

# The Future of Civil Aerospace

A Study on the Outlook for the UK  
Civil Aerospace Manufacturing Sector

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# INTRODUCTION BY PAUL EVERITT

## **The civil aerospace sector is a global success story.**

The UK is home to a highly evolved aerospace sector – both in terms of domestic companies and international brands with a strong UK presence.

Ongoing investment in innovation is key. The UK is at the vanguard of cutting edge technology in areas such as aerodynamics, propulsion, aerostructures and advanced systems. It's extensive yet integrated supply chain and world leading skills has made the UK an attractive market for significant prime investment and helped many companies to begin bringing activity back to the UK.

The domestic backdrop is a promising one. Not only is the broader business environment becoming more supportive, the formation of the Aerospace Growth Partnership (AGP) in 2011 demonstrates the joint industry and Government focus on driving the sector forward as effectively and efficiently as possible.

Earlier this year, for the first time, a committed structure, firm priorities and investment that goes beyond the current political cycle was unveiled by the AGP. This unique, innovative partnership has set industry on the road to future success, driven by the strengths and needs of business.

The rapidly growing global civil aerospace market also provides a significant opportunity for the UK. The projected increase in passenger air traffic is expected to drive demand for around 27,000 new aircraft between now and 2031. And the pressure is on to make sure that new aircraft are as comfortable, fuel efficient and quiet as possible.

However, faced with a growing appetite for a share of this valuable market from other countries, the UK cannot afford to rest on its laurels to maintain its world leading position in this fast growing market.

This report by KPMG looks at the future for the UK aerospace industry and highlights its promise and potential. Through the AGP we have made significant strides in the right direction and the focus should now be on long term investment, long term planning and long term success.

Paul Everitt, Chief Executive, ADS



# EXECUTIVE SUMMARY

The UK civil aerospace sector is in a strong position to benefit from significant growth in global aircraft demand. To benefit from the projected increase in demand, industry needs to accelerate investment in current competitive strengths such as innovation and high level skills, as well as focus on the future.

Recent key commitments show the UK is tackling the challenge head on – with both Government and industry equally serious about maintaining its world leading position.

## The strengths of UK civil aerospace

With over 3,000 companies employing around 230,000 people (direct and indirect), the UK civil aerospace sector is supported by world-class research, design and engineering capabilities and an end-to-end supply chain.

- **World leading position:** With a 17% global market share, the UK's civil aerospace industry is the largest in Europe and second largest in the world.
- **Expertise in innovative, high-value technologies:** The UK is recognised globally for being at the cutting edge of design, innovation and engineering, including wing design and assembly, engine design and manufacture and advanced avionics systems.
- **Strong and 'joined up' industrial strategy:** A wide range of coordinated initiatives are underway to drive new investment and address barriers to growth – the UK is an increasingly attractive location for new investment in civil aerospace.
- **Unique partnership approach to growth:** Through the Aerospace Growth Partnership (AGP), UK industry and Government have established a unique, collaborative partnership to increase investment in UK innovation, supply chains and engineering skills, with both industry and government committing £2 billion towards an Aerospace Technology Institute.

## UK opportunities for global growth

The global civil aerospace market could see demand for around 27,000 new aircraft & 40,000 new rotorcraft amounting to £2.8 (US \$4.5) trillion by 2031, with high-growth economies accounting for 45% - 60% of demand for new aircraft.

- **Rising global demand could generate over £474 billion in orders for UK companies:** Even without growing its current global market share of 17%, the projected increase in orders for new aircraft could be worth nearly £474 billion in revenue for UK companies by 2031.
- **Aerospace hubs offer access to growing global markets and supply chains:** To support ambitious growth, emerging economies are offering incentives for UK primes and their suppliers to invest in local civil aerospace hubs. Setting up satellite locations or investing in joint ventures could provide strategic access to growing markets and supply chains.
- **Leverage the UK's innovation advantages:** The UK has a strong heritage in the development of cutting edge technology and the AGP has secured significant support for businesses through the supply chain to increase investment in R&T.

## Investing in the UK's long-term global competitiveness

Long-term success for the UK civil aerospace sector is a core objective of Government and industry activity.

- **The AGP commitments are critical to competitiveness:** The ambitious commitments in the AGP strategy are an important first step to the UK's future success. Delivering these goals will be critical if the UK is to maintain its position as a global leader for civil aerospace investment, innovation and production.
- **Continuing to strengthen industry-government partnership:** Given lengthy development lead-times, decisions for next generation, post-2020 programmes are already being made. Industry and Government must continue to leverage the early successes of the AGP.
- **Accelerating investment in innovation and skills to secure high-value activity in the UK:** Without investment in innovation, the UK risks losing its competitive positioning to other markets in the long run. Priorities include:
  - Developing capability in technologies, including manufacturing technologies, that will play a greater role in future platforms in order to compete more effectively against other markets and to accelerate on-shoring.
  - Prioritising technology skills in the UK's education system to ensure the UK has innovative engineers and apprentices to maintain a long-term technological edge.
- **Ensuring that the UK supply chain is fit for purpose to meet the requirements attached to future opportunities in the UK and abroad**

# THE UK IS A PRIME LOCATION FOR CIVIL AEROSPACE

## Introduction

**With a 17% global market share, the UK's civil aerospace industry is the largest in Europe and second largest in the world.**

The UK's civil aerospace industry, with over 3,000 firms, is supported by world-class research, design and engineering capabilities and an end-to-end supply chain.<sup>(1)</sup>

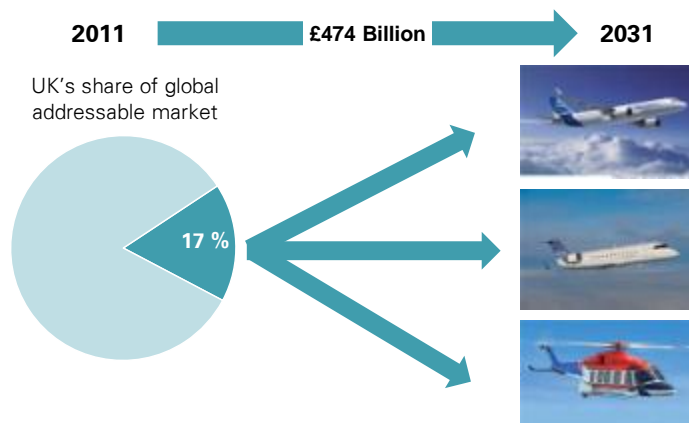
As part of this study on the outlook for the UK aerospace industry, KPMG spoke to 19 stakeholders including prime contractors, SMEs and Government departments. Feedback was consistent in that the industry has developed a strong position globally. Strong annual average post-crisis growth of 4.7% is set to rise to 6.8% per year on the back of rising global demand.<sup>(1)</sup>

However, the UK faces increasing global competition to develop ground-breaking technologies, meet global demand for new aircraft and maintain existing fleets.

*"The AGP has transformed the way Government and business work together. It's not been about industry laying down a list of demands to Government; nor has it been about Government trying to dictate to industry what it should be doing. Rather, it has been a collaborative process of us seeing what industry needs to do to increase its competitiveness and agreeing where Government has a role to play in assisting."*

**The Rt. Hon. Michael Fallon MP – Minister of State for Business & Enterprise (jointly with the DECC)**

**Figure b. Potential revenue addition to UK civil aerospace industry from new orders<sup>(3)(4)</sup>**



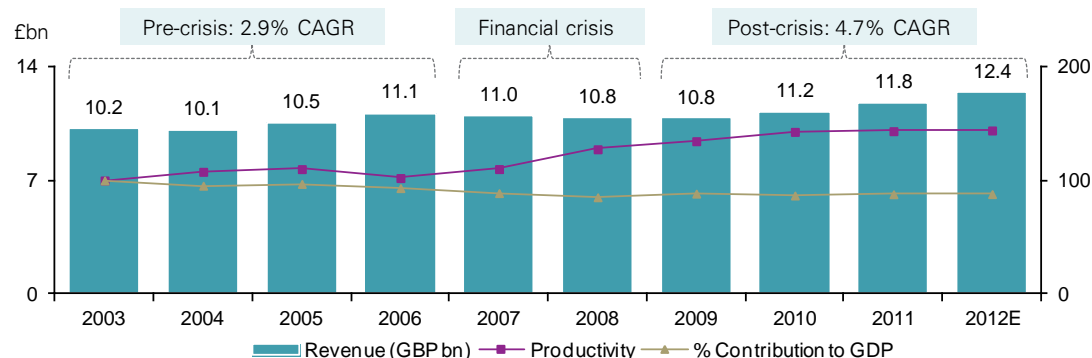
Assuming the UK maintains its 17% current market of its addressable market up to 2031, it could generate £474 billion from global demand for new aircraft worth £2.8 trillion.<sup>(1)</sup>

**With an eye on the potential prize, government and industry are working closer than ever to strengthen the entire value chain.**

Global civil aerospace companies have benefited from the UK's skilled workforce and efficient supply chain which has driven a 41% increase in productivity between 2002 to 2011.<sup>(3)</sup> Accounting for roughly half of the UK's £24 billion aerospace market, the civil aerospace sector is a significant contributor to the UK economy in terms of output value and job creation. Employees in the sector tend to have higher qualifications than other sectors as well as earning 34.4% more than the UK average.<sup>(3)</sup>

The formation of AGP signals long-term commitment by Government and industry to build on the UK's position to capture value from global growth in aerospace demand.<sup>(3)</sup> Also, in March 2013 the Aerospace Technology Institute (ATI) was announced with £2 billion of funding to help develop the technologies of tomorrow.<sup>(1)</sup>

**Figure a. UK aerospace expanding with rising global demand, industry growth 2003-12E<sup>(1)(2)(a)(b)</sup>**



The UK aerospace industry is expected to grow at a rate of 6.8% over the next few years.

