

Welsh Assembly Government:

Executive Summary:

The Welsh Assembly Government has directly invested in developing the physical infrastructure, learning and skills and supply chain businesses within the sector.

Advanced Materials including composites is an R&D and commercialisation priority identified by Welsh Ministers for HE in Wales.

In January 2008, the Welsh Assembly Government, working through Deeside College, commissioned BIC Innovation to undertake a study to identify the demand for composites skills training linked to the aerospace sector in Wales. The final report highlighted an opportunity to create a National centre for composite skills as part of a wider vision to develop an innovative aerospace community located the Deeside area

A follow up report considered the wider advanced materials economy and highlighted that with targeted investment over the next 10 years the cross border North Wales/North West England region could be developed into an internationally renowned applied knowledge hub for advanced materials and manufacturing systems. This vision proposes a thriving advanced manufacturing-led cross border community that encompassing high value manufacturing and skills, applying new manufacturing technologies and processes through:

- A fully developed technology ready supply chain.
- Skilled Workforce
- Composite Research and Development partnerships and expertise.
- Suitable infrastructure to house advanced manufacturing companies, indigenous and inward.

The all-Wales workforce for composites, across the 80-plus identified composites businesses, is difficult to estimate but is probably in the region of 1,500 – 2,000 in total today. This number will increase dramatically over the next 3 years as not only Airbus moves into composites manufacturing but also a sizeable proportion of the workforces at the MRO operators and supply chain will need to be trained in composites and composites maintenance and repair. This will provide a critical mass within Wales for skills related composites training

Wales have made a commitment to increase the number of places for apprenticeship training over the next three years which will include composites training where appropriate.

Welsh Assembly Government:

Composites Skills in Wales Overview

According to the National Composites Network (March 08 – NCN Draft report into UK Composite Training Provision) the composites industry has grown steadily for over 50 years, with a current global market revenue for finished parts of approximately £25billion and their predictions suggest a continued growth of 4-5% per annum for the foreseeable future.

This growth has been achieved as a result of the development of new and improved materials and associated manufacturing processes. There have also been significant performance improvements in the costs of new product development. As a consequence, industry has continued to extend knowledge and skills, supported in the main by the materials suppliers and by in-house R&D groups.

The UK Composites Industry is estimated at nearly £1billion turnover associated with the manufacture of finished composites parts. The NCN Report lists Airbus UK as the No1 OEM already (see below) although its current utilisation of composites is relatively modest versus its future transformation of composites manufacturing at Broughton.

The challenge is with the embedding of composites at companies such as Airbus similar development occurs within the supply chain from a low base currently to maximise the economic multiplier.

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Welsh Composites Workforce

Our estimates for the composites skilled workforce in Wales are therefore:-

2008	1,500 - 2,000
2010	2,000 – 2,500
2012	4,000 – 5,000

The establishment of other new composites manufacturers, i.e. on top of Airbus, would further add to the total composites workforce in Wales.

Recent technology road mapping carried out by the NCN has flagged up a significant skills shortage in the UK composites industry at both the operator and professional level in support of existing business delivery as well as maximizing growth opportunities in the current buoyant climate. Currently training across the industry takes place largely in-house either through in-house transfer from more experienced staff, already prepared short courses or via bespoke training courses. This results in an ongoing cost that the employer has to bear for all new staff joining the company as well as continuing development. In such a climate of changing technology and associated skills there is an increasing need for ongoing training for existing staff to implement these developments.

Whilst there are some appropriate Occupational Standards and National Vocational Qualifications the relevant composites content is often only a part of a broader scope and the provision of accredited courses is limited. As a consequence the take-up by the composites industry is very limited. This has resulted in there currently being limited accreditation of the training that does take place or subsequent certification of the personnel completing the training.

Smaller companies in particular are seeking to have training that is job-specific rather than generic, to be delivered in-house rather than at an off-site facility, and to be supported by external grant funding. However, these same companies are not motivated by funding solely linked to qualifications, particularly where these are seen as only acknowledging existing skills rather than gaining new, job-centred ones. Few companies are aware of relevant qualifications for occupations in composites at any level.

