Aerospace Maintenance, Repair and Overhaul (MRO)

Opportunity, capability and competitiveness

A National Manufacturing Institute Scotland (NMIS) led white paper, backed by industry

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NMIS National Manufacturing Institute Scotland

CATAPULT High Value Manufacturing

Executive Summary

The UK aerospace Maintenance, Repair, and Overhaul (MRO) sector stands at a critical juncture. Despite its rich industrial heritage and global reputation, the UK lacks a coherent national strategy to support and grow its MRO capabilities. This white paper provides an industry-backed view on the current state of the MRO sector, and its potential contribution to UK innovation, productivity and economic growth.

Global demand for MRO services is rising sharply, driven by ageing fleets, delays in new aircraft deliveries, and technical challenges with newer engines. Countries like Singapore and France have capitalised on this opportunity through coordinated national strategies and investment in innovation hubs. The UK, by contrast, risks further decline in market share and missed economic opportunities without a more joined up approach.

This paper outlines the challenges facing UK MRO, including infrastructure gaps, skills shortages, and limited innovation funding. It proposes targeted investment of £500 million over five years to modernise facilities, adopt advanced technologies such as AI, digital twins, and automation, and build a skilled workforce. It also emphasises the need for government intervention, industry collaboration, and strategic planning to unlock the sector's full potential.

By repositioning MRO as a strategic growth lever, integral to original equipment (OE) manufacturing, the UK can enhance sustainability and productivity, strengthen its aerospace ecosystem and maximise readiness of fleets in defence through enhanced availability and maintainability. This white paper serves as a call to action for policymakers, industry leaders, and innovation bodies to prioritise MRO in a national aerospace strategy.

Section 1: Introduction and objective

The UK aerospace sector is a global leader in innovation, anchored by specialist hubs that drive advanced manufacturing and sustainability. With over 100,000 employees, 6,000 apprentices, and a £34 billion turnover - £23 billion of which comes from exports - the sector is a cornerstone of the UK's industrial strength. Productivity has risen by 25% over the past decade, and the median salary of £48,700 is 39%[1] above the national average, reflecting the sector's high value and competitiveness.

However, this success derives from specific clusters of the aerospace value chain, which has largely been driven by the successful development of a national strategy.

The opportunity outlined in this paper aligns closely with the UK Industrial Strategy's ambitions for aerospace, advanced manufacturing and place-based growth, providing a route to strengthen regional capability while increasing national competitiveness.

Three key realities highlight a strategic imbalance in the make-up of the UK aerospace sector:

1. The UK holds a 13% global market share in aerospace OE supply chains, underscoring its reputation for high-value design and manufacturing[2].

2. The UK aerospace MRO sector accounts for only 3% of the global market, revealing a significant underperformance relative to its OE capabilities - unlike its US and French counterparts[3].

3. Aftermarket/MRO revenues now match or exceed OE revenues globally, meaning the UK is missing out on billions in gross value added (GVA) and tens of thousands of high-skilled jobs.

Despite a strong heritage and internationally recognised aerospace and MRO clusters in regions such as the West of Scotland and Wales, the UK's MRO sector is constrained by underinvestment in facilities, innovation and technology. High operating costs and fragmented strategic support further weaken its global competitiveness.

To reverse this trend, the UK must act decisively. A national MRO strategy focused on technology-enabled competitiveness is essential.

This includes:

- **Reducing turnaround** and factory footprint.
- **Lowering capital expenditure** through automation and digitalisation.
- **Investing in innovation** to unlock productivity and growth.

[1] ADS Data 2025
[2] UK Innovation Report 2024, Cambridge Industrial Innovation Policy, University of Cambridge, March 2023
[3] UK Innovation Report 2024, Cambridge Industrial Innovation Policy, University of Cambridge, March 2023

The global demand for aerospace MRO is accelerating. With a clear and coordinated strategy, the UK can not only retain its current market share but also expand it significantly in the near term, securing economic growth, job creation, and industrial resilience.