Notes: a) Productivity and % contribution to GDP values are indexed to base year 2002  
b) 2012 industry revenues are estimated based on year-on-year growth rate over 2010-11

Sources: 1) HMG and AGP, Lifting off: Implementing the strategic vision for UK Aerospace, 2013  
2) HM Treasury  
3) ADS, UK Aerospace Annual survey, 2012  
4) Airbus

# THE UK IS A PRIME LOCATION FOR CIVIL AEROSPACE

## A world leading position

**With significant depth and maturity in a supply chain of over 3000 companies, the UK is poised to lead, develop and produce future technology.**

The companies that form the core of the supply chain for the civil aerospace industry in the UK, range from major multinationals such as Airbus and Rolls Royce to SMEs such as JJ Churchill and Aeromet.<sup>(1)</sup>

Although the supply chain is led by a small number of prime contractors, there is a long tail of SMEs where significant value is generated. Feedback suggests increasing consolidation amongst SMEs could increase strategic focus and generate additional economies of scale.<sup>(1)</sup>

Recent investment in UK aerospace <sup>(2)</sup>	
Company	Investment
<b>Airbus</b>	New wing factory costing £400 million and employing 650 workers in North Wales
<b>Bombardier</b>	New composite wing facility worth £520 million and employing 800 workers in Belfast
<b>GE Aviation</b>	New Electrical Power Integration Centre in Cheltenham costing £9 million and employing over 100 workers
<b>GKN</b>	New aerostructures factory worth £170 million and employing 450 people outside Bristol
<b>Rolls-Royce</b>	New apprenticeship academy in Derby Engine blade casting facility at Rotherham employing 150 workers
<b>Spirit Aerosystems</b>	New development centre for composites in Prestwick employing 50 workers

**The UK's international leadership is reflected in its long-held expertise in high value, complex and safety critical technology.**

Within its wide range of offerings, the key areas of competency and focus for the foreseeable future, include:<sup>(4)</sup>

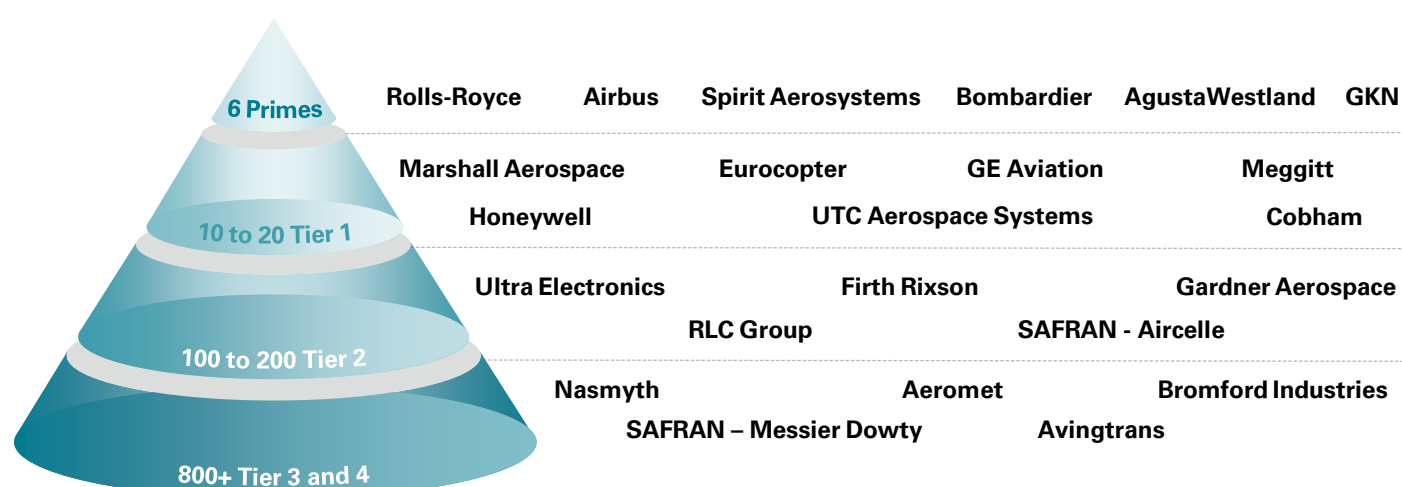
- Aerodynamics (e.g. wing design);
- Propulsion (e.g. rotor blades, engine assembly);
- Aerostructures (e.g. fuselage & wing assembly);
- Advanced systems (e.g. avionics, undercarriage).

Production of these aircraft areas is underpinned by a skilled workforce of around 230,000 supply chain personnel, deep institutional knowledge and a strong research base.<sup>(4)</sup> This research base is likely to be critical to the continued success of the UK's civil aerospace industry.

*"UK aerospace is a national asset that we need to look after."*

**Jonathan Dennison, Director of Government and External Affairs, GKN**

**Figure c. High level overview of the long tail of UK civil aerospace supply chain<sup>(3)(a)</sup>**



Notes: a) Primes – Design and assembly of complete sections; Tier 1 – Assembly and/or manufacture of sub-sections; Tier 2 – Manufacture of sub-sections; Tier 3 & 4 – Produce machined components and sub-assemblies / specialise in the production of particular components.  
Company logos have been positioned on the grid depending on the scale of operations in UK. Only a sample of supply chain companies have been included.

Sources: 1) KPMG interviews and discussions with industry participants, May 2013.  
2) Multiple press and publically available information, retrieved in May 2013  
3) ADS discussions, May 2013.  
4) HMG and AGP, Lifting off: Implementing the strategic vision for UK Aerospace, 2013.

# THE UK IS A PRIME LOCATION FOR CIVIL AEROSPACE

**The UK continues to build upon its long standing association with large global programmes; e.g. 54% of A380 (with Rolls Royce Trent 900 engines) aircraft value is generated in the UK.**

The UK civil aerospace industry has been involved in the early stage development of multiple platforms over the years. Recent examples include the wing assembly for the A320 Neo as well as the supply of composite material for Bombardier's C-series jets.<sup>(1)</sup>

Its importance in such programmes is perhaps best reflected in the Airbus A380 programme, where UK companies have designed and produced highly technical components such as engines and composite wings worth an estimated 54% of total aircraft value.<sup>(2)</sup>

The continued level of innovation in new focus areas such as advanced composites and electric actuators has kept pace with leadership in traditional areas of strength such as engines and wings. These strengths are being leveraged by OEMs including Airbus and Rolls-Royce.