At an academic level the provision for composites training in Higher Education Institutes is also limited and typically only forms a small part of more general engineering courses. There are, however, a significant number of universities with strong research capabilities which continue to produce high calibre post-graduates specific to composites technologies. Many are from abroad, however, and return to their home countries after graduating. This, therefore also leaves a gap in the skills base for the industry in the UK".

Wales Composites Skills Actions

In January 2008, the Welsh Assembly Government, working through Deeside College, commissioned BIC Innovation to undertake a feasibility study to identify the demand for composites skills training linked to the aerospace sector in Wales. The final report highlighted an opportunity to create a National centre for composite skills as part of a wider vision to develop an innovative aerospace community located the Deeside area.

Discussions have taken place not only within Wales, but with cross border organisations including the Mersey Dee Alliance and NWAA and the NCN & SEMTA on a national level. See next section on Strategic Developments.

Advanced Materials (which include composites) often represent significant competitive advantage over other materials, especially metals and plastics, across a wide spectrum of sectors including automotive, marine, renewable power, healthcare, construction and interior products, tanks and enclosures, consumer sports and leisure. Many of these sectors are economically and strategically important to Wales and form part of the 14 sectors identified by the Welsh Ministerial Advisory Group

Apprenticeships

Apprenticeships are unique, part of both the education system and the world of work. They offer a combination of paid employment (or work experience for Foundation Modern Apprenticeships) with on-the-job and off-the-job learning, delivered in partnership between employers, learning providers and the Assembly Government.

Apprenticeships are based on frameworks of job-specific and transferable learning, specified by Sector Skills Councils (SEMTA), formally recognised through qualifications and credit. For young people, apprenticeships provide an excellent bridge between full-time learning and employment, and for adults, they offer the opportunity to improve skills and gain qualifications while still earning.

Wales have made a commitment to increase the number of places for apprenticeship training over the next three years.

The Welsh abolition of the upper age limit for apprenticeships (unique in the UK) has already enabled a broader range of people to benefit from the programme.

The Welsh Assembly Government (WAG) is funding a new scheme to boost apprentice numbers in Wales. Its Pathway to Apprenticeship programme will support 650 young people on a one-year programme.

Leading to NVQ level 2 in Performing Engineering Operations, six Key Skills and the Welsh Baccalaureate at intermediate level.

SEMTA has represented employers' interests including Aerospace to WAG and provided guidance on shaping the initiative.

In addition the Advanced Materials skills training at Airbus and across Wales in the Aerospace supply chain will directly affect the training within the FE and HE sector of 1100 modern apprentices directly within the Airbus contracts with Deeside College, and an estimate of a further 1500 in sector related training within FE and HE over the 7 years based on current estimates.

However as the knowledge within the supply chain and other sectors increase, we would expect this to rise to over 3000 people a year being trained in new technologies based on estimated workforce predictions

Therefore providing a critical mass with Wales in skills related composites training

SEMTA

SSC Engagement in NOS (National Occupational Standards) in new technology areas, and course development

- SEMTA in Wales within the Aerospace Sector, Primes and MROs with the aerospace forum to pilot a review their own needs and their of supply chain capabilities and deliver and Action Plan for improvement

