Mills Carbon Design Ltd

April 2026

Structural Light-weighting

Design Consulting & Applications Development

Andrew Mills
FIMMM

LinkedIn: http://uk.linkedin.com/pub/andrew-mills/3/144/61a

T: +44 (0) 7726 466672

millscarbondesign@gmail.com

Andrew Mills

Mills Carbon Design

Brief Biography

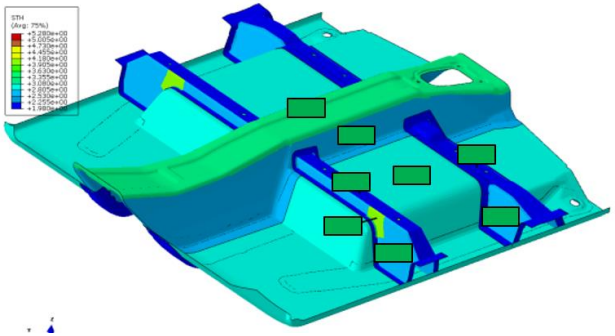
- From studying Metallurgy and Materials Science at Nottingham University, I joined British Aerospace at Weybridge, helping with manufacturing technology for the Airbus A320 ailerons and secondary structures.
- After two years with the Production Engineering Research Association PERA, developing the RTM process and investigation composite structures impact performance, I moved to Courtaulds Structural Composites to develop varied applications for composite structures, including aircraft interiors, medical scanners and radar components.
- Joining Cranfield University in 1991 to lead the Airbus UK composite wing research project AMCAPS, I set up a team which developed the 1st UK multi-axial fabric wing box demonstrator. The novel semi-preg processing and automated lay up equipment produced was patented by Airbus and was implemented for the Airbus A380 production by Hexcel and GKN.
- Also running modules for MSc students and industrial short courses focused on Motorsport Engineering, Advanced Materials, Composites Manufacturing, and Composite Structures Design.
- Leading projects with Bombardier Belfast (now SPIRIT,) Dowty (now GE,) GKN and BAE SYSTEMS on preforming and RTM through IK Gov and industry funded projects.
- With BAE SYSTEMS funding I led the future composite airframe aspect of the FLAVIIR research project and built the DEMON aircraft flying technology demonstrator.
- Recent years research has been automotive and high-rate manufacturing focused, on projects developing SMC/prepreg hybrid manufacturing, fabric preforming, wet compression moulding and battery case design with partners including NISSAN, JLR, Sigmatex, GKN and the AMRC.
- I have recently set up Mills Carbon Design to help UK companies design and build effective lightweight structures

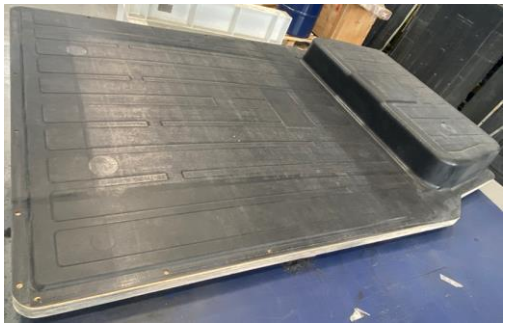
Vehicle Light-weighting Projects - Examples of designed and developed structures

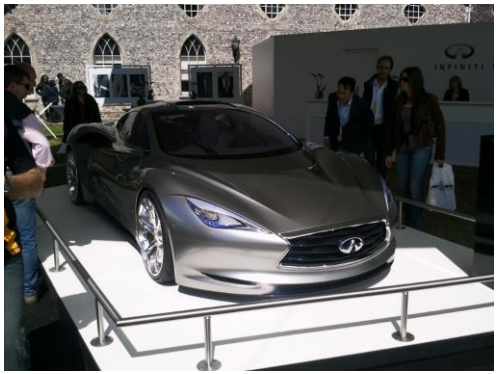
Mills Carbon Design

Expert Design, manufacturing technology & product development partnership through 40 years of lightweight structures engineering research and applications development