This white paper seeks to extend the OE aerospace strategic lens to the aftermarket and MRO sector. While individual companies are focused on meeting immediate demand, the sector lacks a coordinated national approach. The aim here is to demonstrate why MRO must be treated as a strategic priority in its own right - one that requires collective action, long-term planning, and targeted investment to unlock its full potential.

Globally, all major MRO economies - both established and emerging - are underpinned by coherent government-backed strategies. The UK remains an outlier in this regard. Without intervention, the country risks ceding further ground in a market that is growing rapidly and becoming increasingly competitive. This paper is intended to serve as a catalyst for change, providing the rationale and direction needed to elevate MRO to the same level of strategic importance as OE design and manufacturing.

Scope of this paper

This paper focuses primarily on the civil aerospace Maintenance, Repair and Overhaul (MRO) sector. While the analysis does not explicitly examine defence MRO activity, many of the technologies, skills and innovation opportunities discussed, including automation, digital maintenance and advanced repair techniques, have direct relevance to defence platforms and support capability. Strengthening the UK's civil MRO ecosystem could therefore deliver additional benefits for defence resilience and capability over time.

Section 2: The problem statement

The introduction of the 'Power by the Hour' model in the 1990s marked a pivotal shift in aerospace, moving the industry from reactive maintenance to a service-oriented model that prioritised reliability, efficiency, and customer value. Therefore, MRO has gone from a cost centre to a strategic enabler - one that underpins safety, sustains profitability, and funds future innovation.

Yet despite this evolution, the UK has failed to develop a coherent national strategy for civil aerospace MRO. While the global MRO sector itself can deliver strong commercial returns, the UK currently lacks the coordinated national strategy and innovation ecosystem required to capture a greater share of this value.

This strategic gap has led to:

- **Reduced attractiveness** for domestic and international MRO investment.
- **Erosion of competitiveness**, with vendors increasingly choosing more supportive and innovation-driven environments abroad.
- **Missed economic opportunities**, particularly in job creation, at a time when the UK government is actively seeking growth levers.

The urgency is clear. Boeing forecasts a global requirement for approximately 710,000 new aircraft maintainers over the next two decades[4]. Without a competitive, innovation-led strategy, the UK risks further erosion of its position in the global MRO market. This will directly affect the scale and quality of MRO work that the UK can attract for the next generation of narrowbody and widebody platforms - segments that are critical to future aerospace growth.

The global MRO market, forecast to reach $139 billion in 2026, is increasingly being captured by nations that have aligned industrial policy with strategic investment.[5] Many of these competitors are backed by prioritised government funding and long-term planning. To remain competitive, the UK must respond in kind. Capturing near-term growth and securing long-term capability will require targeted investment of approximately £500 million over the next five years, focused on technology development, innovation capability and workforce development.

Section 3: Market

Commercial aerospace MRO demand is projected to grow at a compound annual growth rate (CAGR) of 4.5% over the next decade. This growth is driven by a rising number of in-service aircraft, delays in new aircraft deliveries, and the extended operational life of ageing fleets. Technical upgrades and service actions associated with newer engine platform - such as Pratt & Whitney's GTF and CFM's LEAP - are further accelerating demand, particularly in engine MRO, which remains the largest and most complex segment due to regulatory requirements and engineering intensity.

However, capacity across the global MRO sector is under strain. Turnaround times are increasing, constrained by shortages in spare parts, skilled labour, and logistics. Inflation and rising material costs are compounding these pressures. At the same time, global MRO activity is shifting toward emerging hubs in the Middle East, India, and Asia Pacific.

The global nature of aerospace means MRO activity does not need to be co-located with aircraft operators or major aviation hubs. Where the right combination of capability, capacity, skills and competitiveness exists, MRO providers can attract work from international markets.

The Middle East MRO market alone is forecast to grow at 5.4% annually. Singapore, which historically lacked OEM capability, now commands 10% of the global MRO market - more than triple the UK's current 3% share. This growth has been enabled by strategic planning and international expansion, with Singapore's MRO sector serving as a gateway to acquiring OE capability, including the transfer of Trent fan blade production from the UK.

