Modernising Composite Materials Regulations

Presented by

Simon Quinn

Report authors: Simon Quinn, Janice Barton, Simon Gerrard, Robert Veal, Mikis Tsimplis, Rob Stevens & Ole Thomsen

Based on position paper

'Modernising Composite Regulations'

www.southampton.ac.uk/CompositeRegulations

Intentions

- The market
  - Global market for composites 2013 (all sectors) ~US$ 68bn. Expected growth 6.5% CAGR over 7 years – 2020 forecast ~$106bn.
  - 2016 UK Composite Strategy predicts growth from £2.3bn in 2015 to £12bn in 2030
- Problem statement
  - Major inhibitor to the uptake of composite materials in new sectors; Regulations, codes and standards
- Study group
  - Formed at University of Southampton to consult with key industrial players and regulators, and report to BEIS
  - Limitations of current framework and issues
- Emergent proposals
  - The need for a harmonised, cross-sectoral, regulatory framework for composite materials (UK and international)
  - To boost GVA, skills, inward investment, exports and jobs, including repatriation of some manufacturing back to UK and other countries

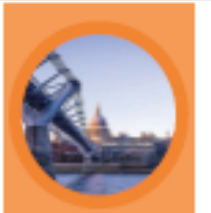
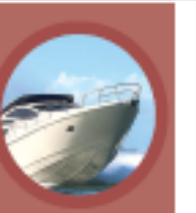
UK Market size (similar trend worldwide)

Consultation with the UK composites supply chain has shown that the UK has the opportunity to grow its current £2.3bn composite product market to £12.bn by 2030. [UK Composites Market Study*]

	AEROSPACE	DEFENCE	AUTOMOTIVE	RAIL	CONSTRUCTION	MARINE	OIL & GAS	RENEWABLES
2030 OPPORTUNITY	UPPER £3,590m 19% LOWER £1,250m	UPPER £1,150m 8% LOWER £910m	UPPER £3,490m 16% LOWER £1,430m	UPPER £160m 7% LOWER £130m	UPPER £1520m 10% LOWER £1240m	UPPER £370m 4% LOWER £320m	UPPER £1,100m 33% LOWER £320m	UPPER £1,100m 4% LOWER £880m
2020 FORECAST	UPPER £1,160m 33% LOWER £1,040m	UPPER £950m 20% LOWER £920m	UPPER £530m 7% LOWER £480m	UPPER £100m 12% LOWER £80m	UPPER £640m 12% LOWER £510m	UPPER £270m 4% LOWER £240m	UPPER £340m 86% LOWER £80m	UPPER £690m 3% LOWER £650m
2015 BASELINE	£270m	£380m	£380m	£60m	£360m	£220m	£20m	£600m





Percentage figures are Compound Annual Growth Rate (CAGR). The forecast figures reflect the view of UK supply chain companies in research carried out by the NCC in mid-2015.

Process

- Depth provided by interviews/visits
  - A greater awareness of what could be made from composites. Improve cross-over between industries. Understand better the benefit to through life-costs. Need for global/international solutions

- Breadth provided by composite industry responses to a questionnaire, https://www.isurvey.soton.ac.uk/20768
  - Composites UK sent questionnaire to their members on 15 August 2016
  - Supply chain across all three composite supply chain clusters are predominantly SME's
    - Therefore unable to take financial risk of overcoming regulatory constraints
  - Current regulatory system preventing innovation (>50%) and delaying time to market (>60%)
  - Composites material data not shared between industrial sectors (>60%)

Industrial drivers

There is **an increased demand for a sustainable environment** without reducing profitability/growth which:

- Shows 'traditional' material manufacture to be resource, energy and personnel intensive
- Creates a public demand to reduce fuel usage, through life costs and installation times
- Drives demand for invention and use of stronger, lighter, more intelligent and more durable materials

But manufacturers are **reluctant to change** because of:

- Huge initial capital costs
- Retooling costs
- Retraining the workforce and associated union negotiations
- Redundancy issues
- Costs of modifying the current regulatory requirements