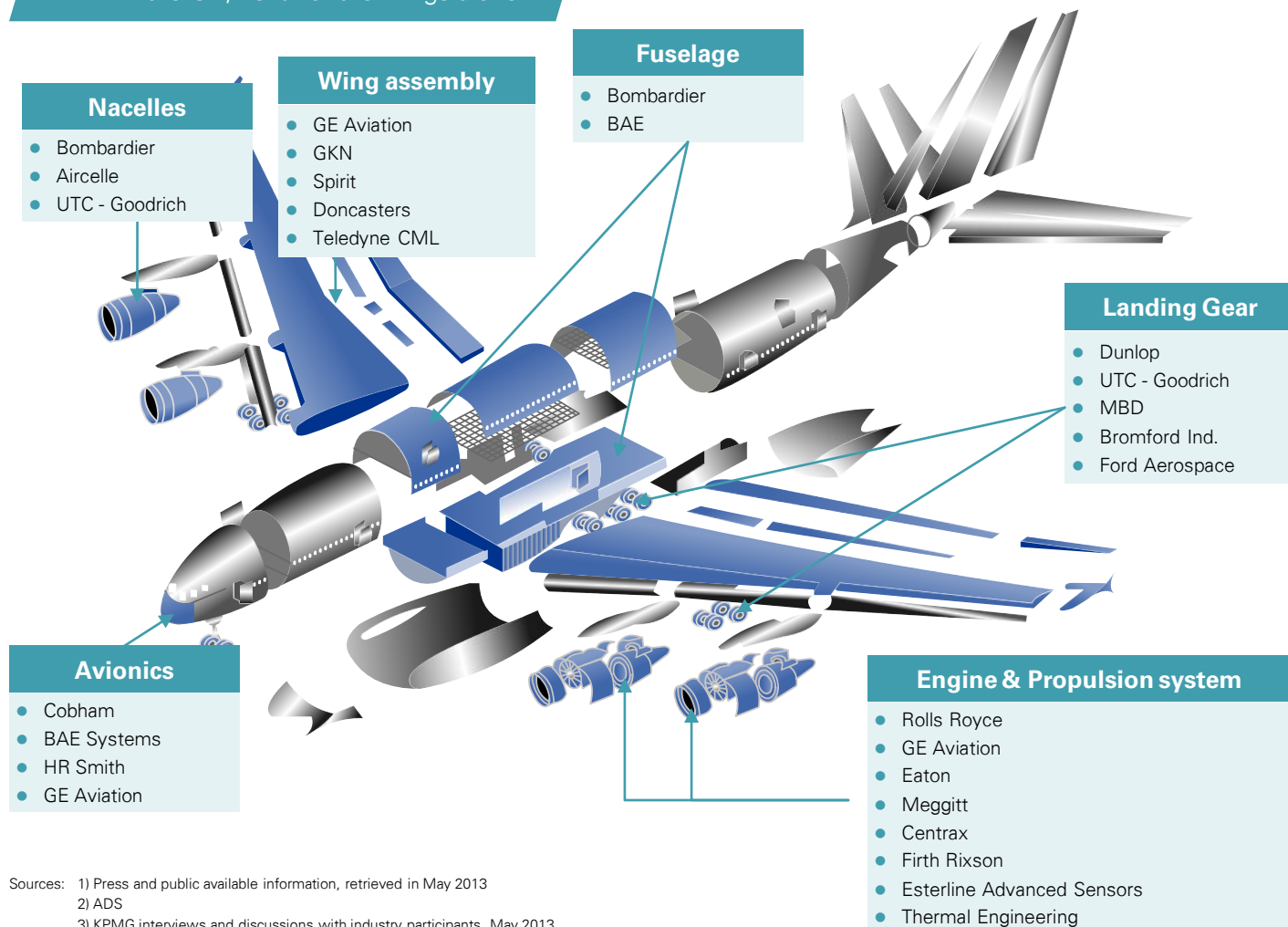
Manufacturing technologies should not be overlooked. Feedback from industry participants highlights that innovation in the way a component is made is as important as the product itself.<sup>(3)</sup> Leveraging innovative new technologies will be important in increasing aerospace productivity and retaining and attracting activity to the UK.

Figure d. Major areas of focus for UK firms in aircraft development and production<sup>(2)</sup>

54% of A380 (with Rolls Royce Trent 900 engines) aircraft value is generated in the UK; 18% for the wings alone

*"There is a high level of knowledge and experience in the supply chain. We are a long way up the learning curve."*

**Clive Lewis, Managing Partner, Achieving the Difference**



Sources: 1) Press and public available information, retrieved in May 2013  
2) ADS  
3) KPMG interviews and discussions with industry participants, May 2013



# THE UK IS A PRIME LOCATION FOR CIVIL AEROSPACE

## A unique partnership approach to growth

**With new funding of over £1 billion pledged, the UK Government has reinforced its strong support for the civil aerospace industry and further strengthening the framework for growth.**

Successive Governments have created a stable environment for the UK civil aerospace sector. However, direct investment by Government into the sector has been limited historically.<sup>(1)</sup>

Recent initiatives, chief among them the AGP, ATI and NATEP, indicate a clear and sustained desire on the part of UK Government to work with industry to retain its number two position globally. The civil aerospace sector stands to benefit significantly in the medium to long term in areas such as funding support, R&D, and manufacturing technologies.

### How did the AGP come about?<sup>(2)</sup>

- The Aerospace Growth Partnership (AGP) and the Aerospace Business Leaders Group (ABLG) were formed jointly by Government and industry to work together to address strategic challenges to growth.
- The ABLG, chaired by the Secretary of State for Business, is the senior engagement forum for discussion of issues of strategic importance, building on previous initiatives, such as Aerospace Innovation and Growth Team (AeIGT).
- The AGP is chaired jointly by Michael Fallon (Minister of State for Business and Enterprise) and Marcus Bryson, VP Aerospace at ADS. It is charged with driving forward key strategic issues and removing barriers to growth.
- The ABLG meets twice per year while the AGP meets four times per year.

### Aerospace sector specific activities include:<sup>(3)</sup>

- **Aerospace Growth Partnership (AGP)** – a unique partnership between Industry and Government that has created a shared vision for the UK Civil Aerospace sector for the next 15 years and beyond.
- **Creation of the Aerospace Technology Institute (ATI)** - representing joint Government and Industry funding of £2 billion over the next seven years providing stability and assurance for investment in technologies which will deliver UK growth.
- **Aerodynamics Centre** – a £60 million investment in a state-of-the-art aerodynamics research centre (part of ATI) to achieve a step change in the UK's capability in complex aerodynamics.
- **National Aerospace Technology Exploitation Programme (NATEP)** – permitting the exploitation of mid-Technology Readiness Level capabilities through collaborative support in the lower tiers of the UK Civil Aerospace supply chain.
- **Creation of 500 new Masters level graduate places** – a Joint industry and Government bursary funding to attract and train skilled workforce to the aerospace sector.
- **Aerospace Finance Forum** – to help address sector specific issues relating to access to finance.
- **UK Trade & Investment (UKTI) Aerospace marketing pilot** – a Civil Aerospace industry marketing pilot abroad to access priority platforms and boost exports.

*"We are going to create this new Aerospace Technology Institute so we can bring together academics, researchers, engineers, designers - everybody - to make sure that we are always right at the cutting edge of all the new designs and technologies required in this very fast moving sector."<sup>(4)</sup>*

**Nick Clegg, Deputy Prime Minister**

*"NATEP will give smaller companies real leverage in developing new technologies because it injects not only funding but also R&D expertise and mentoring from large companies into them."*

**Dr Andrew Mair, Chief Executive,  
Midlands Aerospace Alliance**

Sources: 1) KPMG interviews and discussions with industry participants, May 2013

2) AGP - An overview for MRO & L Network, April 2012

3) HMG and AGP, Lifting off: Implementing the strategic vision for UK Aerospace, 2013

4) <http://www.bbc.co.uk/news/uk-england-21829499>



# THE UK IS A PRIME LOCATION FOR CIVIL AEROSPACE

## Government Commitment

**The broader UK business environment has also been improved through recently implemented Government cross-sector initiatives.**

The World Bank consistently ranks the UK as a top 10 destination in its 'Doing Business' report. Recent Government initiatives are likely to increase the attractiveness of the UK business environment in sectors including aerospace, automotive, energy and life sciences.

These initiatives will benefit UK-based civil aerospace companies and are likely to attract international companies to the UK.

### R&D tax benefits on offer<sup>(1)</sup>

- In the 2012 budget the UK Chancellor announced the 'patent box' tax relief to encourage investment in R&D and related manufacturing in the UK.
- The patent box became effective on 1 April 2013 and includes:
  - A lower rate of corporation tax on profits generated from UK-owned intellectual property.
  - Eligible profits from worldwide sales protected by a granted UK or European patent will be taxed at 10%.
- A new 'above the line' R&D tax credit available since April 2013.