While MRO is a smaller and more stable sector than OE, it has demonstrated resilience, maintaining steady revenues and employment even during the COVID-19 pandemic. Yet UK MRO productivity has declined sharply - falling by two-thirds between 2010 and 2021 - despite stable sales. The recent uptick in performance appears to be driven by short-term price spikes rather than structural recovery. In contrast, productivity in aerospace manufacturing has steadily improved, coinciding with the £3.6 billion ATI Grant Programme formed in 2014, which

[4] Boeing, 2025, Boeing Company - Boeing Forecasts 20-Year Global Demand for Nearly 2.4 Million New Commercial Pilots, Technicians, Cabin Crew

[5] Aviation Week, 2026

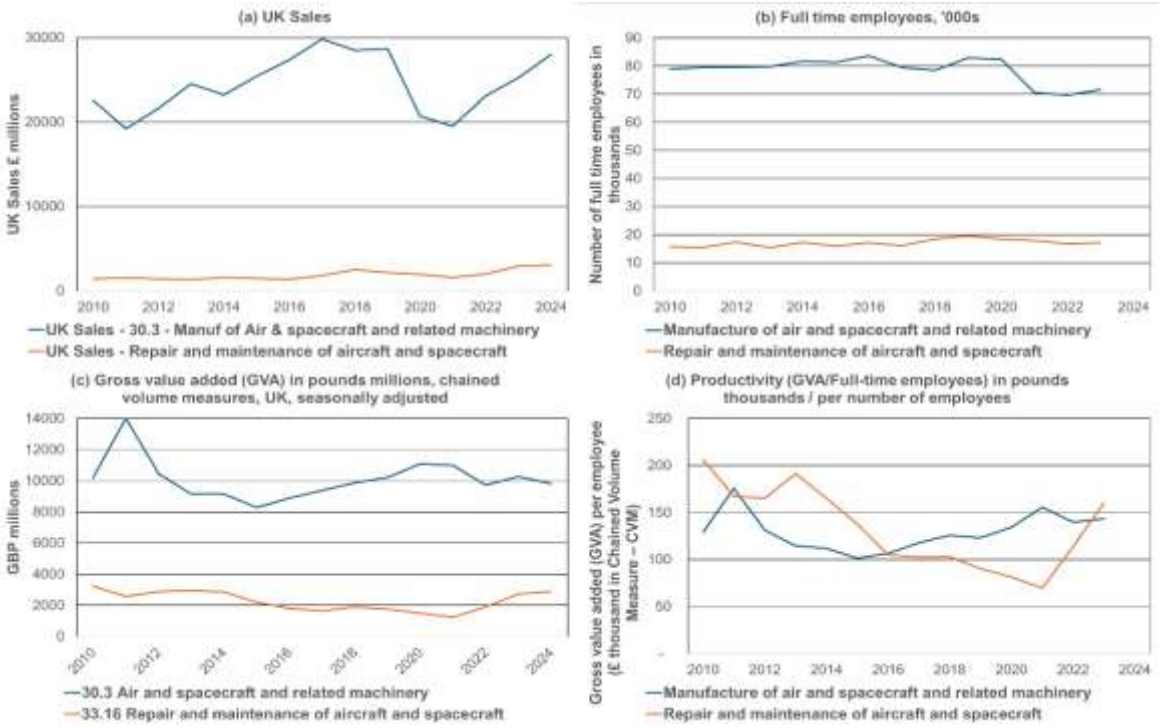
OE manufacturers have fully leveraged. MRO providers, by comparison, have not benefited from similar strategic support.

Figure 1, below, demonstrates the comparison between UK aerospace manufacturing and MRO, highlighting several trends.

Despite its smaller scale, the MRO sector holds significant potential for productivity gains. Without targeted investment, UK providers risk falling further behind.