Some structures designed and built whilst at Cranfield University





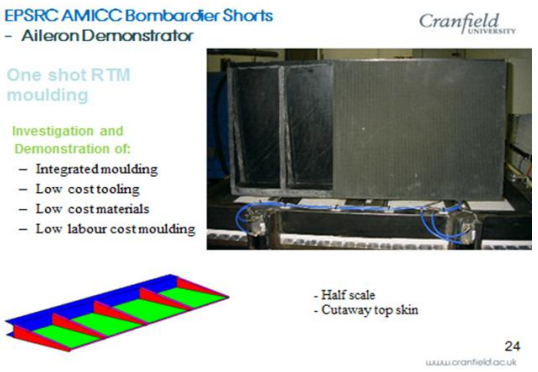


Vehicle Light-weighting Projects - Examples of designed and developed structures

Mills Carbon Design

Expert Design, manufacturing technology & product development partnership through 40 years of lightweight structures engineering research and applications development

Some structures designed and built whilst at Cranfield University



Engineering Short Courses

Mills Carbon Design

- **Client location based**

2 or 3-day courses on

high performance composites:

- **Design**, materials selection and manufacturing technology.
- **Case studies** focused on client sector:
  - Aircraft
  - Automotive
  - Motorsport
  - Sports equipment
- **Practical manufacturing demonstrations**

Services

Mills Carbon Design

Application feasibility studies and guidance

- Exploring new component or structure application alongside client teams, using the experiences from many end users and manufacturers.

- Guidance to design teams on new structures development

Services

Mills Carbon Design

Structural and component concept design and guidance

- Generating and evaluating design concepts for new applications
- Re-engineering existing structures for
  - Light-weighting
  - Cost reduction
  - Higher manufacturing rate

Services

Mills Carbon Design

Materials and process technology selection and manufacturing cost and weight comparison

- Using a Cranfield software tool, developed through the Innovate UK composites supply chain initiative, the CIC, new and current applications can be studied to select either established or emerging new materials forms and manufacturing techniques.
  - Suitable materials and process technique options can be compared for both component weight and manufacturing cost.
  - Suppliers of materials, process equipment, tooling and manufactured parts are recommended
  - Exemplar component applications are identified and case studies provided.

Services

Mills Carbon Design

Prototype design, development and testing guidance

- Assistance with detail design, stressing and manufacturing specification.

- Guidance for tooling design, manufacturing process development, prototype manufacture and structural testing.

Services

Mills Carbon Design

- Assembly techniques specification
  - Joining techniques guidance and specification; including:
  - Joint design
  - Adhesive bonding
  - Mechanical fastening technique
- Supply chain advice
  - Recommendation of capable suppliers of materials, equipment and part manufacturing.

Team

- Andrew Mills – project lead and design, materials and manufacturing technology guidance
- Matt Dawson – design concepts and structural analysis – FEA
- Frankie Aglietti – CAD - design detailing

Materials and Process Selection Software Tool

https://www.prosel.co.uk/

PROSEL

Mills Carbon Design

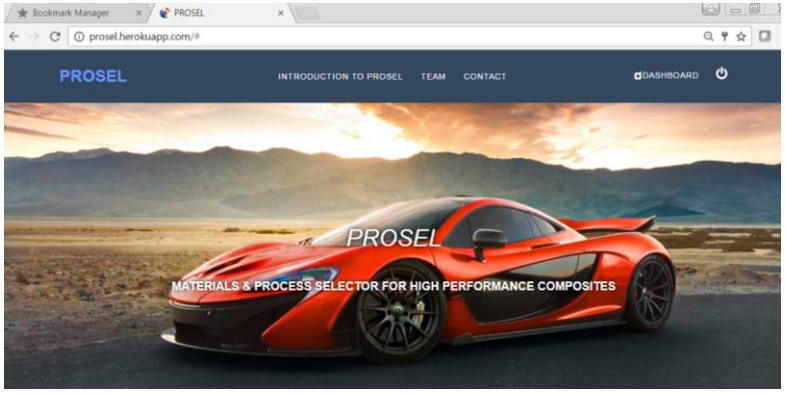
A world-first interactive design tool developed within the UK Composites Industry Cluster CIC

- **Selection** of suitable composite M&Ps by interactively working through new applications design and manufacturing requirements

