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Lessons learnt from development and implementation of a Composites Strategy in the UK

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Overview

- ▶ Introduction
- ▶ UK Composites Strategy
 - ▶ Background work
 - ▶ The Strategy
 - ▶ Implementation
- ▶ Lessons learnt and comments



Introduction

- ▶ The invention of carbon fibre at RAE in the UK means that many people see the UK as the birth place of composites.
- ▶ However, being a technology that crosses so many industry sectors meant that there was no overall UK strategy for the development of composite technology and UK expertise began to slip.
- ▶ It took the establishment of a team of people from across-Govt who understood the potential of the technology to start the ball rolling on an overall strategy.
- ▶ This presentation documents the history of the UK Composites Strategy development, launch and implementation and tries to draw out lessons learnt for other groups considering developing technology/sector strategies.



Background Work



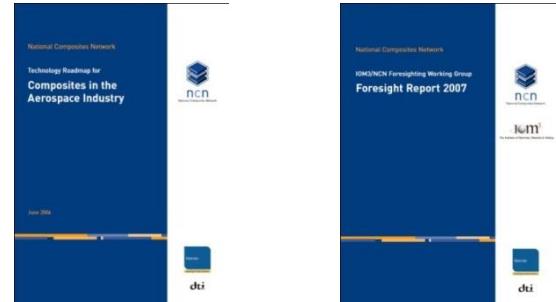
The Inter Agency Composites Group

- ▶ Founded Feb 2007.
- ▶ Members:
 - ▶ Govt Depts: DTI/BERR/BIS Aero, Auto, Materials, DECC, UKTI
 - ▶ Funding Bodies: TSB, EPSRC, Regional Development Agencies
 - ▶ Research organisations: DSTL, NPL
 - ▶ Supporting organisations: BCS, NCN, Composites UK, Materials KTN.
- ▶ Met three times/ year.
- ▶ Remit:
 - ▶ Information exchange
 - ▶ Coordination
 - ▶ Strategic influencing



IACG instigates the strategy

- ▶ Jan 2008 – statement that IACG needed to be more strategic and develop a UK composites strategy.
- ▶ Initially wondered whether to focus on perceived strengths – i.e. aerospace and motorsport.
- ▶ Decision - High level paper required providing:
 - ▶ Opportunities for **ALL** industry sectors
 - ▶ Consequences of lack of action
 - ▶ Views of large players
 - ▶ Barriers
 - ▶ Priorities
- ▶ Thanks to the work done by the National Composites Network (www.ncn-uk.co.uk), we had a variety of documents to draw on, so the IACG started reading and drafting documents, but soon realised more input was required. Specifically:



Industry buy-in

Data

Money



The strategy timeline

- ▶ January 2008 – IACG starts compiling ideas.
- ▶ October 2008 – Industry Engagement meeting. **(Industry buy-in)** 
- ▶ Feb – Apr 2009 – UK CFRP Scoping Study. **(Data)** 
- ▶ June 2009 – BIS secures funds from SIF. **(Money)**
- ▶ June 2009 – TSB tasked to write call for proposals. **(research)**
Discussions on how to provide 'kit'.
- ▶ June 2009 – Strategy workshop. **(Industry reps buy-in)** 
- ▶ Oct 2009 – Industry Consultation Workshops. **(Industry buy-in)** 
- ▶ October 2009 – Call for proposals for NCC. **(kit)** 
- ▶ 26th November 2009 – Strategy launched.



Industry Engagement Meeting

- ▶ Remit of meeting:
 - ▶ Validation from industry of IACG's initial thoughts on strategy.
 - ▶ Ideas from industry of other factors to be included.
- ▶ Format of meeting:
 - ▶ Initial presentation on UK composites industry.
 - ▶ Discussion on the vision for UK Composites and how to achieve.
 - ▶ Discussion groups on three topics chosen by IACG (Manufacturing, recycling and raw materials).
- ▶ Outcomes:
 - ▶ Agreed a vision for the UK Composites Industry. "***UK - world class location for innovation, design and construction of high value sustainable composite structures and materials.***"
 - ▶ Identified needs and barriers to achieve the vision.
 - ▶ IACG received industry feedback on the three areas it had chosen to focus on. **Not all about technology development** – added 'leadership', 'voice' and 'skills'.