To remain competitive, the sector must adopt advanced technologies such as predictive and preventative maintenance, automation, digital twins, and AI-enhanced tools. These innovations are essential to unlocking capacity, reducing downtime, and positioning the UK as a globally competitive MRO hub.

Figure 1: Comparison between UK aerospace manufacturing and MRO



Source: NMIS/ HVM Catapult analysis informed by publicly available industry and market data.

Section 4: Technology, innovation, and competitive advantage

The MRO sector has historically been a driver of innovation. The first wave of digital transformation in aerospace emerged from MRO through the development of equipment health monitoring and predictive maintenance, culminating in the now-standard ‘Power by the Hour’ model. This evolution demonstrates MRO’s unique capacity to deliver rapid, value-driven innovation.

Unlike other aerospace segments, MRO benefits from:

- **Shorter time-to-value cycles**, enabling faster returns on investment.

- **Stable and predictable revenue streams**, making it attractive for sustained innovation.

- **Efficiency-driven incentives**, where non-performing technologies are quickly phased out.

MRO's appeal lies in stable and predictable revenue streams, which make it an attractive domain for investment. Unlike other aerospace segments, MRO innovation is driven by the imperative of efficiency and profitability. Solutions that fail to deliver tangible value are quickly phased out, creating a dynamic environment where only the most effective technologies survive. This natural selection process has made MRO a fertile ground for the adoption of advanced tools such as predictive and preventative analytics, automation, and artificial intelligence.

Despite this potential, UK-based MRO providers face structural barriers to innovation. Many lack dedicated research and development departments and have limited experience participating in funded collaborative programmes. The administrative burden of managing innovation projects often deters smaller firms from engaging in joint ventures or technology pilots. To address this, the UK must consider establishing centralised innovation programmes housed within technology centres of excellence.

Collaborative programmes delivered through centres of excellence could utilise a range of delivery models, including subscription-based approaches, shared innovation programmes and funded collaborative projects.

International examples demonstrate the effectiveness of this approach. In Singapore, Pratt & Whitney's Eagle Services Asia and KLM Engineering & Maintenance have successfully implemented multi-partner innovation programmes coordinated by centralised teams. These initiatives have accelerated the deployment of cutting-edge technologies and positioned their MRO sectors as global leaders. France, Singapore, and the United States now rank among the strongest markets for MRO growth, supported by innovation-led national strategies and targeted investment.

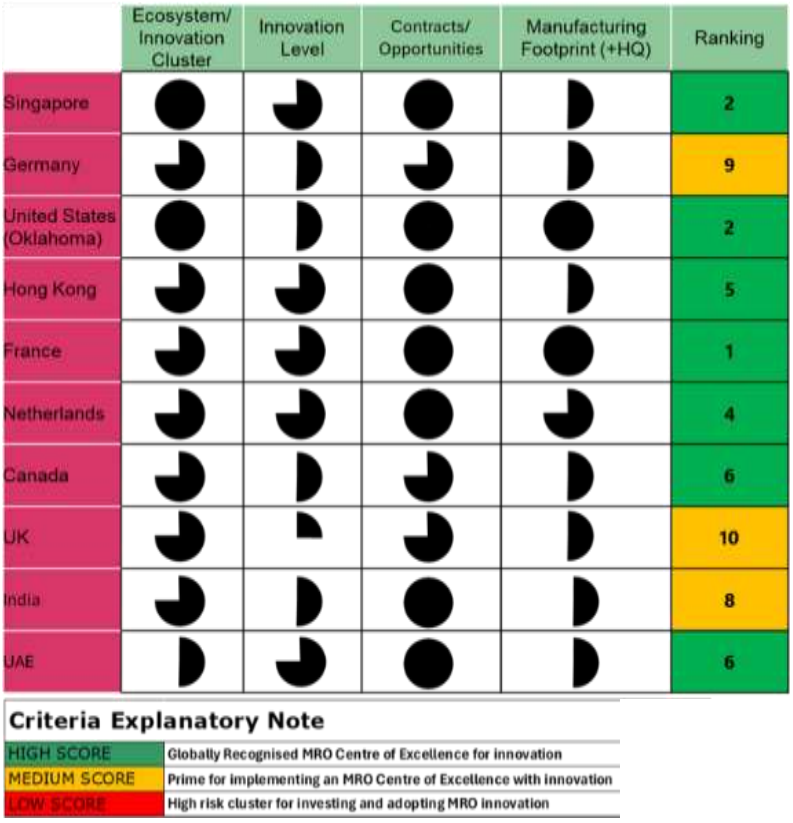
To better understand how global MRO hubs compare across capability, infrastructure and innovation, NMIS/ HVM Catapult undertook a comparative assessment of leading international markets.