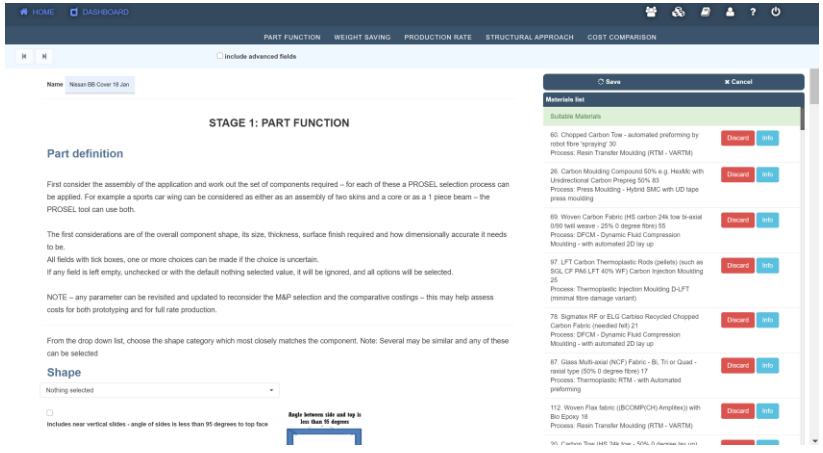
PROSEL provides:

- **Capable materials and processes**
- **Component weight and manufacturing cost** comparison for each recommended M&P option

Home Screen



1st Stage Design Page



Output Page Example

Hi-rate, Ultra-light Parts Manufacturing Process

Hybrid CFSMC – UD Prepreg Compression Moulding

Mills Carbon Design

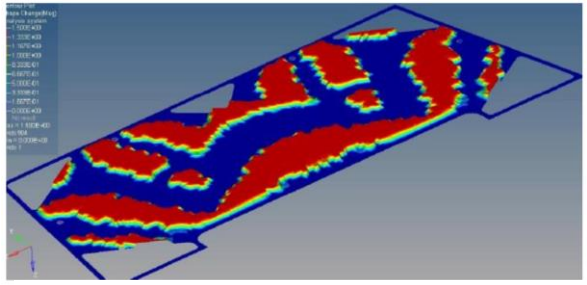
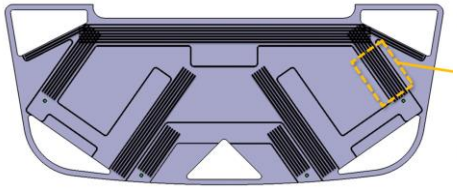
A unique process for ultra light-weight, complex shape part manufacturing at very high rate

High stiffness structures are moulded with aligned carbon fibres in selected areas combined with chopped fibre moulding compound to provide highly complex shape, extremely dimensionally accurate parts - having ultra light-weight and a sub 3 minute cycle time

Metisse Motorcycle Sub-frame




Bentley Continental GT Tonneau Cover


Automotive Sector Project Clients and Partners

Mills Carbon Design

Nissan Europe
Jaguar Land Rover
Lotus Cars
Reynard Engineering
Caterham Cars
Ford UK
Bentley Motors
McLaren Automotive and Racing
Red Bull Technology
HONDA UK
GKN Wheels and Structures (now Autostructures UK)
Prodrive Composites
Engenuity
Automotive Trim Developments
Cranfield Impact Centre

Project Clients and Partners

Other Sectors, RTOs and Suppliers

Mills Carbon Design

BAE SYSTEMS
Airbus UK
Bombardier (Spirit)
GKN Aerospace
National Composites Centre
Advanced Manufacturing Research Centre
Airborne
SAFRAN
Hexcel Composites
Sigmatex UK
Huntsman International
GEN 2 Carbon
TWI
Nottingham University
University of Bristol
University of Warwick