- Semta is currently establishing appropriate linkage to existing National Occupational Standards (NOS) and identify and close any gaps in the NOS within Advanced Materials In Wales SEMTA have identified the Credit and Qualification framework as a key to bring forward new developments
- Airbus in Wales is taking the lead within the Aerospace Manufacturing Employers in the development of National Occupational Standards for NVQ level 3 Aeronautical Engineering (Composite / Metal Assembly). With the help of Deeside College Airbus are developing the NOS to ensure it is fit for purpose in the changing landscape of Aircraft manufacturing in the 21st century. SEMTA in Wales will then through this partnership develop the NOS through national routes and also directly into the Welsh Credit and Qualification framework to allow fully delivery across Wales
- Framework for Foundation Modern Apprenticeship. NVQ level 2. (This is being worked on with the support of Deeside College, SEMTA and EAL) Airbus expects to have this completed early 2009 and will be innovative in its format recognising in-house courses as the Technical Certificate for the apprenticeship. This will then be developed into the Aerospace supply chain across Wales by providers and SEMTA.
- Airbus has been part of the strategy-working group for the development of the Strategic Workforce Development programme. This will be significant for our sector in producing a tool for employers that will help them in the identification of a demand signal for the skills their workforce will require to meet the demands of the business strategy. This will then be developed into the Aerospace supply chain across Wales by providers and SEMTA

Welsh Support for Workforce Development will be delivered through:

- an expanded Workforce Development Programme, facilitated by a network of quality-assured Human Resource Development Advisors;
- specific support, through the Workforce Development Programme,
- a centre of excellence for leadership and management in Wales to coordinate information and drive up the quality of provision;
- the Basic Skills Employer Pledge to tackle basic skills needs in the workplace;
- an expanded Wales Union Learning Fund, using the Union Learning
- an Apprenticeship Programme providing entrants (of any age) to a sector with the suite of skills and competencies they and their employers need.
- a new Sector Priorities Fund to align our investment in adult skills to strategic sector needs, as identified through Sector Skills Agreements, Sector Qualifications Strategies and their action plans. SEMTA are developing a £4 Million Pound Bid into the Welsh Assembly Government , through this fund , which will fully support the Aerospace sector in the development of NOS , Apprenticeship's ,and new up skilling skills.

This means that any Aerospace company in Wales, can access Workforce Development support, in relation to developing a strategy for Advanced Materials, through targeted direct support for their business

Skills that Work for WALES

Skills that work for Wales is the agreed “Welsh Skills Strategy” that fully embraces and supports the delivery of the UK Government “Leitch Review” (2007) and the Webb Review (2007) in developing high value skills within Wales and the UK.

- The Aerospace sector supports “The Skills That Work for Wales” and the work with the Welsh Baccalaureate is to be used in conjunction with Apprenticeships.
- The Aerospace sector in Wales recognises the challenges that face Wales in supporting young people with the choices they have to make. The 14-19 Learning Pathways as described in “Vision into Action” was an excellent start and the proposal as suggested in “Skills That Work for Wales” in placing a duty on Head teachers, governing bodies, local authorities and further education institutions to secure a minimum learners entitlement is real progress. To support young people being confident that the choices they make are right for them and fully reflect their aptitudes and potential.
- Airbus is working on a pilot with a local School, Deeside College and SEMTA on a 14-19 Work-based Learning Pathway Pilot. Airbus has committed to a minimum of 20 days employer linked learning over two years. As part of our commitment we have taken the 15 young people to a number of manufacturing companies, such as Sharps, JCB, Kelloggs and Toyota. We have also taken them to one of our Wing and Pylon Manufacturing sites in Bremen Germany. This will assist in them achieving Wales Europe and the World element of their Welsh Bac. SEMTA will look to expand this best practise across the Aerospace Supply chain

A Key output within Wales is the development through SEMTA of new skills

- Smaller companies in particular are seeking to have training that is job-specific rather than generic, to be delivered in-house rather than at an off-site facility, and to be supported by external grant funding. However, these same companies are not motivated by funding solely linked to qualifications, particularly where these are seen as only acknowledging existing skills rather than gaining new, job-centred ones. Few companies are aware of relevant qualifications for occupations in composites at any level.
- At an academic level the provision for composites training in Higher Education Institutes is also limited and typically only forms a small part of more general engineering courses. There are, however, a significant number of universities with strong research capabilities which continue to produce high calibre post-graduates specific to composites technologies. However in Wales we will have next year the a MSC in Composites delivering a range of units and full qualifications globally.