The assessment framework considers factors including aerospace manufacturing presence, MRO capability, infrastructure connectivity, workforce and skills availability, innovation ecosystem strength, and industrial clustering. Comparative scoring was informed by publicly available industry and market data, aerospace cluster analysis, and NMIS/HVM Catapult benchmarking.

Figure 2, on the next page, is an assessment of global MRO hubs, categorising their status across four key areas, using a weighted scoring system with innovation weighted more heavily to reflect its importance in long-term competitiveness and growth.

France, Singapore, and the USA emerge as the strongest markets for growth through innovation, while India, South Korea, Indonesia, Thailand, Canada, and Germany show significant expansion. With investment in innovation, the UK can position itself as an MRO and advanced repair centre of excellence, attracting inward investment through its OEM presence and a well-developed innovation ecosystem.

Figure 2: Assessment of global MRO hubs



Source: NMIS/HVM Catapult analysis informed by publicly available industry, market and aerospace cluster benchmarking data.

Targeting investment by showcasing a robust MRO cluster and innovation potential is crucial for future growth. Germany's DLR Institute of MRO at its ZAL Centre in Hamburg advances aviation with lifecycle analytics, maintenance technologies, and digital process optimisation, collaborating with Lufthansa Technik. Singapore hosts 130+ MRO companies, including ASTAR's Smart Manufacturing Laboratory. Pratt & Whitney's Technology Accelerator, driving robotics, automation, and digital twins, has two locations in Singapore and Florida (US). It is also piloting a new MRO Hub at its Quebec overhaul facility. Air France/ KLM's MRO Lab in

the Netherlands/France prioritises predictive maintenance, digitalisation, and robotics, fostering innovation with startups and manufacturers.

Further, centres like GE Aerospace STAC[6] and P&W's NATA[7] were recently established to focus on the development of MRO technology, aiming at high-value aftermarket developments. With strategic investment, these hubs lead in MRO 4.0, enhancing efficiency, sustainability, and advanced aerospace maintenance solutions. The UK must leverage innovation to remain competitive in a tidal wave of global MRO advancements.

The UK, with its world-class original equipment (OE) design capabilities, is well-positioned to lead in maintenance-driven aircraft design. However, this advantage is at risk. Global competitors are rapidly advancing their own MRO strategies, establishing hubs to develop future technologies and talent. AI and digital technologies are reshaping every aspect of aerospace maintenance, from bolt tightening to inspection routines. Autonomous robots are extending access to hard-to-reach areas, improving safety and operational insight. AI-driven documentation is standardising data formats, enhancing communication and reducing errors. Digital twins are enabling real-time simulation and diagnostics, unlocking new levels of efficiency.

To remain competitive, the UK must invest strategically in next-generation MRO innovation. This includes leveraging its existing MRO base, OEM presence and well-developed innovation ecosystem to attract inward investment and position itself as a centre of excellence for advanced aerospace repair. The opportunity is clear: with the right support, the UK can lead the next wave of MRO transformation, delivering enhanced productivity, sustainability, and global competitiveness.

This approach mirrors the success of the UK's Aerospace Technology Institute programme, which has strengthened original equipment competitiveness through coordinated innovation investment.