Issues - Generic

Significant research investment to improve composite manufacturing but without commensurate investment in improving the Regulatory framework. The result is:

- Common use of 'equivalence' to traditional materials rather than 'performance' based regulation
- Lack of fully integrated support process to develop codified sets of standards and/or guidelines, nor centralised/authorised testing organisations to deliver data or large structure testing to achieve performance/goal based regulation, or support 'equivalence' processes
- These regulatory constraints have inhibited innovation and R&D in the composite 'shy' sectors
- So the time to market is very slow, costly and hinders productivity (particularly in TRLs 4, 5 and 6)

Issues – UK specific

Disparate Government approach to regulation of composite materials

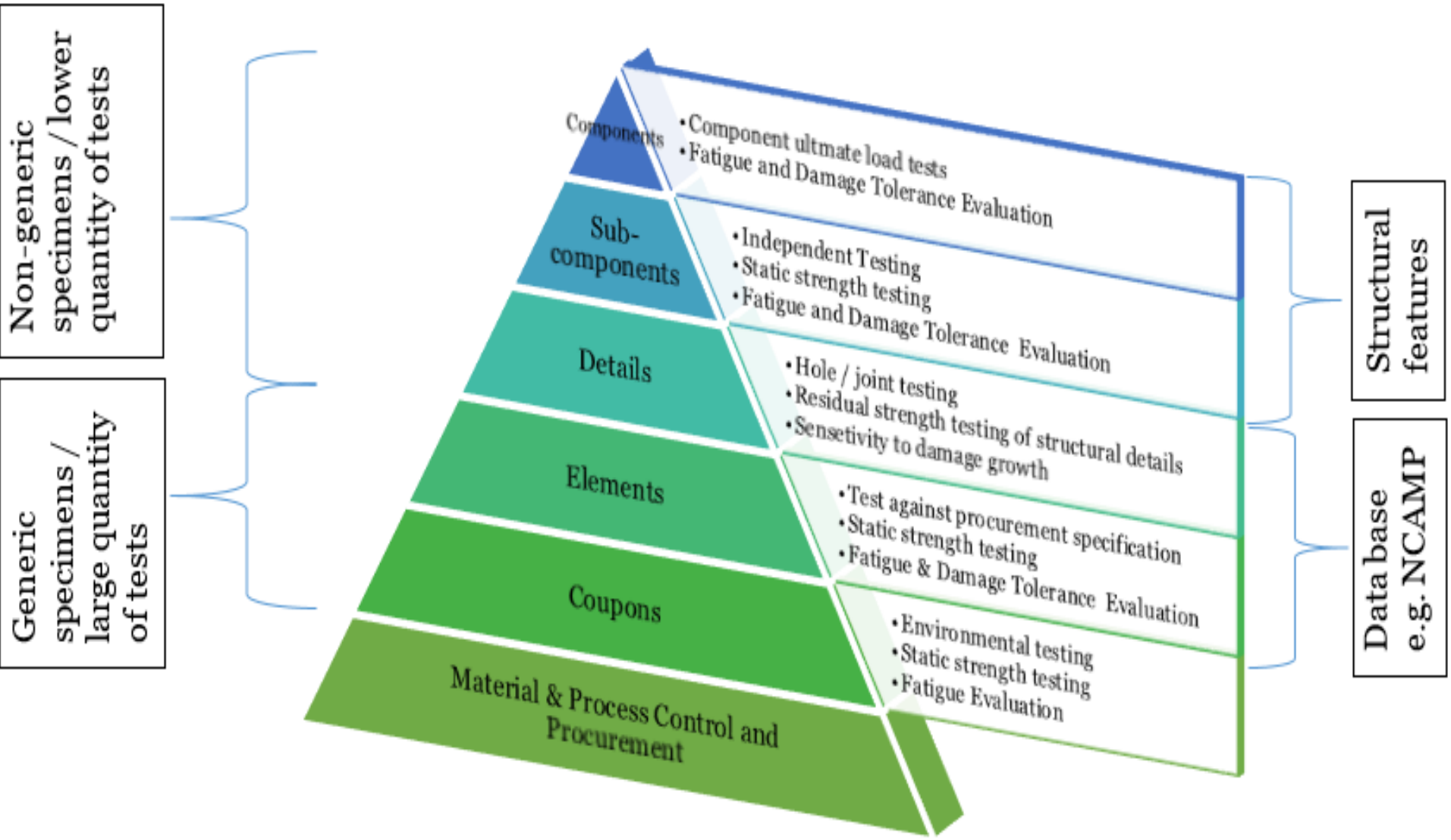
- At least 4 separate Government departments (BEIS, DfT, DWP, MOD) and 7 separate agencies plus Class Societies involved
- Composite materials expertise within regulatory agencies and policy departments is sparse
- No proper mechanism for shared research, data or best practice, which slows/prevents innovation and inhibits 'informed decision' for regulator processes