*"I have been greatly impressed by the Government's close engagement with senior industrialists and others and the practical collaboration in developing robust and well-informed strategies."*

**Professor Sir Mike Gregory,  
Head, Institute for Manufacturing**

### Cross-sector Government initiatives include:<sup>(1)</sup>

- **Corporation Tax** – currently the lowest in the G7 at 23%, to be further reduced to 21% in 2014, and 20% in 2015 resulting in the UK having the joint lowest rate in the G20.
- **Annual investment allowance** – increased from £25,000 to £250,000 for two years from January 2013, accelerating tax relief on qualifying plant and machinery.
- **High Value Manufacturing (HVM) Catapult** – a Technology Strategy Board (TSB) programme with seven technology centres providing integrated capability and shared expertise to accelerate the commercialisation of new and emerging manufacturing technologies.
- **Advanced Manufacturing Supply Chain Initiative (AMSCI)** – a £245 million supply chain grant and loan fund, targeted at sectors such as aerospace, automotive and chemicals. Funding can be used for capital equipment, associated R&D activity and training/skills development.
- **Regional Growth Fund (RGF)** – a £2.6 billion fund for UK-based firms which runs up to 2016. £137 million of RGF funding is allocated to 16 aerospace projects. It supports programmes to create economic growth and sustainable employment.
  - EADS and GKN have received funding worth £1.96 million for industrialising a new process (Additive Layer Manufacturing), which could create up to 30 engineering jobs.
  - Aeromet International PLC also received a grant worth £1 million for R&D into its patented alloy A20X, adding 38 new jobs.
- **Apprenticeships** – Apprenticeship Ambition launched by the Sector Skills Council for Science, Engineering and Manufacturing Technologies (SEMTEA) with National Apprenticeship Service (NAS) aims at doubling to 16,000 the number of advanced and higher level apprenticeship registrations by 2016.
- **Talent Retention Solution (TRS)** – a national web-based solution bringing together engineering specialists whose jobs may be at risk or people who want to work in engineering with companies that are looking to recruit. It was created as a redeployment and retention tool but was expanded by business to allow students and apprentices to register, capturing their interest in working in the advanced manufacturing and engineering sectors.

Sources: 1) Multiple press and publically available information, retrieved in May 2013

# THERE ARE SUBSTANTIAL FUTURE GROWTH OPPORTUNITIES FOR UK COMPANIES

**Strong growth is expected in global aerospace to 2031, worth up to US \$4.5 trillion. This presents a huge opportunity for the UK to meet global demand.**

The UK industry has charted growth in line with global GDP trends over the last 10 years. It continues to enjoy a strong relationship with traditional hubs of development such as France, Germany and the US due to its association with companies such as Airbus. The UK supplies critical components such as engines, wings and composites across multiple global programmes. Global exports form 75% of revenue for the UK aerospace industry.<sup>(1)</sup>

With the global growth trajectory expected to continue, sustaining the UK's leadership position in civil aerospace could provide significant upside for the economy. Estimates for global civil aerospace opportunities to 2031 include:<sup>(1)</sup>

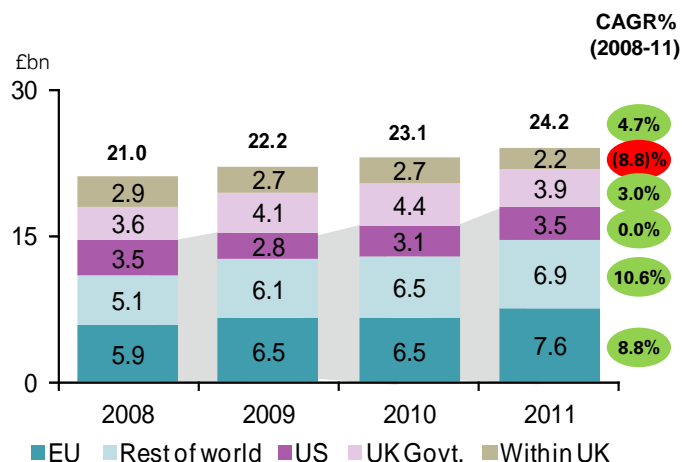
- 27,000 100+ seat aircraft worth US \$3.7 trillion;
- 24,000 business jets worth US \$648 billion; and
- 40,000 helicopters worth US \$165 billion.

Recent Government and industry initiatives should help maintain the UK's ability to sustain export growth.

*"There are projects we're working on in the UK that wouldn't have been considered without the AGP."*

**Alison Starr, Strategic Partnerships, GE Aviation**

**Figure f. Sales by destination for UK, 2008-11<sup>(2)(a)(b)</sup>**

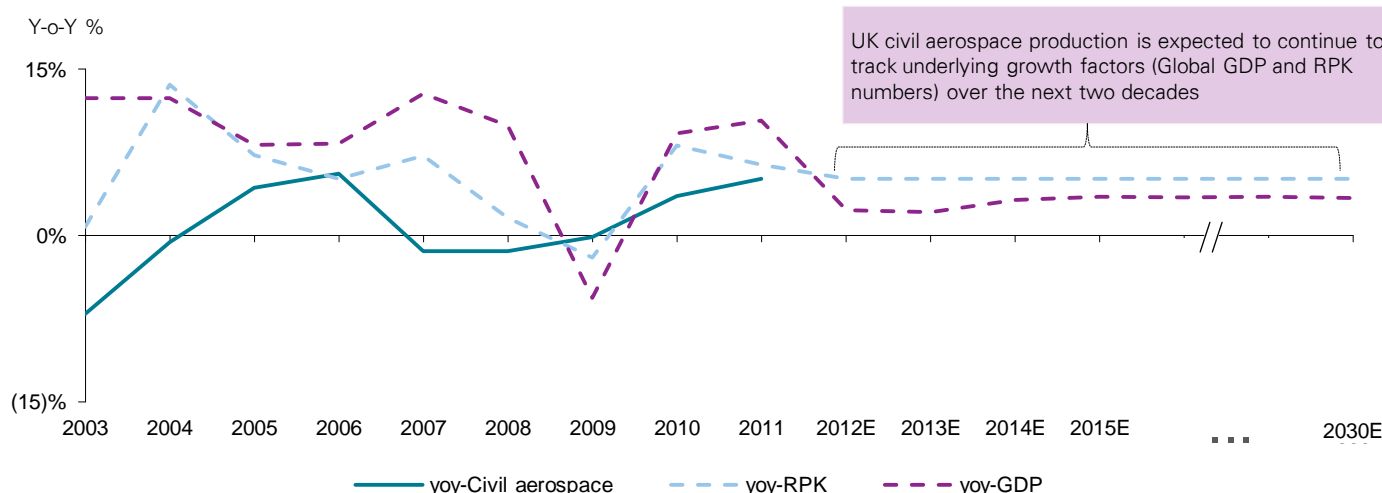


Note: a) Includes defence exports  
b) CAGR is abbreviation for Compound Annual Growth Rate

*"Wise investments will allow the UK to not just protect and stabilise the industry, but also enable long-term growth."*

**Michael J Ryan, CBE**  
**Vice President and General Manager,**  
**Bombardier Aerospace**

**Figure e. Growth in UK Civil Aerospace production versus global GDP and RPK: tracking future growth<sup>(3)(a)</sup>**



Notes: a) RPK is abbreviation for revenue per passenger kilometre

Sources: 1) HMG and AGP, Lifting off: Implementing the strategic vision for UK Aerospace, 2013

2) ADS Annual Survey, 2012

3) ADS / BIS, Oxford Economics, Airbus



# THERE ARE SUBSTANTIAL FUTURE GROWTH OPPORTUNITIES FOR UK COMPANIES

**Growth in civil aerospace will increasingly be driven by emerging economies. The UK is increasingly trading with them as well as highly developed markets such as the US.**

The expected surge of demand for fixed wing aircraft and helicopters is being led by high-growth economies from Asia, the Middle East and South America. These markets are expected to account for 58% of new fixed wing aircraft and 45% of rotor craft orders to 2031.

The US and other highly developed civil aerospace markets such as France, Germany, Canada and Japan will continue to be important trading partners for the UK over the next 20 years.

However, UK firms are actively seeking opportunities in high growth markets as their importance in the global supply chain increases. Major international OEMs and MRO providers (Maintenance, Repair and Overhaul) have shifted some activities to these countries or are planning to. This provides strategic market access and low cost production potential.