Section 5: Sustainability and environmental considerations

With zero-carbon air travel still developing, kerosene-based fuels will remain dominant for large civil flights for decades. Coined at the 2024 ATI conference, "the best fuel is the fuel you don't burn"[8], this principle has shaped aerospace's sustainability strategy, balancing fuel efficiency through design and maintenance. Traditionally, design improvements such as aerodynamics, lightweight materials, advanced propulsion and systems optimise fuel use on paper/spec. At the same time, maintenance activities are incorporated to restore aircraft performance closer to spec, reducing tailpipe emissions and reducing excess manufacturing of replacement parts and its associated environmental impact.

Today, maintenance-driven design is emerging, integrating big data, AI, remanufacturing and full circularity into the aerospace design lifecycle. By leveraging high-quality MRO data,

[6] GE Aerospace's Services Technology Acceleration Center to Open in September 2024 | GE Aerospace News
[7] News | RTX's Pratt & Whitney announces North American Technology Accelerator | Pratt & Whitney
[8] Said by Eric Dalbies, Safran VP

intelligent tools, and digital integration, the industry can create more sustainable maintenance models and extend aircraft life while lowering environmental costs.

Further, the development of full circularity solutions, including end-of-life planning and disposal, will allow aviation to assess the actual trade-offs between new aircraft development and legacy fleet optimisation. This holistic approach, afforded by the services-oriented business model, ensures aviation advances within the near-term technological limits, making sustainability a practical reality and business driver. As maintenance and design become increasingly interconnected, aerospace can achieve greater efficiency and lower emissions, pushing toward a more responsible, sustainable future for air travel.

Section 6: Capability and knowledge development

The MRO sector is facing a critical workforce challenge. Rising global demand, inflationary pressures, and a tightening labour market have driven salaries upward, making competitive pay a necessity rather than a differentiator. At the same time, the sector is grappling with a confluence of structural issues: an ageing workforce, persistent skill shortages, and the urgent need to equip personnel with the capabilities required to operate and maintain increasingly complex technologies. This challenge is already evident in UK MRO clusters such as the West of Scotland, where industry demand is driving the need for expanded skills provision and technology-enabled training to support future growth.

As the sector evolves, so too must its workforce. The emergence of technologies such as predictive maintenance, AI-driven diagnostics, robotics, and composite material repair techniques demands a new generation of digitally fluent technicians and engineers. Without a concerted effort to upskill and reskill the existing workforce, the UK risks falling behind more agile and better-prepared competitors.

To address this, leading MRO providers globally are investing in two key areas. The first is digital and automation upskilling, ensuring that technicians are proficient in the use of smart maintenance tools, AI-based systems, and robotic platforms. The second area of focus is cross-sector collaboration. By drawing on best practices from adjacent industries such as automotive and advanced manufacturing, the aerospace sector can accelerate the integration of new technologies and processes, while also broadening the talent pool. The UK is well placed to leverage the skills across sectors, supported by the Industrial Strategy.

For the UK, building a resilient and future-ready MRO workforce must be a national priority. This means not only investing in training and education, but also creating pathways for career progression, fostering diversity in technical roles, and supporting regional clusters where skills development can be closely aligned with industry needs. Strategic investment in workforce capability will be essential to unlocking the sector’s growth potential - from the current 3% global share to a more competitive position - and to laying the foundation for onshoring future opportunities in high-value aerospace services.

Section 7: Summary

Aerospace MRO is no longer a localised service. It is a globalised industry, enabled by advanced logistics, digitisation, and rapid innovation across engineering disciplines. The UK must recognise this shift and respond accordingly.

To fully capture the growing demand, particularly in narrowbody platforms where reliability and maintainability are paramount, the UK needs a forward-looking MRO capability. These aircraft, due to their intensive utilisation, require robust aftermarket support. Without coordinated advancements in both original equipment (OE) design and MRO services, the UK risks repeating issues like those seen with the GTF engine, which undermined platform performance and market confidence.

Strategic investment in civil aerospace MRO strengthens the UK's position in civil aviation with additional benefit realised in other sectors, including defence, through improved turnaround times, preventative maintenance and enhanced fleet availability.