UK CFRP Scoping Study

- ▶ IACG recognised that to back up a bid for funding and for any strategy document to be taken seriously, industry data was required. This did not exist.
- ▶ An external consultant was engaged to produce a report.
- ▶ Remit of report:
 - ▶ Provide data on the size and structure of the UK composites industry.
 - ▶ Beliefs and expectations of how the industry is likely to progress based on questions provided.
 - ▶ Capability review and suggestions.
- ▶ Outcomes:
 - ▶ Document at: <http://avaloncsl.files.wordpress.com/2013/01/composites-carbon-fibre-study.pdf>
 - ▶ All of above provided.
 - ▶ Key points: need to Invest in **composite manufacturing equipment (kit)**, **fund research in manufacturing** and **improve skills**.





Strategy Workshop

- ▶ **Remit of meeting:**
 - ▶ Determine opportunities and barriers for each industry sector.
 - ▶ Agree scope and outline of Strategy document.
- ▶ **Format of meeting:**
 - ▶ Day 1 – presentations from industry and theme representatives (Aero, auto, renewables, construction, O&G, marine, skills) and group discussion about cross-cutting themes.
 - ▶ Day 2 – Strategy document structure and plan of action.
- ▶ **Outcomes of meeting:**
 - ▶ Document outlining requirements in different sectors.
 - ▶ Letter to First Secretary for State and Minister asking for support.
 - ▶ Outline of document (Statistical Background, Technology, Skills, Awareness and Leadership, Supply chain, Regulation and Legislation, Standards).
 - ▶ Timescales (launch Jan 2010).





Industry Consultation Workshops

- ▶ 9th Oct Manchester, 23rd Oct London.
- ▶ Remit: demonstrate industry buy-in to key themes of UK Composites Strategy.
- ▶ Format: Presentations to, and discussion with industrial delegates on:
 - ▶ Rapid Manufacturing/ Facilities – introduce idea of NCC.
 - ▶ Sustainability and technology developments – Grand Challenge?
 - ▶ Skills – SEMTA and Cogent join and set up group.
 - ▶ Awareness and Leadership – Leadership Forum.
 - ▶ Supply Chain – needs support.
- ▶ Outcomes: feedback used to develop strategy.





National Composites Centre

- ▶ Call for proposals.
- ▶ Requirements included:
 - ▶ Ability to deliver by March 2011.
 - ▶ Ability to develop and disseminate cost effective rapid manufacturing techniques.
 - ▶ Employment opportunities and skills development.
 - ▶ Collaboration and cross regional usage – fit with existing centres.





The UK Composites strategy

UK Composites Strategy

- ▶ Launch:
 - ▶ 26th November 2009, Williams F1 Headquarters
 - ▶ Peter Mandelson, Secretary of State for Business, Innovation & Skills.
- ▶ Strategy documentation.
 - ▶ UK Composites Strategy.
<http://avaloncsl.files.wordpress.com/2013/01/compositesstrategy-public-version-nov-2009.pdf>
 - ▶ National Composites Centre.
 - ▶ Affordable Composite Manufacturing:
Grand Challenge – Call for Proposals.
 - ▶ UK Composites Technology Needs.
 - ▶ UK Polymer Composite Skills Report.
 - ▶ Carbon Fibre Composites Report.
<http://avaloncsl.files.wordpress.com/2013/01/composites-carbon-fibre-study.pdf>
 - ▶ Regional Composite Capability Reports. (RDAs, Wales, Scotland and Northern Ireland)



Strengthening Capability – Leadership, Skills and Awareness

- **Strengthen leadership** in composites by establishing a **Composites Leadership Forum** chaired by a BIS Minister, involving key composite companies and industry stakeholders
- Develop future technical and manufacturing capabilities in composites through a more coordinated approach to **skills development** via:
 - building on Government support for this key sector as outlined in *Skills for Growth: a national skills strategy for economic growth and individual prosperity* and in *Higher Ambitions: the future of universities in a knowledge economy*
 - Semta and Cogent Sector Skills Council partnership supporting businesses.
- **Raise awareness** of the commercial opportunities presented by composites through:
 - **Composites Supply Chain initiative** led by RDAs, with the composite Centres of Excellence to include promotional activities and support to companies;
 - **Strengthening the network of Centres of Excellence**, led by the new National Composite Centre, to co-ordinate technology transfer across regions
 - BIS, UKTI and the RDAs will work with other Government Departments, including DECC, and industry, to **map, grow and market the UK's capability in composites**. This work will target increased Foreign Direct Investment and help UK companies win trade opportunities across the world.