*"In the short term the UK can create more value by updating to modern manufacturing techniques; however, in the long-term we need to totally challenge the way in which products are designed and manufactured."*

**Neil Rawlinson, Director Strategic Development, The Manufacturing Technology Centre**

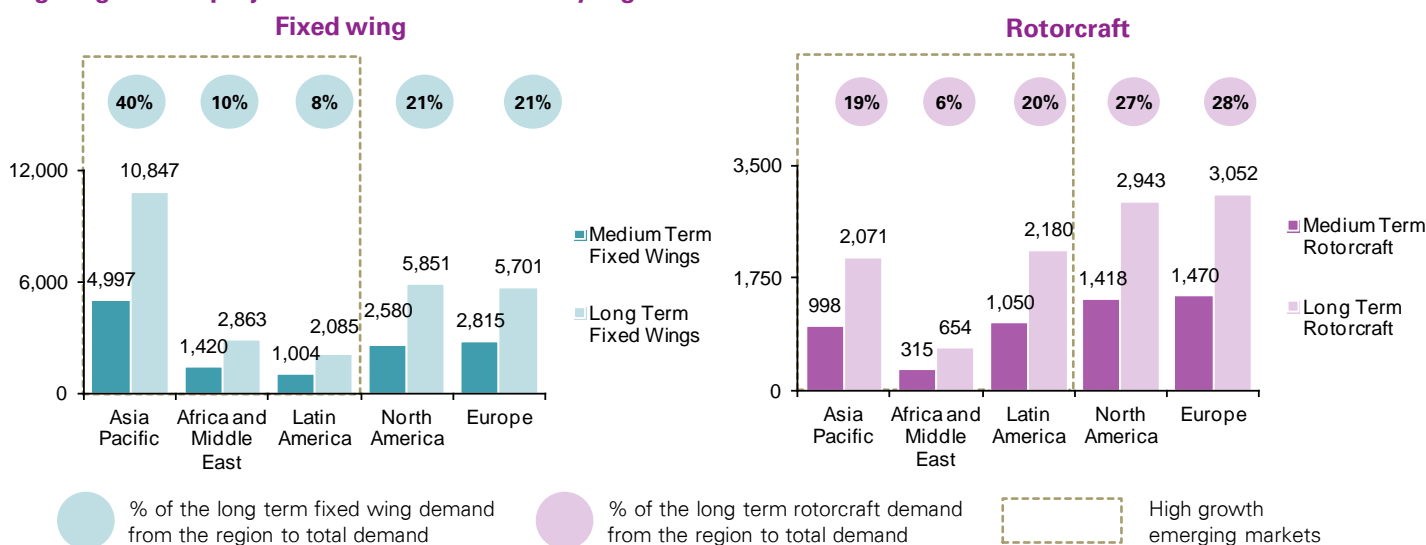
Recent major orders placed by firms from emerging economies <sup>(2)</sup>		
	Entity	Order Size
<b>A320 Neo</b>	Air-Asia	264
	Indigo	150
	Go Air	72
<b>A380</b>	Emirates	90
	Singapore	24
	Qatar	10
<b>A350</b>	Emirates	70
	China Airlines	14
<b>EC-135</b>	Multiple Indian firms	10
<b>AW 189</b>	Gulf International	15

**Emerging economies seeking to develop their civil aerospace manufacturing capability are looking for a greater foothold in the global market.**

- Only Brazil, with Embraer, has any prior experience of bringing a successful commercial aircraft to market and building a globally recognised brand.
- China is estimated to have invested over US \$9 billion in development of the C-919.
- Russia and India announced investments of over US \$6 and US \$1 billion respectively on national programmes.

To support their ambition, civil aerospace hubs are being developed. Incentives are being offered to foreign primes and suppliers to set-up greenfield sites or enter into joint ventures with domestic companies.

**Figure g. Future projections of aircraft orders by region<sup>(1)(a)</sup>**



Notes: a) Aircraft projections only include single / twin aisle aircrafts >100 seats capacity and not business / regional jets  
For fixed wings medium term is for period 2012 to 2021 and long term is for 2012 to 2031; while for Rotorcraft medium term is for period 2013 to 2017 and long term is for 2011- 2020  
Long term forecast numbers mentioned above are inclusive of medium term projections

Sources: 1) Airbus, Honeywell, Rolls Royce  
2) Multiple press and publically available information, retrieved in May 2013

# THERE ARE SUBSTANTIAL FUTURE GROWTH OPPORTUNITIES FOR UK COMPANIES

**Emerging players from countries such as Russia, China and Brazil are perceived to pose a competitive threat. However, new forms of collaboration with these potential customers represents an opportunity for UK companies.**

While Airbus and Boeing firm up orders for sales in the long-haul and twin-aisle category, they are facing increasing competition in the single aisle category from emerging players such as Embraer, Sukhoi, COMAC, Bombardier and Mitsubishi. This multi-country race for the skies is partly driven by the rising ambitions of companies from emerging economies.

Since development costs pose a major risk, emerging players require the expertise of established players. This is driving collaboration with companies such as Airbus, Boeing and some of their large suppliers.

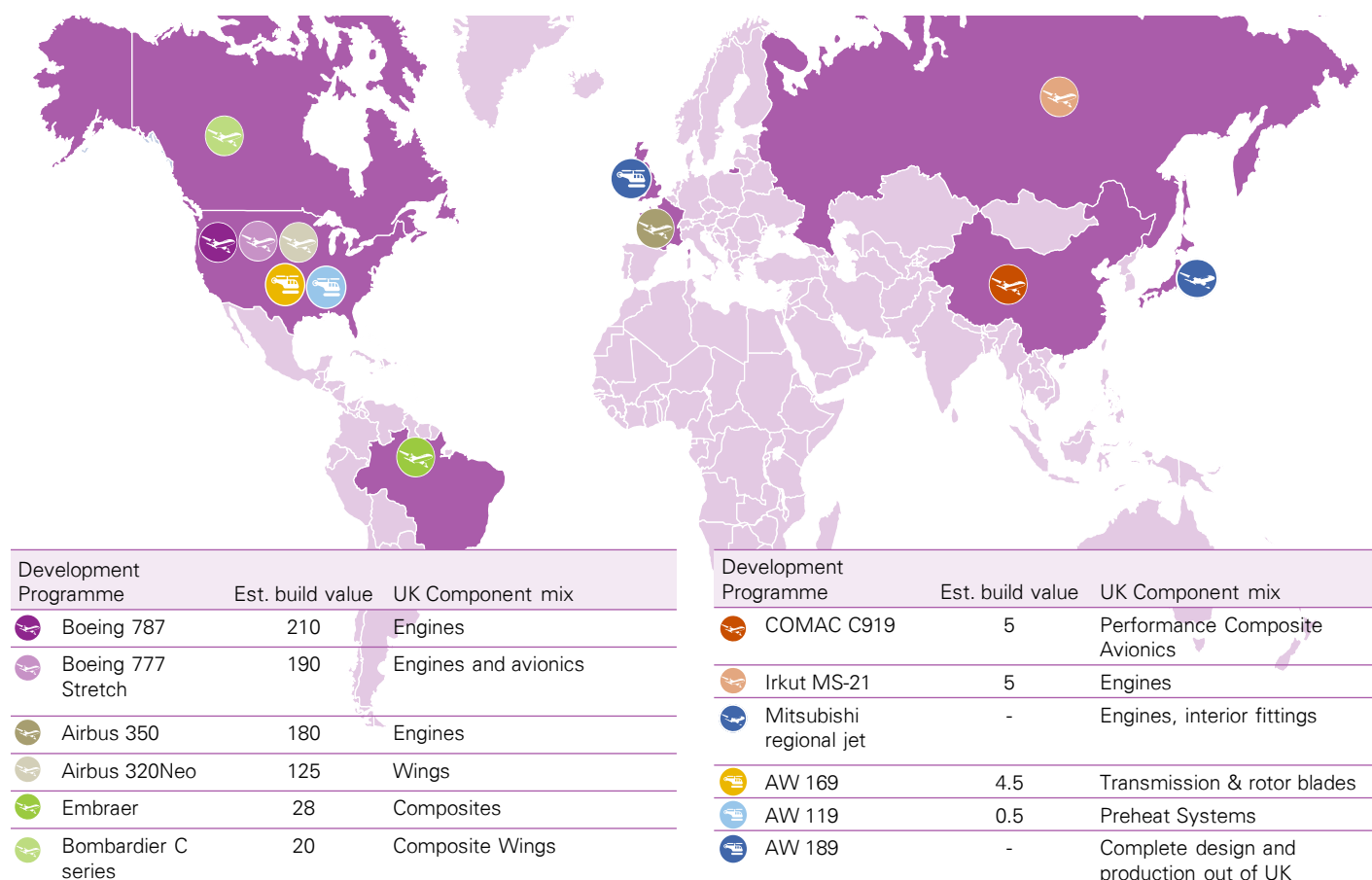
As a result, emerging players represent a partnership opportunity rather than a competitive threat for large and small UK companies. Some UK companies are seeking to set up satellite locations outside the UK – a trend which we expect to accelerate.