Industry	Authority	Test Database	Strategic Management
Aerospace	ICAO / FAA / EASA	Yes (NCAMP)	DfT
Marine	IMO / DfT/ MCA / Class	No	DfT
Automotive	DfT / Vehicle Certification Agency	No	DfT
Rail	Rail Safety Standards Board	No	DfT
Construction	HSE	No	DWP
Oil and Gas	HSE	No	DWP
Renewables	RUK	No	BEIS
Defence	MOD	No	MOD

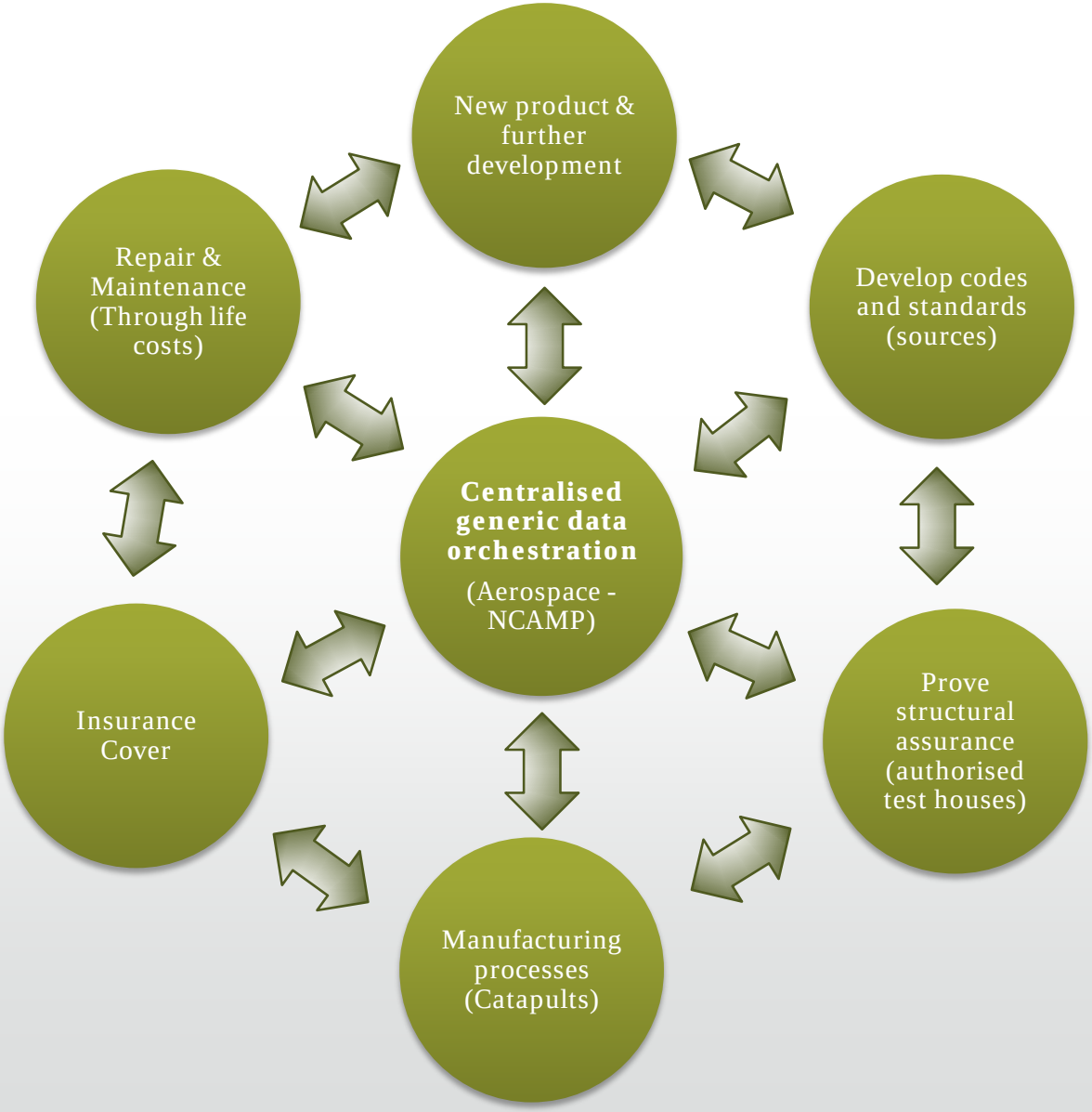
Emergent proposal

- Establish a generic 'performance' based building block approach (inspired by Aerospace and wind energy sectors) to a regulatory and certification framework that would provide the data and support to 'goal' or 'performance' regulation and support the 'equivalence' system whilst in transition
- It should be shaped around the need to preserve or improve safety, reduce the time to market and minimise costs by drawing on the best practice found across industry sectors (harmonisation of processes/procedures)
- Process should be underpinned by a **cross-sectorial**, **cross-governmental department** and **multi-national** process for agreeing composite material codes/standards and their characteristics subject to their specific sector requirements

‘Building block’ approach to certification



Integrating the industrial cycle with regulation (generic process)



Benefits of the generic performance based approach

- Harmonisation of composites certification processes **nationally** and **internationally**, to increase productivity across multiple industrial sectors, generating jobs, exports and increasing GVA
- Facilitate more rapid development of 'fit for purpose' codes & standards, making it easier for SME supply chain companies to innovate and do R&D
- Enable companies in a wide range of industrial sectors to share best practice and common data
- Enhance efficiency in **International** & **Government** regulatory management structure
- It would enable the sectors predominantly using 'Equivalence' to migrate to the 'Performance' approach seamlessly
- It would improve innovation and reduce the time to market for new products
- Minimises duplication