Building Capacity – Rapid Manufacturing	Increasing Sustainability and Recycling
<ul style="list-style-type: none"> ● Developing rapid manufacturing through <ul style="list-style-type: none"> – launch of a National Composite Centre with £16m of Government funding to research ways composite structures can be produced cost effectively and quickly – a £6m Technology Strategy Board Challenge to spark innovative solutions for rapid manufacture of composites. 	<ul style="list-style-type: none"> ● Establish a consortium of businesses, leading universities, DEFRA, the Technology Strategy Board and EPSRC to prioritise work on sustainability issues such as improving recycling processes and applications for recyclate, and to identify gaps in our current knowledge base for composites recycling and the broader issue of sustainability of composite materials.

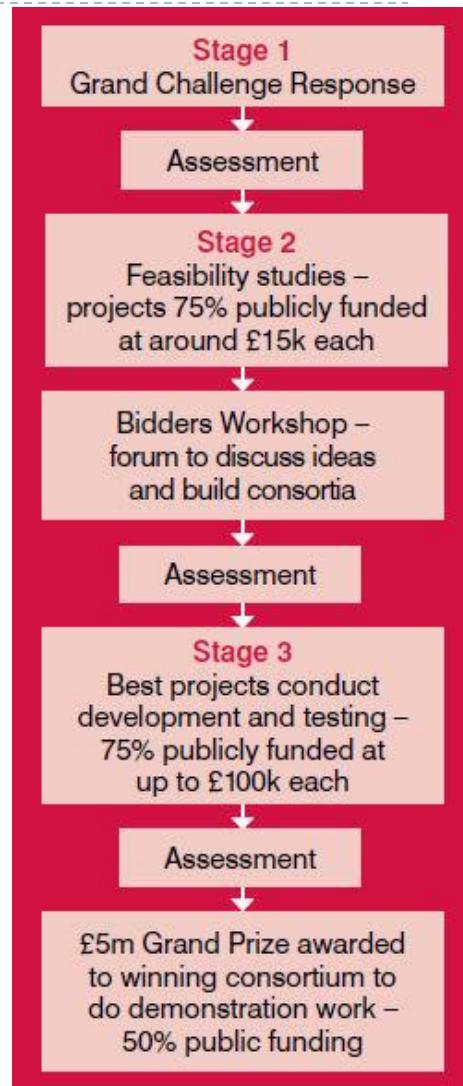


Grand Challenge

- ▶ Aim: to develop cost-effective and rapid composite manufacturing techniques for high performance, high-value products.
- ▶ Also wanted to introduce innovation into the innovation process:
 - ▶ Applicants were funded to do work as part of the application process.
 - ▶ Bidders were encouraged to discuss their proposals with each other and pull bids together to form large consortia.

Key dates

Competition launch	26th November 2009
Stage 1 Challenge Response deadline	Noon 18th December 2009
Stage 2 awards to applicants	8th January 2010
Stage 2 submission deadline	Noon 29th January 2010
Workshop	8th – 10th February 2010
Stage 3 awards	17th February 2010
Stage 3 submission deadline	Noon 17th March 2010
Grand Prize awarded	31st March 2010





UK Composites Technology Needs

- ▶ Identification of Sector Needs:
 - ▶ Automotive, Renewable Energy, Construction, Aerospace, Marine, Oil & Gas.
 - ▶ Brief overview of UK ability followed by challenges faced, mapped onto Capability, Capacity and Sustainability.
- ▶ Technology Developments:
 - ▶ Automated Rapid Manufacturing Technologies
 - ▶ Resin Technology Development
 - ▶ Carbon Fibre Production and Research
 - ▶ Textile Preforms
 - ▶ Functional Composites
 - ▶ Computational Modelling/Design Tools
- ▶ Recycling and Sustainability.
- ▶ Metrology, Standards and Certification.

