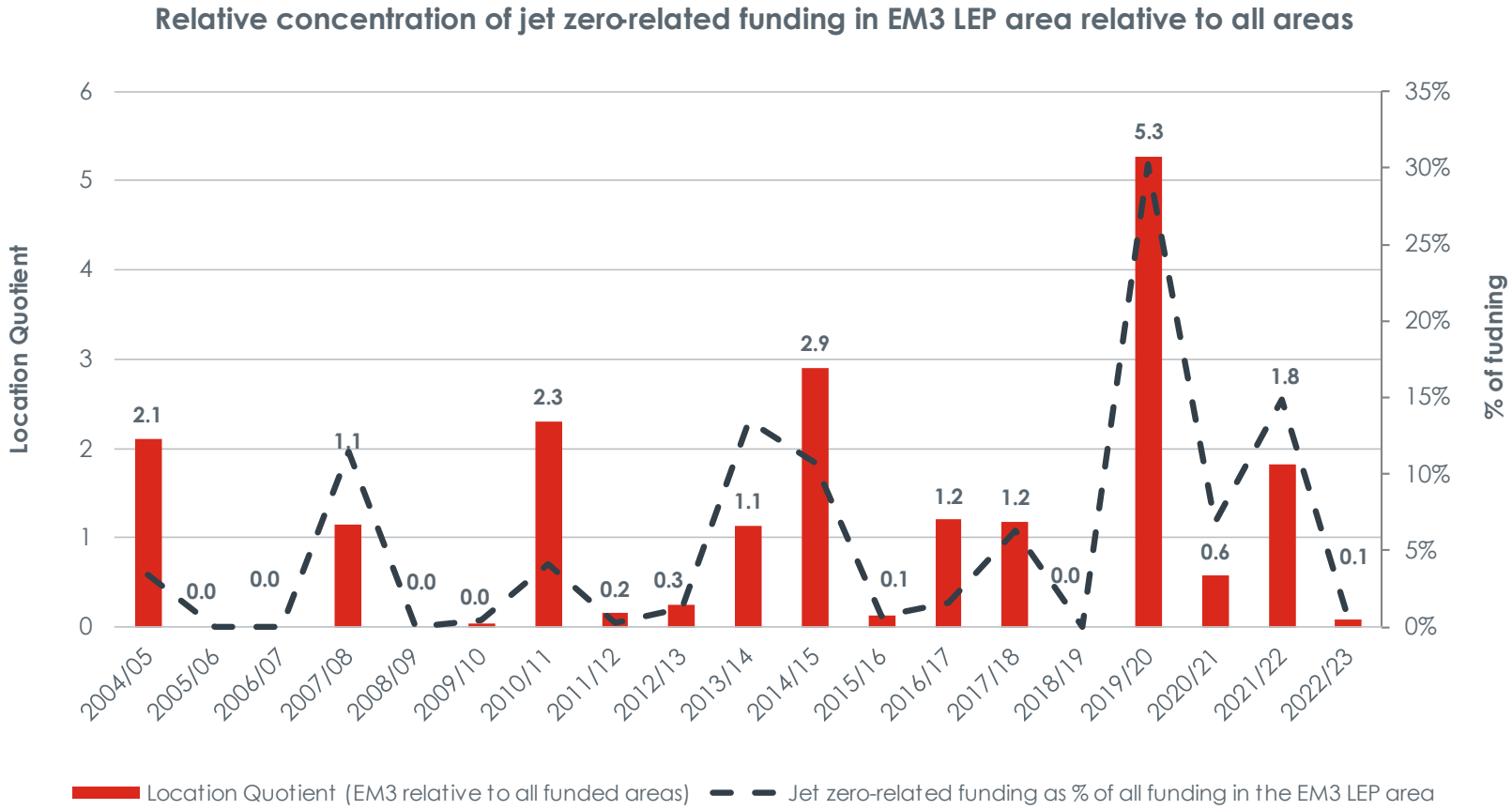
Innovate UK Data: relative concentration of jet zero-related funding in the EM3 LEP area



Note: Data as of June 2023. In 2003/04 and 2023/24 there were no aviation-related funding awards in EM3 LEP area.

Jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

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where aviation-related includes (any of): aviation, aerospace, airspace, airport

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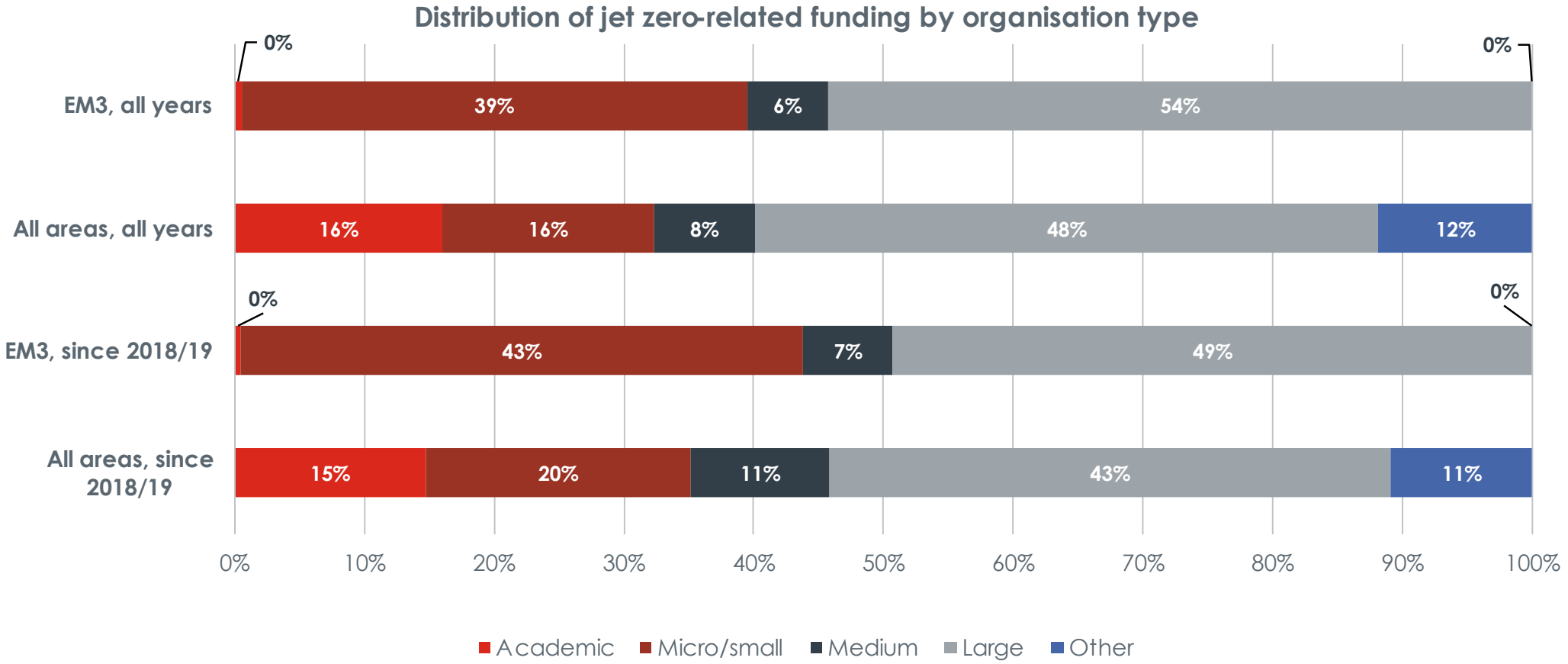
Innovate UK Data: distribution of jet zero-related funding by organisation type



Note: Data as of June 2023. 'All years' refers to the period from 2003/04. 'Other' organisation types include Catapults, Research and Technology Organisations (RTOs), Public Sector Research Establishments (PSREs), Public Sector Organisations (PSOs) and unknown.

Jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

where aviation-related includes (any of): aviation, aerospace, airspace, airport

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Innovate UK Data: top 10 recipients of aviation-related funding in the EM3 LEP area

Aviation-related, all years (since 2003/04)

No.	Organisation	Sum of awards
1	Thales	£8,020,194
2	QinetiQ	£7,284,388
3	TISICS	£6,098,376
4	McLaren	£4,929,189
5	BAE Systems	£4,350,516
6	NATS	£2,287,489
7	Autodesk	£2,056,979
8	MSC Software	£1,343,291
9	COREteQ Systems	£1,288,826
10	Custom Interconnect	£753,432

Note: Data as of June 2023.

Aviation-related, since 2018/19

No.	Organisation	Sum of awards
1	TISICS	£4,938,985
2	McLaren	£3,829,829
3	NATS	£2,218,219
4	MSC Software	£1,036,875
5	Thales	£864,065
6	Custom Interconnect	£753,432
7	Roke Manor Research	£397,699
8	University of Southampton	£395,398
9	Trax International	£303,775
10	Cecence	£224,310

Note: Data as of June 2023.