Benefits of the generic performance based approach (continued)

- It would improve workforce mobility, and widen the skill base across all the composite manufacturing sectors
- Reduce the time for installation and associated operating costs
- Reduce the 'through life costs' of the new products and therefore the cost of infrastructure nationally and internationally
- Reduce the carbon footprint
- Create a competitive advantage and increased market shares (in competition against other materials technologies)
- Establishes a benchmark model for regulatory processes for other advanced materials

Summary

- The absence of harmonised support for ‘performance’ or ‘goal’ based regulation and the proof of ‘equivalence’ in most manufacturing sectors (except Aerospace and Wind), is inhibiting growth and delivery of the long term strategic goals of the composites industry.
- It devalues composites research and gives other, more nimble material technologies a competitive advantage.
- Makes investment in composite manufacturing financially unattractive.
- There is a real need to create better integrated support to develop the codes, standards and best practice to facilitate a ‘performance’ based building block approach

And

- The assurance of composite materials needs to be harmonised and vested in one national/international authority

Recommendation

- Aim: To create a 'performance' based 'building block' approach for developing regulations, codes and standards for composite materials
  - A generic framework, inspired (but not bound) by the well proven 'building block' approach (used in aerospace sector)
  - Sufficiently adaptable and universally understood, to meet specific requirements of individual sectors without being constrained by 'material equivalence' legislation
  - Ensures the accessibility of data to new entry companies
  - Industry-led, with representation from regulatory bodies and academia
- Appointed by single national/international authority
- Operating internationally for benefit of all composite manufacturing nations