<http://avaloncsl.files.wordpress.com/2013/01/composites-tech-needs-nov-2009.pdf>





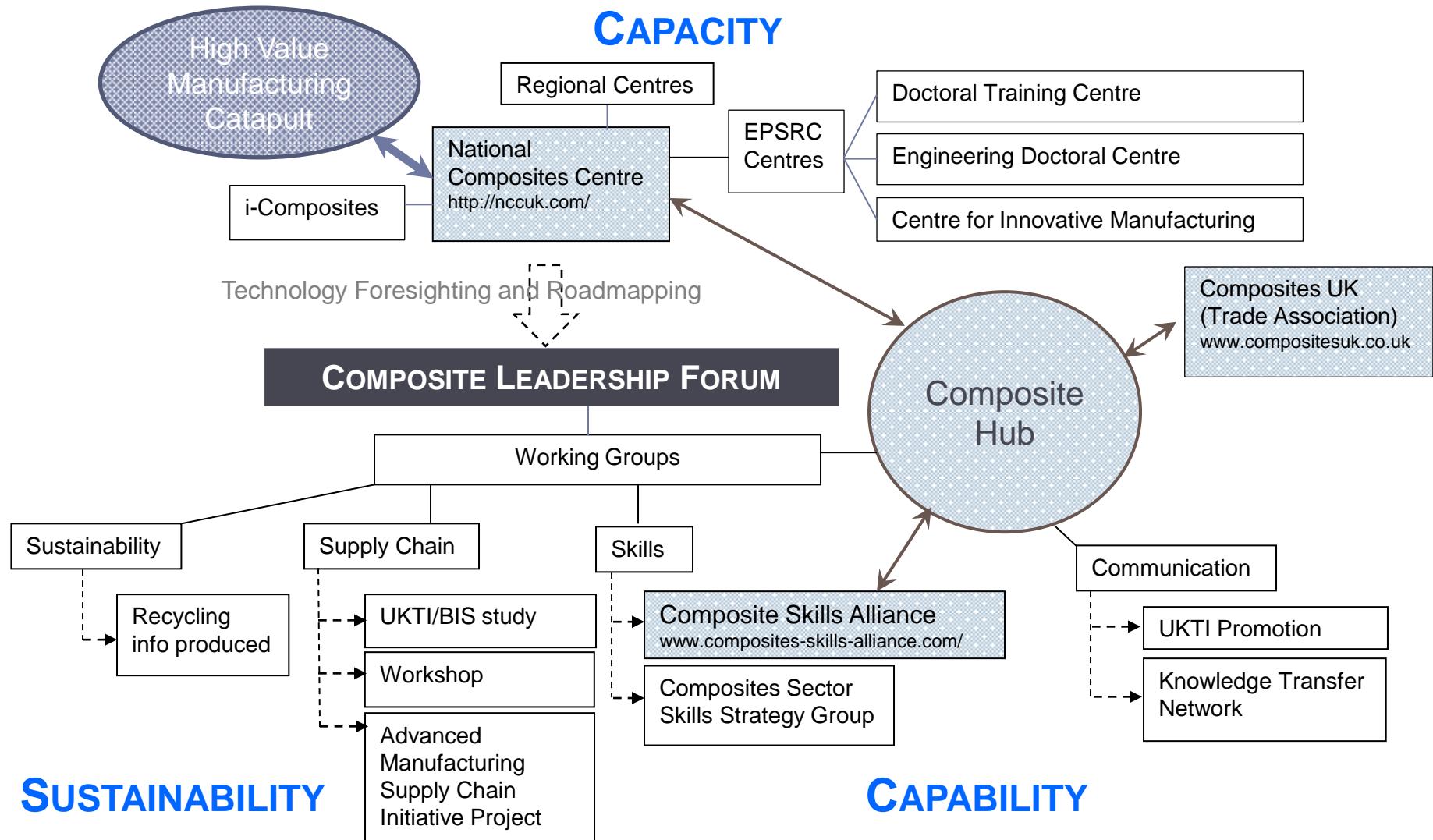
National Composites Centre

- ▶ Won by University of Bristol and SWRDA with key partners Vestas, Rolls Royce, AgustaWestland, Airbus UK, and GKN.
- ▶ £25m centre in AXRC model.
 - ▶ Tiered membership
 - ▶ Research = Core programme, collaborative, private work.