- Engaging with emerging players could enable UK companies to diversify their customer base and build a presence in markets where the majority of new aircraft demand is forecast to be generated.
- UK companies could channel part of their R&T budgets to new technology supported by emerging players as well as working with established players on existing platforms such as Dreamliner.
- Aftermarket activities could be particularly lucrative.
- Collaborating with a larger customer that has established a presence could provide strategic access to emerging markets for smaller UK firms.
- Capital funding grants support smaller UK firms with investment in capacity and manufacturing technologies to mitigate the labour-cost differential in emerging economies. Furthermore, initiatives such as the AGP's SC21 enhance performance by sharing the benefits of supply chain best practice.

*"The UK Civil Aerospace industry has an excellent reputation globally."*

**Carole Sweeney, Advanced Manufacturing, UKTI**

**Figure h. New and existing primes' major programmes: UK aerospace's contribution<sup>(1)(2)(a)</sup>**



Notes: a) All values in \$ billions for the period 2011-31

Sources: 1) ADS, UK Aerospace Export Outlook, 2013  
2) UKTI – "UK aerospace international strategy", 2010



# THERE ARE SUBSTANTIAL FUTURE GROWTH OPPORTUNITIES FOR UK COMPANIES

## Case study

The following case demonstrates UK-based companies ability to enter successful collaboration with a rising player from an emerging economy; China.

### GE Avionics: Serving global demand from the UK <sup>(1)</sup>

GE Aviation and AVIC Systems of China have formed a joint venture 'Aviage Systems', which has been selected to provide the avionics core processing, on-board maintenance and display system for the COMAC C919 single-aisle aircraft.

Aviage Systems will provide support for avionics integration that will include:

- Flight recording system
- On-board maintenance system
- Flight deck large-area display system
- Open-architecture, integrated modular avionics core processing system

The C919 modular avionics system will be the central information system and backbone of the airplane's networks and electronics and will host the airplane's avionics, maintenance and utility functions. The system replaces dozens of traditional, standalone computers fitted to aircraft flying today, generating weight savings, improved reliability and reduced operating costs.

The creation of Aviage Systems has helped enable GE Aviation in the UK to design and develop a substantial amount of the avionics core processing system on the new narrow body aircraft, providing the Remote Data Concentrators, designed to consolidate inputs from the aircraft's systems and sensors and distribute it via the aircraft's avionics network. GE Aviation in the UK already provides this type of equipment to Boeing and Airbus and this partnership has led to significant investment in the UK, employing over 50 engineers over the past three years, and creating a long term opportunity to access the significantly growing civil aerospace sector in China.



Figure 1: GE Aviation RIU-303 for the COMAC C919

Source: 1) GE Aviation UK

# THE UK HAS A STRONG INDUSTRIAL STRATEGY TO SECURE ITS AEROSPACE FUTURE

**The AGP is actively defining and implementing the strategy for UK civil aerospace over the next 15 years and beyond. This strategy sets out an ambitious plan of action.**

The intent of the AGP is to identify and drive new opportunities, remove barriers and work closely with business to ensure continued and sustainable success. Key to this is addressing the challenges the UK civil aerospace sector faces and ensuring real traction across all levels of the supply chain.

The AGP could provide the critical focus required to defend the UK's civil aerospace market position. It has identified priority activities in its strategy to secure the UK's civil aerospace position. It has also been successful in securing Government funding for the strategy.

*"The important thing about the AGP is to make it meaningful for companies at all levels of the supply chain"*

**Jonathan Conder, Head of Strategy,  
Marshall Defence & Aerospace Group**

There are a number of key next steps:

- Effective implementation will be critical to ensure that large and small supply chain companies benefit.
- Effective communication of the initiatives within all parts of the supply chain will also be critical. Sharing the same long term strategic view at all levels could align companies in terms of capacity, capability and delivery requirements.
- Initiatives focused on innovation such as the ATI and NATEP will need to align to ensure the R&T amongst large and small companies is complementary.
- Initiatives such as NATEP and AMSCI will help the UK civil aerospace supply chain to collaborate and evolve, however an appetite for evolution will also be required amongst individual companies.

Given the long term planning horizons in the civil aerospace industry, Government and industry should identify clearly the plan for investment into the sector.

*"The ATI is the last piece that provides a focal point for all stakeholders, Industry, Academia and Government to collaborate."*

**Dr Ruth Mallors, Director of Aerospace, Aviation and Defence, Knowledge Transfer Network**

## Key next steps and areas of priority for AGP, 2013<sup>(1)</sup>

Action items	Status
<b>Supply Chain Competitiveness</b> <ul style="list-style-type: none"> <li>• Take forward new ideas to accelerate technology exploitation within the supply chain</li> <li>• Develop a more strategic approach with UKTI to identify and pursue opportunities in overseas target markets and inward investment</li> <li>• Tackle access to finance issues through the newly created Aerospace Finance Forum</li> <li>• Enhance leadership and build best practice in supply chain management through increased collaboration between prime manufacturers and suppliers</li> </ul>	<ul style="list-style-type: none"> <li>• Government funding secured.</li> <li>• More work taking place to increasing exports.</li> <li>• Engagement Working Group set up to increase communication within industry.</li> </ul>
<b>Technology</b> <ul style="list-style-type: none"> <li>• Map capabilities and develop key technologies in areas with existing comparative advantage while concurrently addressing key gaps</li> <li>• Deliver the Aerospace Technology Institute (ATI)</li> <li>• Strengthen links between industry and academia</li> <li>• Maximise opportunities for UK industry to gain access to European programmes</li> </ul>	<ul style="list-style-type: none"> <li>• Centre for Aerodynamics set up and funded (£100 million).</li> <li>• Complete ATI set-up by the end of 2013.</li> </ul>
<b>Skills and engagement</b> <ul style="list-style-type: none"> <li>• Build on progress made by industry, Government, Semta and UK Commission for Employment and Skills to help secure the next generation of talent for aerospace; improve the image of civil aerospace as a career choice and increase the workforce diversity</li> <li>• Industry to work with Government to promote the benefits of investment in training and skills and look at the scope to develop a sector wide Industrial Partnership on skills</li> </ul>	<ul style="list-style-type: none"> <li>• Funding for 500 MScs.</li> <li>• More could be done to enhance the image of aerospace production to attract future talent into the industry.</li> </ul>
<b>Manufacturing</b> <ul style="list-style-type: none"> <li>• Embed world-class manufacturing processes and systems throughout the supply chain</li> <li>• Develop the aerospace Manufacturing Accelerator Programme (MAP)</li> </ul>	<ul style="list-style-type: none"> <li>• Over 600 SC21 signatories.</li> </ul>

Sources: 1) HMG and AGP, Lifting off: Implementing the strategic vision for UK Aerospace, 2013

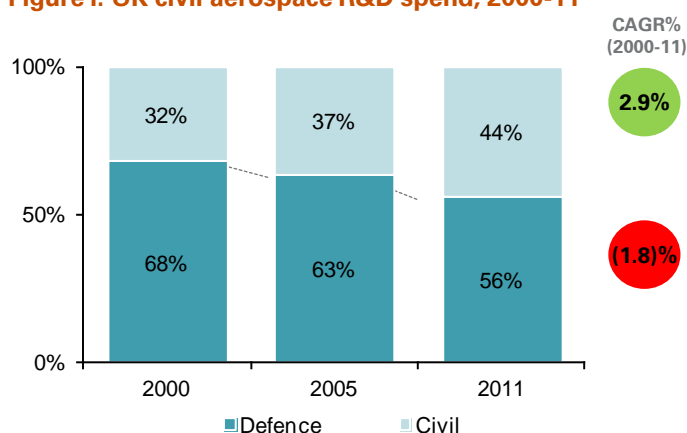


# THE UK HAS A STRONG INDUSTRIAL STRATEGY TO SECURE ITS AEROSPACE FUTURE

**Innovation is being driven by increasing investment in civil R&T which currently stands at almost £1 billion in the UK.<sup>(1)</sup>**

The ATI, NATEP and High Value Manufacturing (HVM) Catapult centres could create a step change in innovation in the UK. Historically, R&T has been driven organically in the supply chain with primes and tier one players typically taking the lead.

**Figure i. UK civil aerospace R&D spend, 2000-11<sup>(2)</sup>**



Note: a) R&D spend is inclusive of technology

*"The target for NATEP is 100 projects but there could be 500 good ideas out there amongst small and mid-sized companies."*

**Jeff Smith, CEO, Aeromet International PLC**

Multiple existing initiatives provide support to showcase new technologies:

- The Aerospace Technology Exploitation Programme by the Midlands Aerospace Alliance between 2006-12 resulted in 11 successful projects being funded and provided the proven model on which NATEP is based.<sup>(3)</sup>
- Farnborough International Airshow which hosted 109,000 trade visitors and 13 civil aerospace delegations from 10 countries in the 2012 edition.<sup>(4)</sup>

## Academia and industry are working in tandem to drive cutting-edge research into new technologies.

Successful examples of industry and academia working together can be found in the UK centre for Aerodynamics, the National Composite Centre, and the Manufacturing Technology Centre (part of the HVM Catapult).

