



Modernising composite materials regulations:  
A position paper



# Foreword

One of the major inhibitors to the uptake of composites in new sectors is that regulations, codes and standards are often inappropriate for composites. This is because they are both explicitly and implicitly based on named materials, such as steel, and do not permit consideration of composites applications despite the strengths and benefits of the materials in many cases.

This review provides important evidence supporting the primary aim of the RCS Working

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Group, as expressed in the 2016 CLF Composites Strategy, to work with regulators and standards bodies to adapt regulations to enable (greater) use of composites. Through this collaboration, the University of Southampton study helps CLF achieve the benefits that will arise from greater use of composites through, for example, increased durability and design flexibility, and light-weighting.

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A lack of appropriate codes and standards is recognised as a key barrier to the uptake of composite materials across many sectors. Composites UK fully supports a performance-based approach to standards where proof of a material's fit for purpose is tested. This report highlights where this approach is utilised and has enabled the use of new and innovative materials, as well as traditional ones, to the benefit and progression of the sector. Applying this approach across other sectors can only bring benefit to those industries and UK PLC.

**Dr Sue Halliwell,** Composites UK





# Executive summary

In 2013, the global market for composite products was US\$ 68bn, which is predicted to grow to US\$ 105bn by 2030 (UK Composites Market Study<sup>1</sup>). The UK's share of this market is £2bn (around 3%) and is estimated to grow to £12bn or more by 2030 (2016 UK Composites Strategy<sup>2</sup>). This figure could be as high as £16bn if the sectors that have not previously embraced the use of composites were to experience the same rate of growth as the aerospace sector, where the use of composite materials has increased by 50% over the last three decades.

<sup>1</sup> UK Composites 2013: A study into the status, opportunities and direction for the UK composites industry, Composites Leadership Forum, June 2013, 12pp.

<sup>2</sup> The 2016 UK Composites Strategy: Lightening the load: Delivering UK growth through the multi-sector application of composites, Composites Leadership Forum, 2016, 13pp.

**The UK is globally recognised as a leading player in the research and development of composites but is not the most agile in bringing these new products to market. Only the Aerospace and Wind Energy industries have fully harnessed the advantages of composites. In Aerospace 52% by weight of the latest generation of aircraft are now composed of composite materials.**

As economic and sustainability pressures have grown, there is increased pressure to reduce energy consumption (including fuel usage), ‘through-life costs’ and installation times. This has increased demand for stronger, lighter, more intelligent and more durable materials tailor made for purpose.

The Automobile industry is now starting to embrace composites. But the other more traditional industries like Marine, Rail, Oil & Gas, Construction and to a lesser extent Defence are still wedded to more conventional materials.

The findings in our report from consulting the composites industry (see Appendix 11) and researching in depth the regulations in each industrial sector (see Appendices 3 to 10) show that the major constraint inhibiting the growth/use of composite material in these industries is the regulation of new materials. This confirms the barrier to the uptake of composite materials in new sectors that insufficient regulations present<sup>3</sup>.

This report reviews the way in which these regulatory processes are inhibiting the introduction of composites and proposes how to resolve the issues.

### **The issue**

The primary concern is the regulatory process. There are two ways to obtain approval to introduce composite materials into engineering design. These are:

i. by proving ‘equivalence’ to traditional engineering materials, such as steel,

or

ii. by proving that the materials can perform to the required standards in operational conditions – ‘performance’.

The difficulty in proving ‘equivalence’ is that, often, the actual performance requirements have developed over many years and can be loosely or poorly defined. As a result, approval is often subjective, rather than objectively based on the assessment of performance.

However, the more objective proof of ‘performance’ relies heavily on having codified standards and guidelines to underpin the regulations. Such standards and guidelines have not yet been developed in many sectors. Consequently the regulators are forced to resort to the less objective ‘equivalence’ based processes. This makes it difficult to move forward with new innovative engineering designs that incorporate new materials.