Previous Automotive Projects

Mills Carbon Design

Some examples from my non-confidential projects

CFC Sports Car Framework

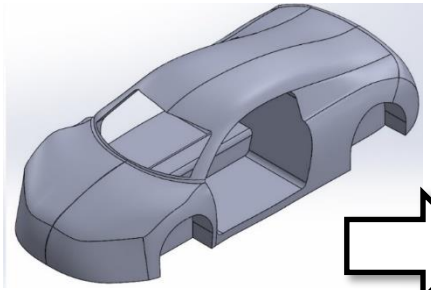
Loading and lay out study

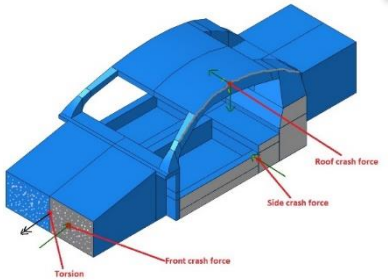
Mills Carbon Design

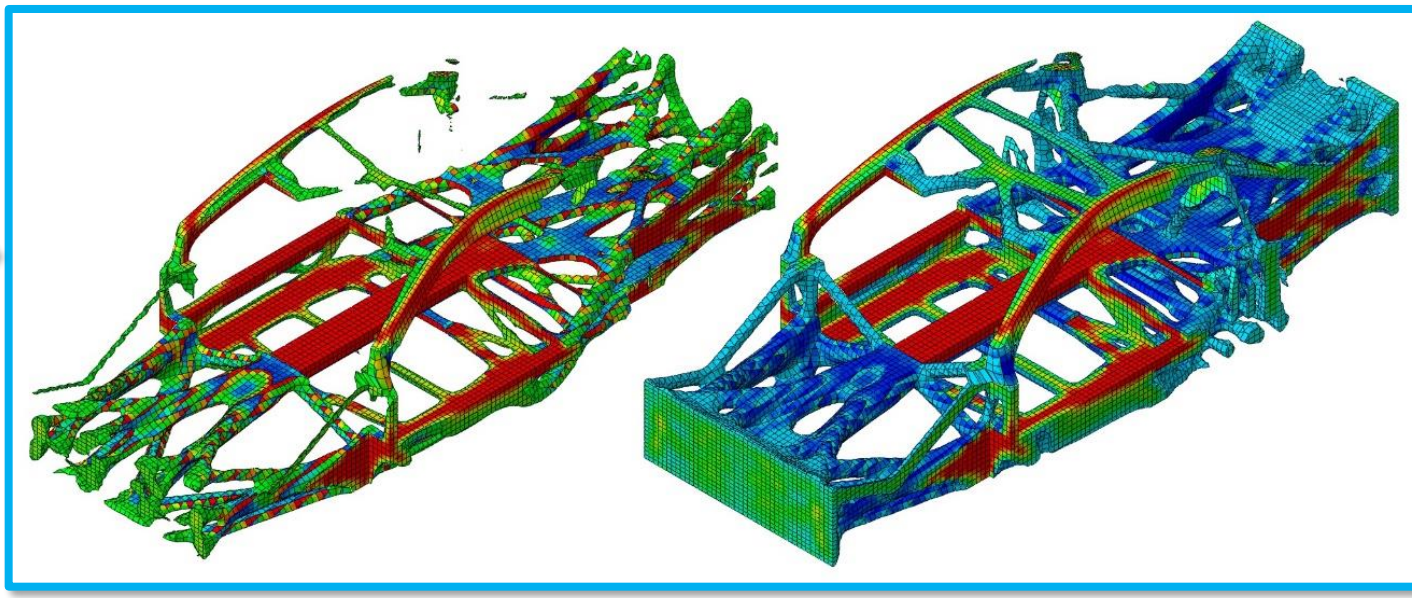
Structural Lay out and Optimisation

Based on the Audi R8 sports car design space

Optimised shape generated from multiple loading scenarios





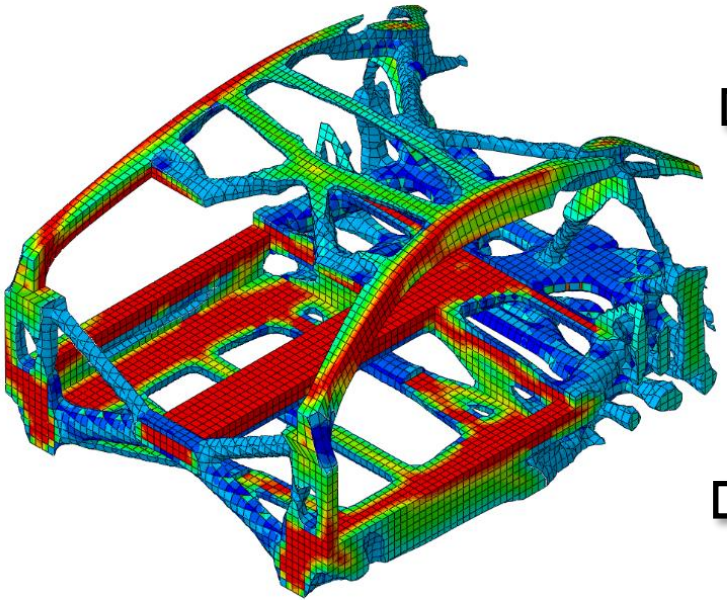


Sustainable and Light-weight Car Framework

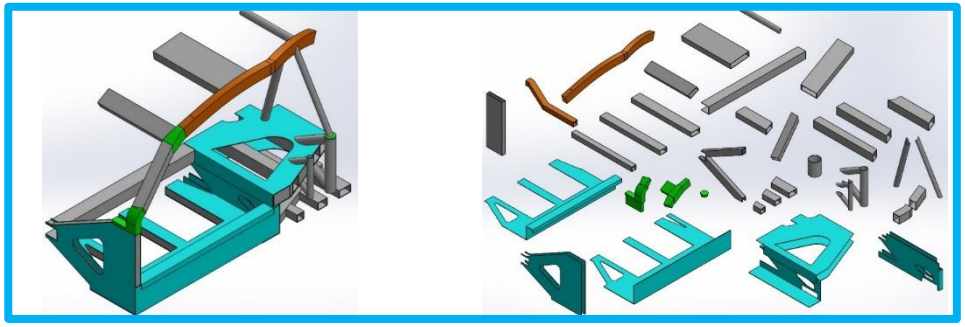