Realising this opportunity will require continued collaboration between industry, government, innovation organisations and skills providers to define priorities, accelerate technology adoption and help devise an innovation-led national strategy for aerospace MRO that strengthens UK competitiveness.

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Industry peer reviewers: Aerospace Wales, BAE Systems, GE Aerospace, Rolls-Royce plc, David Miliken Boeing Global Technology

Appendix: UK MRO regional capability

The UK MRO sector comprises approximately 1,300 companies, delivering services across four key classifications: airframe maintenance, engine overhaul, component repair, and specialised services such as inspection and precision manufacturing. The sector is composed of OEMs like Rolls-Royce (Derby), GE Aerospace (Cardiff & Prestwick), and Safran Landing Systems (Gloucester), which perform base MRO for engines and landing gear. Aircraft operators such as EasyJet Engineering, Ryanair, KLM and British Airways manage routine line maintenance near airports and conduct heavy maintenance in dedicated hangars, while independent MROs, including GTSMRO (Prestwick) and Aero Engine Centre (Heathrow), provide contracted airframe, engine and wiring harness services. Additionally, MRO-related organisations support approved providers through specialised supply chain services.

The industry is highly fragmented, with 85–90% of companies classified as SMEs, many of which are micro businesses with fewer than 10 employees. Major MRO clusters have formed around international airports, MoD sites, and OEM hubs, driving continued industry growth. Significant UK regional clusters are shown on the heatmap of the number of companies around the West of Scotland and London airports, followed by Wales, Belfast, the Midlands, Northwest England and Norwich.

A regional example is the Ayrshire cluster in the West of Scotland, which forms a significant concentration of aerospace MRO activity centred around Prestwick and the wider Glasgow Airport area. With a long-standing aerospace heritage, the cluster is recognised for its capability in undertaking complex, safety-critical maintenance, repair and overhaul work across civil and defence platforms.

The cluster currently supports around 5,000 employees and generates an aerospace combined turnover of approximately £575 million, with industry ambition to increase this to £1.6 billion as global MRO demand accelerates. The sector has been identified for growth and frames several interventions within the Ayrshire Growth Deal (AGD). Employment has increased by around 800 roles since 2023 and is projected to rise further to meet near-term demand, with particularly strong growth anticipated within the aftermarket workforce over the coming decade.

Anchor organisations in the region include BAE Systems, Prestwick Aerosystems (Airbus Affiliate), Prestwick Aircraft Maintenance, Boeing, Collins Aerospace, GE Aerospace, Woodward and Storm Aviation, supported by a dense network of specialist SMEs. The National Manufacturing Institute Scotland, Ayrshire College, South Ayrshire Council and industry partners are planning a dedicated skills and technology centre with a strong focus on MRO, including an industrial-scale pilot line as part of the wider *Aftermarket of the Future* ambition, with opening targeted for 2028/29.

Collectively, this positions the Ayrshire cluster as a strong example of the UK's existing MRO capability and future growth potential, underpinned by industrial scale, skills development and planned innovation infrastructure.