The Aerospace industry has overcome this difficulty. They have introduced ‘performance’ based regulation supported by an organisation dedicated to providing the codified standards and guidelines necessary for approval. Furthermore, by making this information available in an open source database they have encouraged large companies to work together to develop new materials and drive down material and manufacturing costs.

In the UK there is currently very limited coordination and centralisation of the codes and standards data associated with new composite materials. There is neither a coherent development of certified testing facilities, nor a formal process for different sectors to share information and best practice. These factors have reduced productivity, discouraged research and development and innovation, and significantly increased the time to market for new composite products.

Moreover, industry and government have not shared information. In the UK there are four government departments dealing with material regulation<sup>4</sup> and the minister with overall responsibility for Health and Safety (the Minister for the Disabled) has neither the mandate nor the resources to harmonise this system.

There are also seven agencies<sup>5</sup> involved in regulation, alongside a lack of Suitably Qualified and Experienced Personnel (SQEP), creating a labyrinth of assurance without the guarantee of certification at the end. This is a considerable disincentive to those companies wanting to innovate, and a significant barrier to new companies entering the markets.

## Recommendation

The proposal to improve this situation is two fold. Firstly where direct ‘equivalence’ is not easily proven, the safety case should be conducted by the ‘performance’ assessment method but adapted to the needs of each sector. This would offer a route around the lack of operational history essential for proof of equivalence by proving that the material of the manufactured product can perform to the required operational safety and performance standards.

A prerequisite is to create a coordinated focal point for composites regulation for the benefit of the ‘traditional’ sectors taking into account differing needs of each sector, which would have to remain under the purview of the sector regulators who ideally, would be integrated into the process. This shared access to the same supporting science and associated codes and standards would improve productivity, and significantly reduce the time to market. It would allow companies and regulatory bodies to work closely together, using the science and operational experience available to make better informed, traceable and accountable judgments on safety cases.

It is also proposed that one government department should have overall responsibility for regulation, with representation in other

departments. The lead department would oversee material regulatory policy and management of the centre, would have the responsibility to develop codes and standards, and would authorise both UK and nominated overseas test centres.

To minimise costs, preserve regulatory coherence and ensure that the UK capitalises on its global scientific lead in advanced materials, one route to an early solution would be to consider using an existing organisation. The names of candidates that could perform the lead role for a potential solution are provided in Appendix 1.

We recommend that a single Government department takes overall responsibility, alongside the Composites Leadership Forum (CLF), to appoint a project team to produce and fund a project plan for adaptation of a centralised organisation to develop, store and disseminate performance codes, standards and best practice for the use of all sectors. Terms of reference for the proposed Task Group are indicated in Appendix 2.

This approach will increase the value, utility and sustainability of the UK’s composites research and by speeding up the ‘route to market’, allowing the UK to both achieve and maximise its predicted market share and prevent the more agile manufacturing nations using our research to gain a first-mover competitive advantage.

The following report captures all the detailed background research and a proposed strategy for implementation. To underpin our research Appendices 3 to 10 (with a specific conclusion section for each) present a detailed analysis of the regulatory framework and its suitability across industrial sectors.

It is important to note that just prior to publication of this position paper the UK Industrial Strategy Green Paper [[www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/586626/building-our-industrial-strategy-green-paper.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/586626/building-our-industrial-strategy-green-paper.pdf)] was unveiled. The regulatory reforms that are proposed here would contribute significantly to the delivery of the Industrial Strategy.

<sup>3</sup> The 2016 UK Composites Strategy: Lightening the load: Delivering UK growth through the multi-sector application of composites, Composites Leadership Forum, 2016, 13pp.

<sup>4</sup> Department for Business, Energy & Industrial Strategy; Department for Transport; Department for Work and Pensions; and Ministry of Defence

<sup>5</sup> Federal Aviation Administration; International Maritime Organisation/ Maritime and Coastguard Agency; Vehicle Certification Agency; Rail Safety and Standards Board (RSSB), Office of Rail and Road (ORR); Health and Safety Executive; and Ministry of Defence



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