Training required within Airbus

In the period 2008 to 2015 Broughton will still be producing large numbers of metallic wings for the A320 family, A330/A340, and A380 and aircraft, with the ramp up of production of the first composite wings (for the A350 XWB) starting in 2010. The training profile is in line with this build programme scenario, recognising the significant remaining presence of the metallic winged products in this period.

At present Airbus is at the preliminary stage of defining their training programme that will span the next seven years and will no doubt be subject to change throughout that period. It is the intention to create a framework which will demonstrate the broad direction of the Airbus training programme, and to develop flexible KPI's that can respond to the changing requirements through agreed targets at the micro level.

The A350 XWB wing already in development is embodying current composite wing technology standards derived from learning from past R&T programmes and the manufacturing processes that will be employed for its production that will start in 2010 are already well defined. The manufacturing process is moving from a traditional metal fabrication process to one of precision engineering which includes milling and bonding technologies.

Thus the North Factory workforce will be trained in the use of these manufacturing processes for the production of the first composite wings (for the A350 XWB) to be made at Broughton.

The key linkage for Wales is the ability of SEMTA to use this information to inform the NOS as above and drive these developments pan Wales.

Strategic Developments.

Proposal for the Development of an Advanced Materials Economy for Wales

The Welsh Assembly Government has directly invested in developing the physical infrastructure, learning and skills and supply chain businesses within the advanced materials sector in aerospace.

Advanced Materials including composites is one of the R&D and commercialisation priorities identified by Welsh Ministers for HE in Wales.

In support of this officials have recently commissioned a feasibility study into the development of an advanced materials economy, centred on Broughton, in the cross border region of North East Wales and North West of England known as the Mersey Dee Alliance region "MDA". This study seeks to identify how the region can build on existing advanced manufacturing in the region through the presence of blue chip companies such as Airbus, Toyota, Corus, Vauxhall and their associated supply chains.

The Proposed Vision is:

- “By 2020 the MDA region will be recognised internationally as an applied knowledge hub for advanced materials and manufacturing systems.
- A thriving advanced manufacturing-led cross border community that encompasses high value manufacturing and skills, applying new manufacturing technologies and processes through:
 - dynamic networks of academic teams and institutions,
 - full developed supply chains, and
 - an expanding number of innovative SMEs across the region.
 - proactively stimulating inward investment in advanced materials including composites.
- Transformation of manufacturing skills and its provision in the MDA region.
- Make the MDA area “*a clever place*” and secure the long term future of existing blue chip companies in the region.
- Create up to 1500 high value engineering jobs from supply chains, expansion and inward investments.
- Enabling step change at Welsh Universities through UK and global academic partnerships.
- Collaborative UK/International approach to obtaining expertise to support development of the vision

Proposition:

-Advanced Materials and Methods Centre of Excellence located in Deeside area:

- Training & Skills Centre (UK centre of Excellence for NCN aspiration.)
- Methods & Processes Centre
- Knowledge Transfer Centre
- Glyndwr University R&D Centre
- Visitor Centre

-Hawarden Business Park to be developed into an High Value Engineering Village to support supply chain activity.

Next Generation Composite Wings:

NGCW will develop low-cost manufacturing technologies that will enable high volume wing manufacture for next generation aircraft. Future design processes will help to further reduce airline operating costs, airframe weight and maintenance. The programme will also benefit Britain by bringing inward investment to the regions by industrial partners and central Government, as well as generating high value jobs and intellectual property.

Welsh Assembly Government has committed £7.5mill over the life of the NGCW project to support development in composites at the Broughton site, along with the development and up skilling of a Welsh composite supply chain.

Supply Chain

In a paper published by Advanced Institute of Management Research in 2004, the leader author Dr Tim Edward, Lead Scholar, Cardiff University and others made a proposal for UK firms to be encouraged to create more value through strategic innovation. The paper advocated that companies move up the value chain through strategic innovation, based on better practices, product and service innovation in order to generate more value. Key policy implications were as follows:

Next Generation Composite Wings Supply Chain event:-15th Oct:

The Welsh Assembly Government and the North West Development Agency are jointly facilitating a Airbus led NGCW supply chain event. The purpose of this event to identify how the supply chain can work together across all tiers to find solutions to the technical challenges of the project with the result that the UK provides leading edge solutions for composite wing manufacture.