Implementation

Strategic UK Composites Activity





Description of Activity Diagram

- ▶ The Composites Leadership Forum is now in place.
- ▶ Workstreams have been taken forward, such as recycling, skills and supply chain development. 
- ▶ In order to facilitate and coordinate communication, the Composites Skills Alliance, Composites UK and the National Composites Centre have come together to form the Composites Hub.
- ▶ The i-Composites project  started the process of technology development while the NCC was being built.
- ▶ The National Composites Centre is coordinating technology development. It:
 - ▶ Has opened for business and works with industry on a membership basis. 
 - ▶ Coordinates activity with the EPSRC research centres (working on lower TRL technologies) and the regional composites centres.
 - ▶ Is starting the process of updating the foresight and roadmap documentation. 



Supply Chain Work

- ▶ Composites Supply chain study.

<http://www.compositesuk.co.uk/LinkClick.aspx?fileticket=Wm0WJ7RfFY0%3d&tabid=104&mid=532>

- ▶ Funded by UKTI & BIS, produced by Ernst & Young, Mar 2010.
- ▶ Contents:
 - ▶ UK Composites Supply chain
 - ▶ Competitiveness of the UK composites industry
 - ▶ UK demand for composites and opportunities for UK industry in Aerospace, Wind, Automotive, Other sectors.
 - ▶ International demand for composites and opportunities for UK.
 - ▶ Other ideas to support the UK composites industry.
- ▶ Composites Supply chain Workshop March 2011.
 - ▶ Outlined opportunities for composite supply chain across the sectors and provided meet the buyer sessions.
- ▶ Advanced Manufacturing Supply Chain Initiative (£125m).
 - ▶ £20m composites focused proposal submitted Sept 2012.



i-Composites

- ▶ Winning consortium in Grand Challenge.
- ▶ £10m, 22 partners, 23 projects, 6 themes, 1 year.
- ▶ Remit:
 - ▶ Strengthen capability and capacity to sustain UK PLC as a global leader
 - ▶ Provide leadership in the design and manufacture of composites
 - ▶ Increase awareness of composites capability in UK & develop UK skills.
- ▶ Examples of outcomes:
 - ▶ Energy reduction – 33% cure cycle reduction.
 - ▶ Automation – deposition from 20 to 60kg/hr.
 - ▶ Process time reduction – overall 10%. Parallel labour reduction up to 90%, further reduce costs.

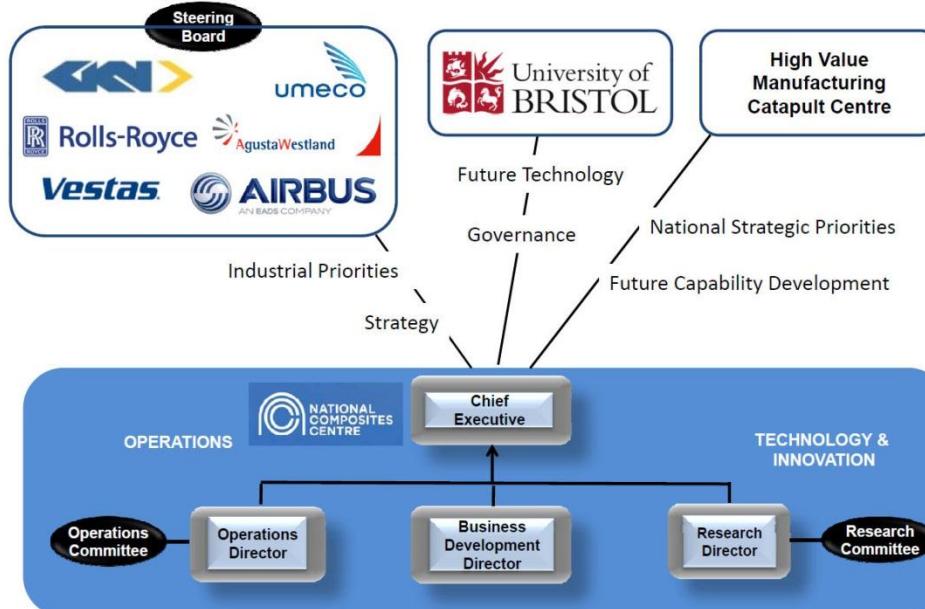
<http://www.axillium.com/i-composites/>



National Composites Centre



- Launch event Mar 2010.
- Keys received July 2011.
- Official opening Nov 2011.