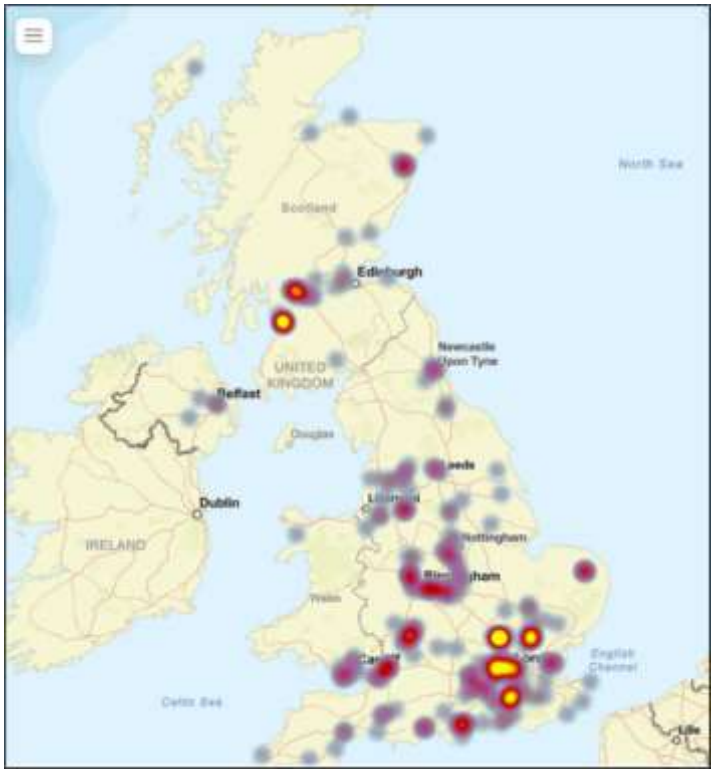

Figure 3: UK regional capability heat map. Source: NMIS internal aerospace MRO dataset, 2026

Another key example is the aerospace MRO cluster in Wales, supported by the Cardiff Airport and Bro Tathan aerospace corridor, and anchored by industry leaders such as GE Aerospace's Nantgarw facility and British Airways Engineering Cardiff, alongside specialist operators including Caerdav, AerFin, ecube, Nordam and others.

The MRO industry in Wales is currently worth approximately £1.5 billion in combined turnover and employs around 6,000 people. At Nantgarw, GE Aerospace operates one of the largest and most advanced engine MRO facilities in the world, with over 1,300 employees, servicing engines like the GE90 and CFM56, and has recently secured substantial multi-million-pound government-backed investment (GOV.UK). Meanwhile, BAMC employs over 650 people and carries out heavy maintenance for BA's long-haul fleet and is also the main UK centre for avionics and interiors.

This cluster is central to strategic industrial development in Wales. Looking ahead, the sector is poised for significant growth - supported by government initiatives, infrastructure investment and the expanding Wales MRO Hub. There is huge potential to see turnover and employment rise sharply, especially within high-value segments like engine overhaul and component repair.

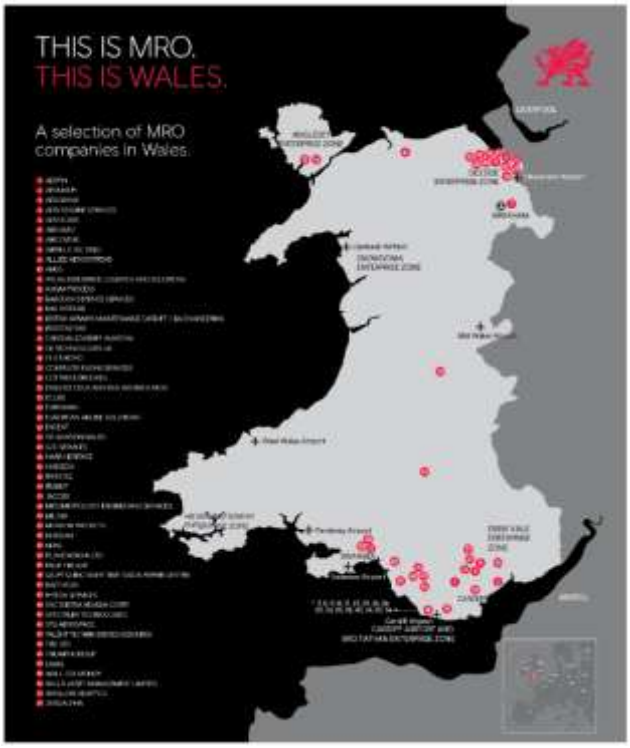

Figure 4: Wales MRO companies

Taken together, the Scottish and Welsh examples illustrate the scale and diversity of MRO capability across the UK, reflecting a wider regional reach of industrial expertise, infrastructure and skills. This distributed capability represents a significant national asset, reinforcing the case for a more coherent national framework to better connect regional strengths and support growth, innovation and long-term competitiveness.