Flexible Support for Business/Business Innovation Programme:

Part of the Welsh Assembly Government's Flexible Support for Business and part funded through Europe Business Innovation is available to a range of businesses including those involved in composites..

Business Advisors, Innovation Managers, design advisors and manufacturing advisors based throughout Wales, provide free business advice on innovation and technology. which includes a technical review of business, identifying innovation needs and helping access to appropriate support and funding to support companies to adopt new technologies and develop new products.

Knowledge Exchange

EU Structural Funding has been utilised to enable investment in high quality, high impact research and development. Welsh Ministers have agreed priority areas for funding following consideration of the Assembly Government's agreed strategic sectors, the latest Research Assessment Exercise results and a detailed mapping exercise. Advanced Materials including composites has been defined as a priority area.

All Wales Academic Capability:

Further Education and Higher Education further linkages

Airbus is currently working with Glyndwr University in developing an academic framework in support of higher level skills in composite materials underpinning manufacturing engineering competency requirements.

Airbus and Glyndwr are also working closely with Bath and Bristol University as part of the higher skills 'Pathfinder' project and have started discussions with Liverpool University regarding their composite capability. The objective is to develop a wide range of courses (NVQ

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level 4/Foundation Degree up to MSc level) that will satisfy generic development needs within the composite sector and specific applications for the aviation industry aligned to Airbus processes.

Airbus have been working with Deeside College and their F.E partners (e.g. Barry College) in developing composite technical units aligned to National Occupational Standards (NOS) in support of the Airbus Apprentice programmes.

Airbus are also in discussions with numerous partners including the WAG and Deeside College with regards to developing a composite assembly practical training centre within the Deeside area."

Current Welsh Academic Projects

The following is a selection of current composite based academic projects within Wales.

Capacity building

Project name	Funder	Description
ArROW (In dev)	HEFCW	Research institute focused on aerospace research – Swansea will take the lead on one of the 3 strands “ 21 st Century Manufacturing Composites and Structures”. Likely to be funding key academic posts in this area in multiple universities.
Glyndwr University Composites		Recruitment of Composite Professorship and Researchers.

Knowledge Transfer

Project name	Lead	Partners	Funder	Description
Welsh Composite Centre	Swansea Uni		WAG/EU	Knowledge transfer Centre developing from the composites network
Industrial Biopolymer KTC	Bangor	Various	WAG/EU	Development of novel biopolymers for a broad range of industry packaging, auto,
Performance Engineering KTC	Cardiff School of Engineering		WAG/EU	The general remit is much broader than composites. However incorporates performance engineering who have a “ large” autoclave, also working on testing and modelling of composites
Lightning lab	Cardiff uni –	EADS and others	WAG/EU	Development of centre for testing of composite material and its resistance to lightning strikes. This will be used by manufacturers of composites, lightning conductors and aircraft manufacturers.

Collaborative research

Project name	Lead	Partners	Funder	Description
TWI	TWI - Phil Wallace	Airbus, RR, GKN, Bombardier	Private and potential SIF	Non destructive Testing and inspection of composite structures
Environmental monitoring of composites	Swansea Uni		WAG/EU	Modelling
Cutting of composites	Swansea Met -		WAG/EU	Cutter and an autoclave
Repair of Composites	Swansea Uni		WAG/EU	

Academic Groups:

School of Eng Cardiff –	CUSP and KTC in Engineering , they have an autoclave facility and have been doing work on acoustic emissions testing applied to composites
School of Eng Swansea,	C2EC and Materials, Complex fluids. Involved in the design and testing of composites and modelling of behaviour
Bangor -	Bio Composites
Glyndwr University	Advanced Polymers ,
Swansea MET -	NDT, Design
ICAT (Barry College/Deeside College)	EASA licensed MRO training provision.