Sustainability!



Tier 1 Member

- Aimed at larger companies
- Define Core Programme & use IP
- Credit to spend in the Centre
- Individual membership of Board and Committees
- Influence on NCC & beyond
- Access to seats & rooms

Minimum Spend: £300k per annum

Tier 2 Member

- Aimed at medium sized companies
- Credit to spend in the Centre
- Collective membership of Board and Committees
- Collaboration with Industry & Academia
- Access to seat & rooms

Minimum Spend: £30k per annum

Associate Member

- Organisations who provide equipment/services in lieu of cash
- Individually customised
- Working with other Members

Cost: £ Fair value per annum

Affiliate

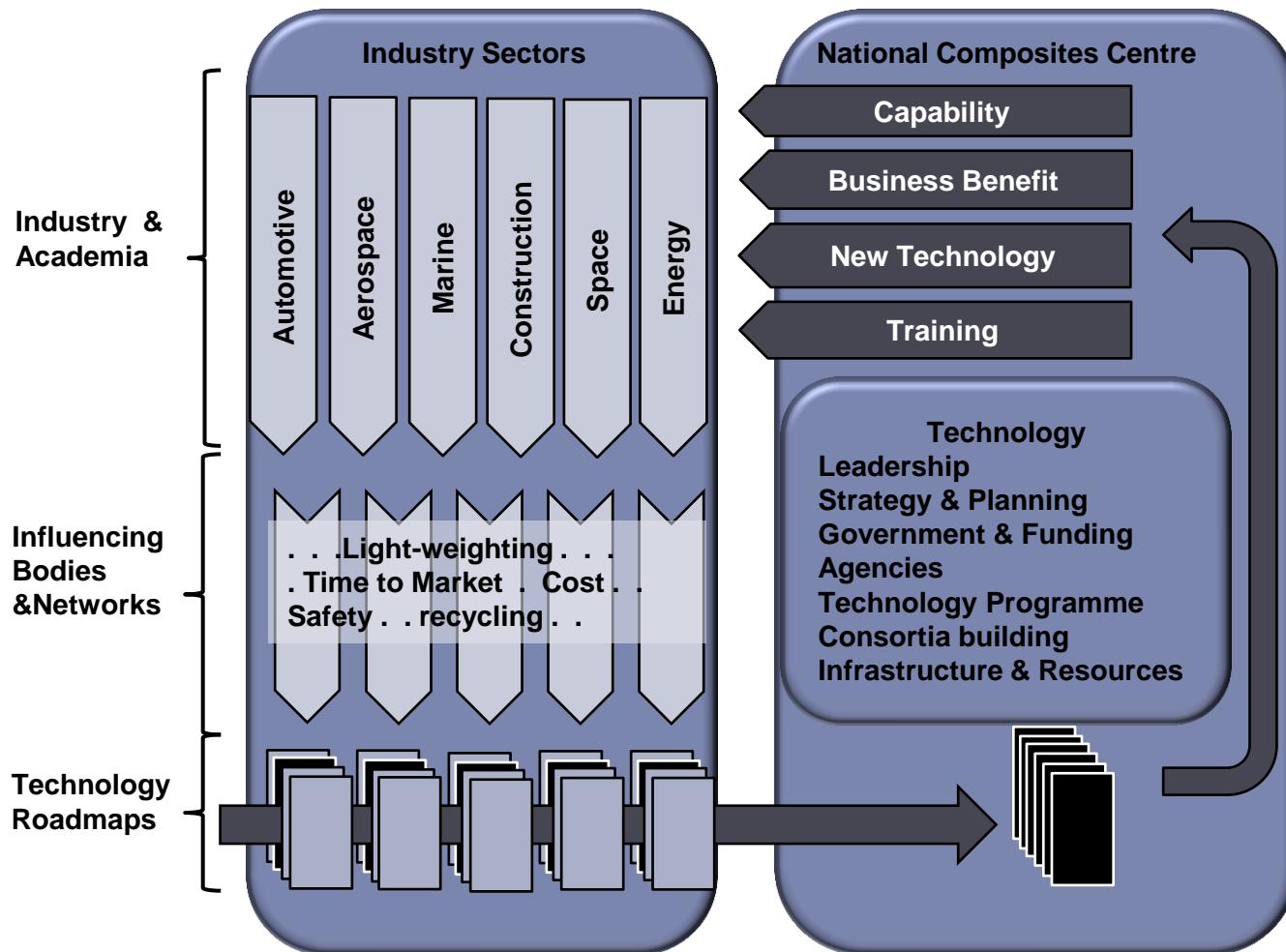
- Aimed at small companies
- Strong brand association
- Good market access
- Collaboration with Industry & Academia
- Building networks