Aviation-related and jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Aviation-related includes (any of): aviation, aerospace, airspace, airport
- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

Innovate UK Data: top 10 recipients of jet zero-related funding in the EM3 LEP area

Jet zero-related, all years (since 2003/04)

No.	Organisation	Sum of awards
1	TISICS	£5,893,127
2	McLaren	£4,484,595
3	NATS	£2,075,324
4	QinetiQ	£1,983,038
5	BAE Systems	£1,890,939
6	COREteQ Systems	£1,288,826
7	Autodesk	£1,268,234
8	MSC Software	£1,036,875
9	Custom Interconnect	£753,432
10	Gordon Murray Design Limited	£520,272

Note: Data as of June 2023.

Jet zero-related, since 2018/19

No.	Organisation	Sum of awards
1	TISICS	£4,938,985
2	McLaren	£3,829,829
3	NATS	£2,006,054
4	MSC Software	£1,036,875
5	Custom Interconnect	£753,432
6	Trax International	£303,775
7	Cecence	£224,310
8	Saab	£218,409
9	Radical Fibres	£183,636
10	Blue Dolphin	£134,987

Note: Data as of June 2023.

Aviation-related and jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Aviation-related includes (any of): aviation, aerospace, airspace, airport
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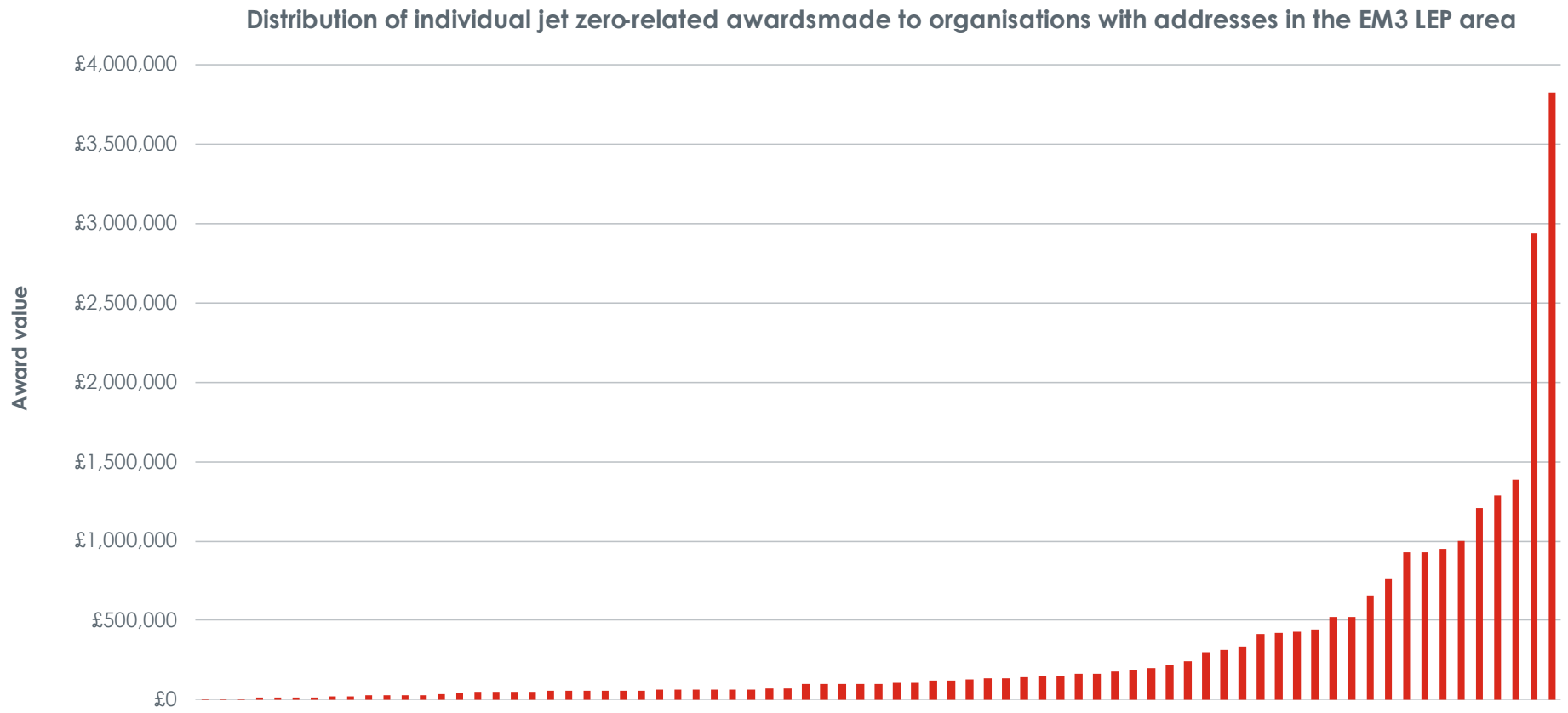
Innovate UK Data: distribution of jet zero-related awards



Note: Data as of June 2023. Five awards with missing or zero values have been excluded.

Jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

where aviation-related includes (any of): aviation, aerospace, airspace, airport

Innovate UK Data: distribution of jet zero-related awards

Jet zero-related funding in the EM3 LEP area

Statistic	All years (since 2003/04)	Since 2018/19
Sum of awards	£24,034,175	£14,066,348
Mean value	£320,456	£380,172
Median value	£101,214	£123,089
Minimum value	£2,880	£2,880
Maximum value	£3,829,829	£3,829,829

Note: Data as of June 2023. Based on awards with non-zero known value (five awards with missing or zero values have been excluded). N=75 for all years (since 2003/04). N=37 for years since 2018/19.

Jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

where aviation-related includes (any of): aviation, aerospace, airspace, airport

Innovate UK Data: top 10 jet zero-related awards in the EM3 LEP area

No.	Award offered	Organisation	Competition	Year
1	£3,829,829	McLaren	279 - APC 12: Advancing the UK's Low Carbon Automotive Capability	2019/20
2	£2,941,144	TISICS	The Sustainable Innovation Fund: SBRI Phase 2	2020/21
3	£1,388,393	BAE Systems	ATI Programme: GE Aviation Systems - Batch 2	2013/14
4	£1,288,826	COREteQ Systems	Energy Catalyst Rnd 1 Mid Stage	2014/15
5	£1,205,000	QinetiQ	High Value Manufacturing Nov-07	2007/08
6	£1,003,801	NATS	Future flight challenge phase 3: strand 1	2021/22
7	£950,535	NATS	Future flight challenge phase 3: strand 1	2021/22
8	£931,277	Autodesk	UK Aerospace Research and Technology Programme: Batch 22A	2017/18
9	£929,379	MSC Software	ATI Programme: batch 35 (closed competition)	2020/21
10	£764,344	TISICS	Innovation continuity loans: Strand 2 November 2020 follow-on competition	2020/21

Note: Data as of June 2023.

Jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

where aviation-related includes (any of): aviation, aerospace, airspace, airport

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Innovate UK Data: list of jet zero-related funding recipients in EM3

IUK jet zero-related* funding recipients with addresses in the EM3 LEP area, 2003/04-2023/24, leads and partners		
Alvant	Gordon Murray Design	Royal Holloway University of London
Autodesk	I6 Systems	SAAB
BAE Systems	IPFT Fuels	Samsung Electronics
Baines Simmons	J&B Hopkins	Senseye
Blue Dolphin	Jackweld	Tacit Connexions
Cecence	McLaren	Thales
CHEP	MSC Software	TISICS
COREteQ Systems	NATS	Trax International
Critical Software Technologies	nquiring minds	uAvionix
Custom Interconnect	Plasma Quest	University of Southampton
Fitfactory	QinetiQ	University of Surrey
Geoxphere	Radical Fibres	Wessex Resins & Adhesives

Note: Data as of June 2023.

Jet zero-related funding has been defined using keywords based on award descriptions provided by Innovate UK:

- Jet zero-related includes (any of): jet zero, aviation-related + net zero/net-zero/carbon/emission/CO2/electric/hydrogen /sustainable/sustainability/environmental/advanced materials/efficiency

where aviation-related includes (any of): aviation, aerospace, airspace, airport

Annex C: Local Skills Provision

Local Skills Provision in Aviation/Jet Zero related activity

University of Surrey

Undergraduate
- Aerospace Engineering (also MEng)
- Astronautics and Space Engineering (also MEng)
- Chemical and Petroleum Engineering (also MEng)
- Electrical and Electronic Engineering (also MEng)
- Physics with Astronomy

Postgraduate
- Air Transport Management
- Electronic Engineering
- Infrastructure Engineering and Management
- Petroleum Refining Systems Engineering
- Process Systems Engineering
- Renewable Energy Systems Engineering
- Satellite Communications Engineering
- Space Engineering
- Water and Environmental Engineering

PhD
- Advanced Technology Institute
- Aerodynamic and Environmental Flow
- Chemical and Process Engineering Research
- Engineering Materials
- Environment and Sustainability
- Micro- and Nano Materials and Technologies
- Robotics and Autonomous Systems
- Space Engineering