Green Jobs

The Welsh Assembly Government has recently launched *Capturing the Potential, A Green Jobs Strategy for Wales*. This strategy delivers the commitment made in the One Wales programme of Government to develop a Green Jobs Strategy.

It is an important component in stimulating the recovery from the current economic downturn, as well as strengthening our commitment to combat the causes and impacts of climate change.

This Green Jobs Strategy sits within the context of the Welsh Assembly Government's Sustainable Development Scheme, *One Wales: One Planet*, under which sustainable development will be the central organising principle of the Welsh Assembly Government. The Assembly Government's approach to tackling climate change, and making the transition to a low carbon economy, is framed within that context and will be a critical element of putting the Scheme and our commitment to sustainable development into action.

The *Climate Change Strategy – High Level Policy Statement* was consulted on at the start of 2009 and the subsequent *Climate Change Strategy – Programme of Action* is now out to consultation. It sets out specific proposals aimed at reducing emissions in transport, the residential sector, business, the public sector, waste, agriculture and land use change. It builds on existing action in Wales and action being taken by the UK Government and at European level.

Within this context, the *Green Jobs Strategy* promotes the greening of existing jobs through more efficient use of resources and stimulates new green jobs by helping to develop skills, innovation and new technologies, and a strengthening of the low carbon energy sector in Wales. The Welsh Assembly Government aims to extract the maximum regeneration benefits in terms of new 'green' jobs, training and supply chain development. This work is being taken forward in conjunction with the private sector and Sector Skills Councils which will result in a skills delivery blueprint for one spatial area which can be applied to other regeneration areas in Wales.

New technology will be the key to meeting these targets and it will also provide significant opportunities for business development.

<http://wales.gov.uk/about/strategy/publications/business/greenjobs/?lang>

The aim is to support businesses in Wales in the transition to a more sustainable economy, and to capture the potential opportunities in new technology and innovation. Some examples of our actions are given below and also include efforts directed through our low carbon and advanced manufacturing focused science policy and the existing sector fora in Wales including those in the automotive, aerospace and construction sectors.

In implementing the Wales green jobs strategy, both in Wales in supporting indigenous operations and overseas with our inward investment activities, the Assembly Government will be working with companies and other organisations to this end.

Stakeholders committed to and embracing these developments include SEMTA, Glyndwr University, Swansea University, Airbus, Hawker Industries, Deeside College, Barry College, Mersey Dee Alliance, Welsh Composites Centre Technium Optic.

Research and Development

Three of the major sustainability research projects currently underway in Wales are:

i) The Low Carbon Research Institute (LCRI). This is being supported by the Welsh Assembly Government until 2013. The four main streams of activity are:
Low carbon energy generation, storage and distribution;
Energy demand reduction including zero-carbon built environment, and work on large scale power generation; An energy Graduate School; and Partnerships with industry, research organisations and government.

Developing low carbon economic activity across the country

ii) The Institute of Biological, Environmental and Rural Sciences (IBERS). This venture has received substantial support from the Welsh Assembly Government. Around 300 research, teaching and support staff conduct basic, strategic and applied research in biology from the level of genes and other molecules to the impact of climate change and bio-energy on sustainable agriculture and land use.

iii) Climate Change Consortium Wales (CCCW). The consortium undertakes a strategic reconfiguration of climate change research in Wales and increase international competitiveness, with a view to achieving sustainability.

Zero Carbon Hub Wales

In sustainable construction, the Welsh Assembly Government has established a Zero Carbon Hub Wales that acts as a focal point to coordinate policy and delivery and links with the UK Zero Carbon Hub over common areas of interest. The Zero Carbon Hub Wales is ensuring that the construction industry is fully involved in delivering our zero carbon aspirations and maintaining the momentum and credibility to allow Welsh industry to react quickly to market opportunities.