Cost: £ 1,400 per annum

General Access:

- Pay per use

Composite Technology Roadmapping



- ▶ The NCC will work across all industry sectors and with all stakeholders to develop roadmaps.
- ▶ In some cases industry sectors have existing roadmaps, which include composite development.
- ▶ The aerospace roadmap is one example – see following slides.

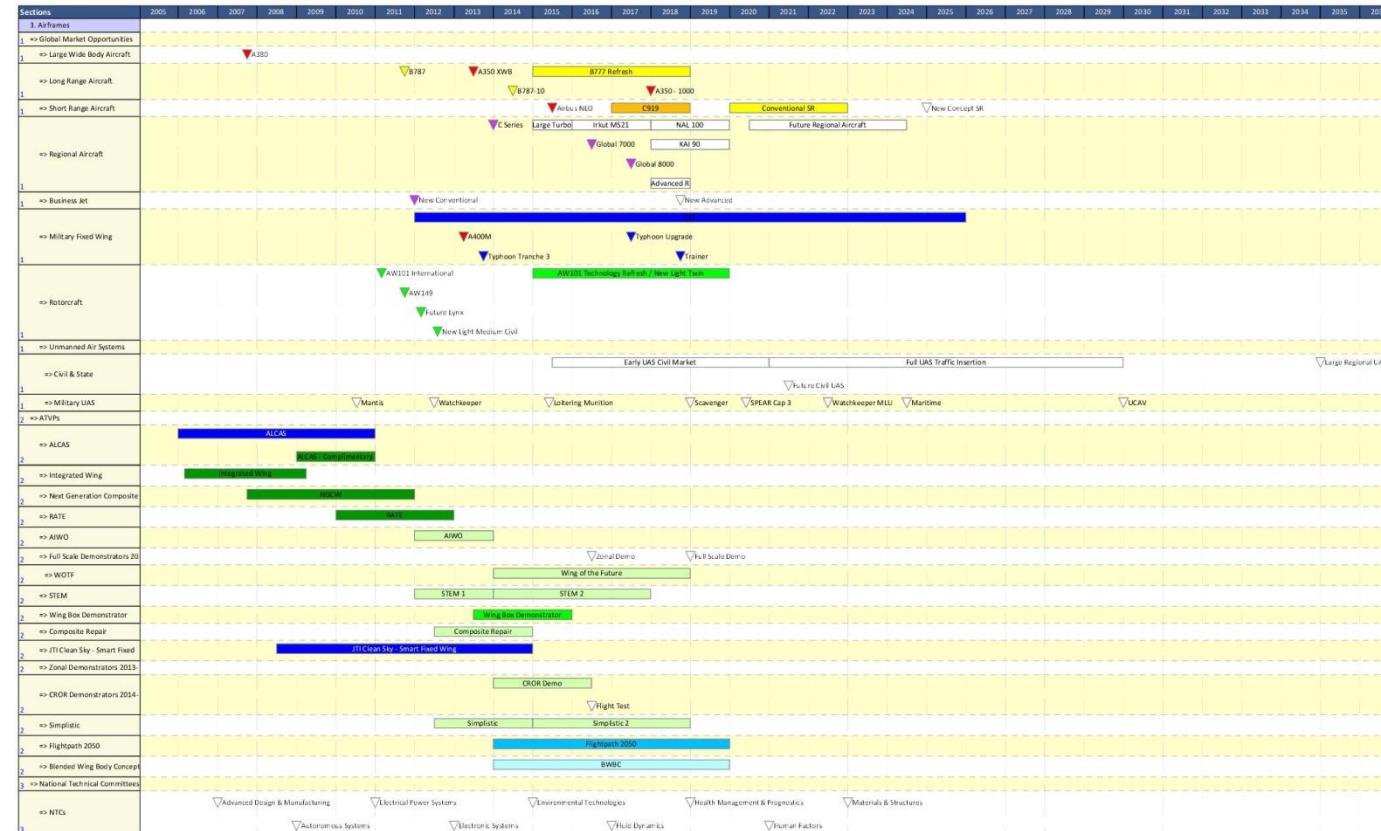


Aerospace Technology Roadmap

- ▶ The Aerospace Technology Roadmaps form part of the National Aerospace Technology Strategy.
- ▶ They are used to inform stakeholders from across the Aerospace and Defence community of the expected research and technology development programmes and estimated investment.
- ▶ The Roadmaps identify the activities necessary to ensure the UK Aerospace sector remains in a formidable position to compete in the foreseeable market opportunities.
- ▶ The Roadmaps show:
 - ▶ Top down review of global market drivers and indicate service entry dates
 - ▶ How, where and when UK products will fit into global market
 - ▶ The Technology and Innovation Programmes (TRL 1-4) and Validation and Demonstration Programme (TRL 4-6) that need to develop to ensure UK industry is in a strong position to make the most of the market opportunities.
- ▶ There is an Airframe and Structures roadmap which includes composites technology development – see next slide.



Airframes and Structures Roadmap



1 - Prime

□ Prime ■ Airbus ■ AgustaWestland ■ BAE Systems ■ Boeing ■ Bombardier ■ Comac

2 - Funding

□ Funding ■ UK - Funded ■ UK - Bid ■ UK - Aspiration ■ MOD - Funded ■ MOD - Bid ■ MOD - Aspiration ■ EU - Funded ■ EU - Bid ■ EU - Aspiration

3 - TRL

□ TRL ■ 1 ■ 2 ■ 3 ■ 4 ■ 5 ■ 6 ■ 7 ■ 8 ■ 9

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Confidential Proprietary

<https://connect.innovateuk.org/web/national-aerospace-technology-strategy-nats/airframes-and-structures>



Lessons Learnt and comments



Lessons Learnt

- ▶ **Steering Group** - To develop, launch and implement a strategy, you need a high level steering group working through all three phases with participants from:
 - ▶ All Govt Depts with an interest.
 - ▶ Funding bodies.
 - ▶ Supporting organisations.
 - ▶ Research organisation.
- ▶ **Boundaries:**