The multi-level approach to innovation programmes identified and channelled by the ATI and NATEP enables funding and expertise to reach all levels of the UK supply chain. This provides the much needed connection between lower tier companies with primes and larger tier one companies.

The table below illustrates six projects allocated £48.2 million in grants by the UK Centre for Aerodynamics which provides funding for industry to work with institutions such as Cranfield University and Cambridge University.<sup>(2)</sup>

Initial projects launched under grants by the UK Centre for Aerodynamics <sup>(2)</sup>	
Project	Overview
<b>Advanced integrated Wing Optimisation (AIWO)</b>	<ul style="list-style-type: none"> <li>• Led by Airbus</li> <li>• Investigation into novel aerodynamic wing configurations for the next generation of Airbus aircraft</li> </ul>
<b>Structural Technology Maturity (STeM)</b>	<ul style="list-style-type: none"> <li>• Led by GKN and Bombardier</li> <li>• Support new concepts in wing structure and manufacturing</li> </ul>
<b>Integrated Turboprop Propulsion Systems (ITPS)</b>	<ul style="list-style-type: none"> <li>• Led by GE Aviation Systems (Dowty Propellers)</li> <li>• Investigate aerodynamic and acoustic performance of innovative propeller blade geometries</li> </ul>
<b>Experimental Dynamics (ExpAERO)</b>	<ul style="list-style-type: none"> <li>• Led by Airbus UK</li> <li>• Purpose is to gain deeper understanding of flows on transonic wings to enhance design methods</li> </ul>
<b>Aircraft Research Association Research &amp; Development (ARA R&amp;D)</b>	<ul style="list-style-type: none"> <li>• Led by ARA</li> <li>• Investigate fundamental aerodynamic aspects and capability enhancements in UK expertise for wind tunnel testing and its associated support technologies.</li> </ul>
<b>Aircraft Research Association Capital Equipment (ARA CE)</b>	<ul style="list-style-type: none"> <li>• Led by ARA with capital grant</li> <li>• Upgrade of Bedford facilities, including: the transonic wind-tunnel main control system, drive system and acoustic measurement system; computing system capacity upgrade and machinery for model manufacture.</li> </ul>

Sources: 1) ADS, UK Aerospace Annual survey, 2012  
 2) BIS – "Plan launched to keep UK aerospace flying", July 2012  
 3) UKTI, How the Aerospace Growth Partnership will Benefit the Supply Chain, April 2013  
 4) <http://www.farnborough.com/visitors/trade-about-fia-2012>

# THE UK HAS A STRONG INDUSTRIAL STRATEGY TO SECURE ITS AEROSPACE FUTURE

**With technology developing rapidly, the UK's R&T base is focused on securing its leadership in critical components as part of its growth strategy.**

OEMs are driving for platform and product technology innovation due primarily to;

- Airlines driving for more fuel efficient aircraft (Airbus show improvements in fuel efficiency of 20% for the A380, 25% - A350 XWB, 15% - A320neo).<sup>(1)</sup>
- Regulation demanding reductions in noise (50%) and CO<sub>2</sub> emissions (50% / km); and NOx emissions by 80% by 2020.<sup>(2)</sup>
- Requirement to improve helicopter safety (reduce accidents to 1.9 per 10,000 hours mandated by the International Helicopter Safety Team).<sup>(3)</sup>

Investment in innovation will be key to maintaining the competitive positioning of the UK supply chain.

**Positioning for programmes such as the next generation single-aisle is currently a key focus for the UK civil aerospace sector.**

Given lengthy development lead-times and procurement processes, scheduling for programmes such as the next generation single-aisle are currently being set out. Leveraging the UK's existing knowledge base and supply chain could help secure significant growth in these programmes beyond 2020.

Capability in technologies that will play a greater role in future platforms will enable the UK to compete more effectively against other markets. A number of UK companies are focused on enhancing domestic capabilities in important technologies such as composites and control systems. Funding and support through the AGP will help companies with these strategic initiatives.

*"The world takes an important view on what happens in the UK aerospace sector."*

**Simon Jones, Vice President, UKGBU, AgustaWestland**

*"There is one huge advantage the UK has in innovation; it is our education system that still creates innovative thinkers who are in general more inquisitive and less compliant. This is of huge benefit to us in the UK."*

**Colin Smith, Director Engineering and Technology, Rolls-Royce**

**Figure j. Addressable current and possible future programmes<sup>(4)</sup>**



Sources: 1) <http://www.airbus.com/company/environment/>  
 2) <http://www.cleantech.eu/content/homepage/aviation-environment>  
 3) <http://partners.decisionbriefs.com/rotor-and-wing/article/helicopter-industry-struggles-with-2016-safety-goal/>  
 4) ADS

# THE UK HAS A STRONG INDUSTRIAL STRATEGY TO SECURE ITS AEROSPACE FUTURE

**UK-based civil aerospace firms are driving innovative solutions to customer requirements. This could support further on-shoring of high-value activity back to the UK.**

Market forces and regulation are driving technological innovation to meet increasing demand. As a result, manufacturing technologies are a key focus due to<sup>(1)</sup>:

- Need for increased productivity and reduced cost;
- Quality improvement (100% on-time-in-full); and
- Evolving MRO needs (e.g. composite part repair).

Companies with advanced manufacturing techniques could mitigate the threat from low-cost markets. On-shoring of activity is typically driven by:

- High-productivity manufacturing methods which improve quality, cost and delivery – over the long-term, low cost destinations may be out-performed;
- Desire for near-sourcing in geographic clusters of excellence - this facilitates effective collaboration;
- Innovative talent pool and like-minded companies.

Providers such as Celestica and Jabil have demonstrated that on-shoring of activity to the UK is possible with advanced production techniques.

**Recent initiatives such as the ATI and NATEP could allow primes to work more effectively with SMEs and collaborate on future technologies.**

UK-based primes and tier one aerospace companies have a strong innovation focus, as do many companies lower down the supply chain. However, these smaller companies tend to be less associated with breakthrough innovations because of high R&T costs, challenges in accessing funding (capital expenditure and working capital finance), risk management or complacency.

Initiatives such as the ATI, NATEP and the regional High Value Manufacturing (HVM) Catapult technology centres could provide UK supply chain companies with visibility of future technologies and the support required to deliver innovation complementary to larger players' programmes.<sup>(3)</sup> Ensuring that these initiatives are coordinated in terms of technology focus should increase value from funding.

*"We are reviewing our supply chain strategy and we are seriously looking at on-shoring options."*

**Scott McLarty, Vice President UK Operations, Spirit AeroSystems (Europe) Ltd**

## Technology case study

### New alloys let heat exchangers work harder<sup>(2)</sup>

**Local SME Advanced Chemical Etchings (ACE) has worked extensively with Wolverhampton-based HS Marston (a UTC division) to develop innovative heat exchangers to cool aircraft engines**

The product is made from new metal alloys that withstand temperatures 300°C hotter than existing units.

#### Project outcomes

- ACE developed a new manufacturing capability to etch new types of metals and is considering expanding from R&T support and small batches into large-scale production.
- New technologies have driven revenue and employment growth for HS Marston on the world's most innovative jet aero engine; the Pratt & Whitney geared turbofan.
- The profile and reputation of both HS Marston and ACE is raised which has supported UK manufacturing employment when transfer to low-cost market was the alternative.



Sources: 1) KPMG interviews and discussions with industry participants, May 2013  
2) Advanced Chemical Etchings (ACE)  
3) HMG and AGP, Lifting off: Implementing the strategic vision for UK Aerospace, 2013



# THE UK HAS A STRONG INDUSTRIAL STRATEGY TO SECURE ITS AEROSPACE FUTURE

## Case studies

There are multiple success stories amongst UK firms that have charted a clear growth plan to capitalise on exciting global opportunities.

### Aeromet International PLC: reaping the rewards of Government funding<sup>(1)</sup>

Aeromet has taken advantage of available government funding streams made available through ATEP2 (NATEP predecessor), TSB and RGF. This has helped accelerate the commercialisation of a family of innovative high performance aluminium based metal matrix composite casting alloys and the birth of A20X. A20X is an innovative product delivering equivalent or superior mechanical properties to the most advanced mill products available today. Principal performance advantages include:

- improved specific strength and stiffness,
- higher operating temperature limits; and
- enhanced fatigue endurance.

The real value to customers is its ability to be moulded into complex and previously unaffordable solutions.