Farnborough College of Technology

HNC/HND
- Aeronautical Engineering

Level 4 Apprenticeship
- Automation & Controls Engineering

Level 3 Apprenticeship
- Composite Technician
- Engineering Fitter
- Engineering Technician – Aircraft Maintenance Fitter
- International Freight Forwarding Specialist
- Science Manufacturing Technician

Level 2 Apprenticeship
- Engineering Operative
- Supply Chain Operator

Top-up Degree (awarded by University of Surrey)
- Engineering (Aeronautical)

Level 3 BTEC
- Aeronautical Engineering

Local Skills Provision in Aviation/Jet Zero related activity

University of Southampton **(note not all courses delivered in EM3 geography)**

Undergraduate

- Aerospace Engineering (also MEng)
- Aeronautics & Astronautics / Airvehicle Systems Design (also MEng)
- Spacecraft Engineering (also MEng)
- Materials (also MEng)

Postgraduate

- Aerodynamics and Computation
- Space Systems Engineering
- Electrical Power Systems

Annex D: Consultations

Evidence from Consultations (1/2)

Between May and July 2023, SQW conducted 19 consultations with organisations and businesses across a range of public sector, industry, local assets and funding agencies.

Understanding the Jet Zero 'ecosystem' in EM3

- Consultations confirmed the range of Jet Zero activity in the region in the existing **aerospace primes, Farnborough airport, the two universities and a few key SMEs** within the aviation supply chain.
- There are **'islands of expertise'** relevant to Jet Zero within the EM3 geography and a high level of commitment to Jet Zero.
- However there is **limited evidence of coordinated working** on the Jet Zero agenda. This was varyingly attributed to: a. the 'silo working' of commercial aerospace companies; b. the diversity of the sectors that could make up 'Jet Zero'; and, c. a lack of leadership within the region on choosing a regional direction for Jet Zero specialism/activities.

What are the strengths of the EM3 region in relation to Jet Zero?

- The EM3 region was identified as having important **R&I strengths** in both universities and local businesses. These included strengths in advanced manufacturing and composites.
- Three universities (in or close to the core geography) have **research specialisms** that could support Jet Zero activity and some are already involved in industrial partnerships towards net zero aviation technologies.

Research Specialisms within University of Surrey

- Centre for Advanced Materials
- Surrey Space Centre
- Thermo-Fluid Systems University Technology Centre
- Aerodynamics & Environmental Flow Groups
- Propulsion Group

Research Specialisms within University of Southampton

- Aerodynamics & Flight Mechanics Group
- Astronautics Group
- Electrical Power Engineering
- Engineering Materials & Surface Engineering
- Transportation Group

Research Specialisms within University of Portsmouth

- Advanced Polymers & Composites Group
- Advanced Materials & Manufacturing Group
- Petroleum Engineering

Evidence from Consultations (2/2)

What are the strengths of the EM3 region in relation to Jet Zero? (cont.)

- The EM3 region has strengths in **space**. Although it operates over a broader area, Space South Central is important. The region has a strong space R&D base and businesses across the space supply chain, with a history of excellence in satellite technologies. There is some overlap of 'key players' in space and Jet Zero, particularly in advanced materials and aircraft designs. There is also an expected overlap in future skills needs.
- Farnborough, as the home of Farnborough Airport, Farnborough Air show and major aviation companies, is seen as a key strength for the region. It is a **'centre of gravity'** for aviation with both heritage and excellence in the sector.

Beyond EM3

- The emerging **Solent hydrogen cluster** (founded by Solent LEP, ExxonMobil and the University of Southampton) is in close proximity to the region and has clear links to Jet Zero with the production and distribution of hydrogen fuel. This may create synergies and complementary activities for the EM3 region across the net zero journey.
- EM3's proximity to both Heathrow and Southampton airports, as well as the presence of Farnborough airport, offers the potential for connecting Jet Zero-related airport activities. It was noted that Southampton airport is well-positioned as an early adopter of zero emission flight due to its short-range routes.

Process: Jet Zero and the 'business voice'

- Whilst recognising the opportunity, consultation feedback suggested that there has been less engagement from the private sector. While local partners, research organisations and some businesses are involved, more company voice is needed.

List of Consultations Undertaken

AGS Airports	Aerospace Technology Institute (ATI)	Aerospace Technology Institute (ATI) Club
BAE Systems	Connected Places Catapult	Department for Transport (Jet Zero, Airports)
Department for Transport	Farnborough Aerospace Consortium (FAC)	Farnborough College of Technology
Farnborough International Airport	Hampshire County Council	Heathrow Airport
Innovate UK	QinetiQ	Space South Central
TISICS	University of Portsmouth	University of Southampton
University of Surrey		

Research, analysis and advice

SQW

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