 - ▶ Define a vision. This should include a discussion on what technologies/industry sectors are included in the strategy.
 - ▶ Set timescales for development and launch of the strategy. This should include discussion on opportunities that you can take advantage of (funding rounds, big events that you can launch at etc).



Lessons Learnt

- ▶ **Strategy Development** – It's not all about development of strategic ideas and actions, you have to put as much effort into:
 - ▶ Gaining industry validation of the strategic ideas.
 - ▶ Data – statistics and quotes to show current and potential future positions.
 - ▶ Funding to take forward the ideas.
- ▶ **What the strategy should include:**
 - ▶ Do not just focus on technology areas for research, consider steps than can be taken to facilitate commercialisation.
 - ▶ Skills - There are examples of newly developed manufacturing kit in UK factories where they have no staff to run it.
 - ▶ Communication/leadership – facilitates collaboration and adoption of new technology.
 - ▶ Supply chain – The supply chain has to be developed to deliver the new technology.



Lessons Learnt

- ▶ **Strategy Documentation** – should include:
 - ▶ High level document that is not too technical and outlines the 'grand vision'. Preferably including a one page summary.
 - ▶ Documentation outlining the strategic ideas.
 - ▶ Background documentation produced or commissioned during the development process. It provides industry with valuable data for business planning and helps them buy into the concept.



Comments

- ▶ **Funding:**
 - ▶ Funding is dependent on political manoeuvres (some positive, some negative), having Govt Depts represented on the Steering Group and on the look out for suitable pots is crucial.
 - ▶ Funding (not just industrial resources) ensures foresighting, not just focusing on immediate industry needs.
 - ▶ All parts of the strategy need to demonstrate a business model that is sustainable in the long term.
- ▶ **Materials technology cross-cuts many other industry sectors. If they have strategic development plans, tap into them. If not, get them to help you with the work – it's in everyone's best interests.**



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