Aeromet continues to develop further additions to the A20X family. Through its targeted use of Government funding, Aeromet has been able to continue to develop its ability to deliver bespoke formulations tailored to specific applications. Examples of ongoing research include targeting specific mechanical properties at higher operating temperatures, the aim being to reduce the need to employ more costly, heavier and less environmentally attractive exotic materials such as Titanium.

Today, through Aeromet's innovation using Government funding, the business is able to offer significant reductions to customers in production costs and an improved environmental footprint relative to traditional techniques.



Figure 1: Demonstrator A205 fuel pump body

### The Mexican wave<sup>(2)(3)(4)</sup>



Note: a) Exports are for entire industry not just limited to civil aerospace sector

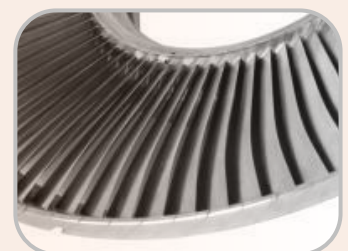
The value chain of critical industries is leading to setting up of new centres for aerospace in emerging economies. Mexico is becoming one of the most obvious examples, with the entry of Bombardier, Eurocopter, GE and Honeywell. According to a recent KPMG study, it is the most competitive country in Americas in terms of aerospace manufacturing costs leading it to become one of the major regions of capacity addition in global aerospace.<sup>(3)</sup>

The industry has managed to double its exports in the last five years through major hubs for aerospace related manufacturing located in<sup>(2)</sup>:

- a) Baja & Chihuahua – Electrical & Electronics parts
- b) Queretaro – Engine components & sub-assembly
- c) Sonora – Turbine blades and engine components
- d) Nuevo Leon – Overhaul and maintenance

JJ Churchill is amongst the initial group of UK SMEs to enter Mexico forming a JV to manufacture turbines with the Offshore Group.

The JV aims to double turnover for UK-based firm from £23 to £50 million by 2019 as the Mexican venture helps boost its UK demand.<sup>(4)</sup>



Sources: 1) Aeromet International PLC  
2) ProMexico – "Flight Plan", 2012  
3) KPMG, "Competitive Alternatives - KPMG's Guide to International Business Location Costs", 2012  
4) Press and publicly available information, retrieved in May 2013

## CLOSING REMARKS

**KPMG believes that civil aerospace is one of the most dynamic sectors in the UK and well positioned for strong future growth. The initiatives launched by Government and industry present opportunities to attract overseas investment as well as to enable UK companies to take advantage of significant growth opportunities.**

The UK clearly has an attractive position in the large and growing global aerospace industry. However, recent announcements by industry and Government indicate that the UK is not complacent about its position. Our conversations with industry participants highlight a breadth and depth of collaboration aimed at overcoming barriers to further growth.

- We understand that the AGP is working through solutions to give greater certainty to supply chain companies in areas such as contracting. This could increase confidence amongst smaller companies to invest in longer-term strategic projects.
- Initiatives such as the ATI could help align planning horizons among large and small supply chain companies. Planning for medium term (10-15 years) opportunities such as next generation single-aisle requires immediate action and collaboration.
- Initiatives such as NATEP should support smaller companies to innovate in products and manufacturing techniques. This could help the UK aerospace industry to out-perform global competition for technology and production. Furthermore, consolidation in the lower levels of the supply chain could help these companies build economies of scale to invest in R&T.
- The UK benefits from a talented pool of over 230,000 people working in the sector (directly and indirectly). A number of companies we spoke to are actively recruiting apprentices and working to attract future talent. Effectively delivering the message about the rewards of working in

this dynamic sector should secure more home-grown talent.

- Initiatives such as the ATI, NATEP and the Patent Box legislation should increase the attractiveness of the UK as a centre for intellectual property rights (IPR) protection. Providing security for IPR give the UK a distinct competitive advantage over some high-growth competitors.

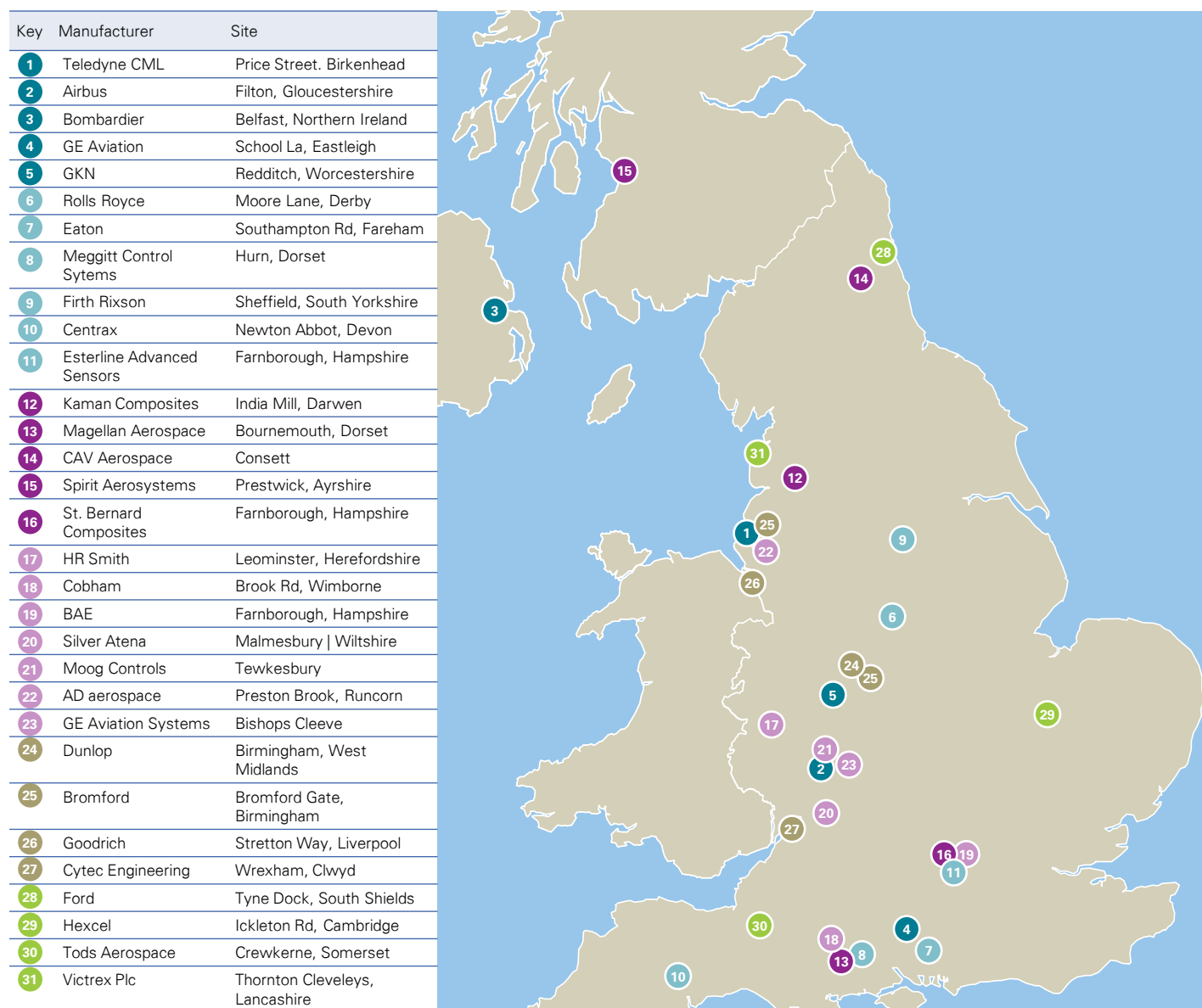
It is clear from aerospace forecasts and our discussions with industry participants that civil aerospace companies are excited about the future. Announcements of recent initiatives have been great news. Government and industry need to maintain this momentum and ensure that the initiatives are implemented effectively so that the AGP can build on the success it has achieved to date. The UK should also consider a successor to the AGP when it comes to a close in seven years. Long term success in the aerospace sector can only be achieved with continued strong and coordinated long-term planning.

Glynn Bellamy, Sarah Owen-Vandersluis  
KPMG LLP (UK)



# Appendix 1 – UK CIVIL AEROSPACE CLUSTERS

**Figure k. Locations of selected UK civil aerospace companies**



\*Note: Names mentioned above are in no order of preference, and merely pulled out from the ADS member list to illustrate capability strength of the value chain in UK and its spread across the entire breadth of country

● Wings ● Engine ● Aerostructures ● Avionics ● Landing Gear ● Composites

**Figure l. Key contact index**

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