– Thermoplastic CFC Body Structure Design and Manufacturing Concepts

Mills Carbon Design

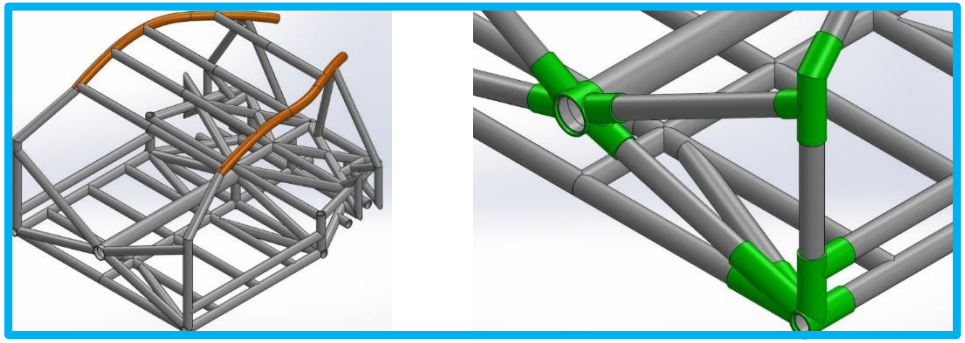
High volume production structural options



Welded TPCFC Pressings



Welded TPCFC Tubing and Aluminium Cast Joint Pieces



Both options utilise CF TP matrix laminates and profiles
– constant thickness allowing continuous manufacturing and localised forming

Novel Cranfield conceived TPRC joint welding techniques allow high rate frame assembly without adhesives

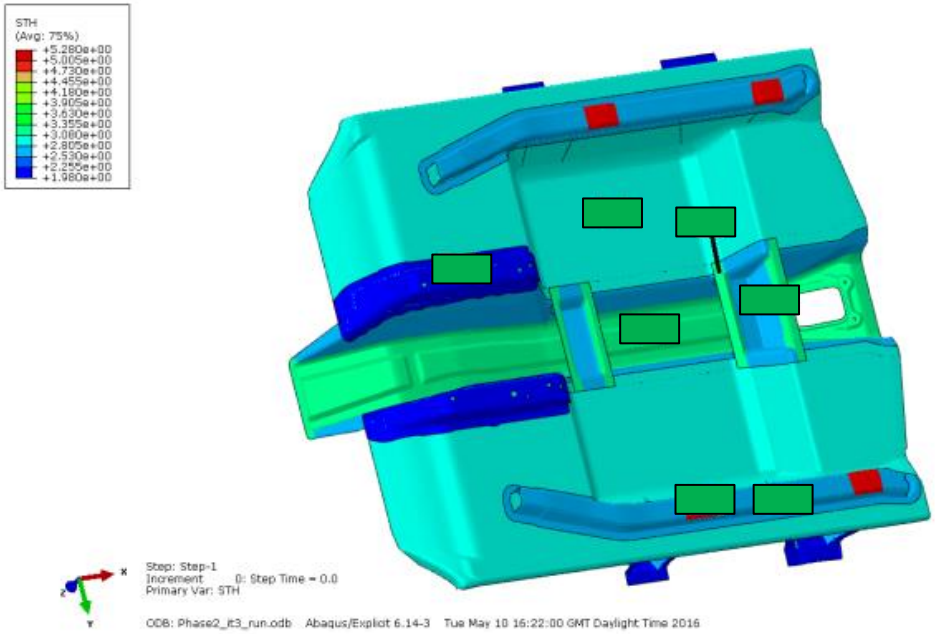
E–Vehicle Composite Platform Concept

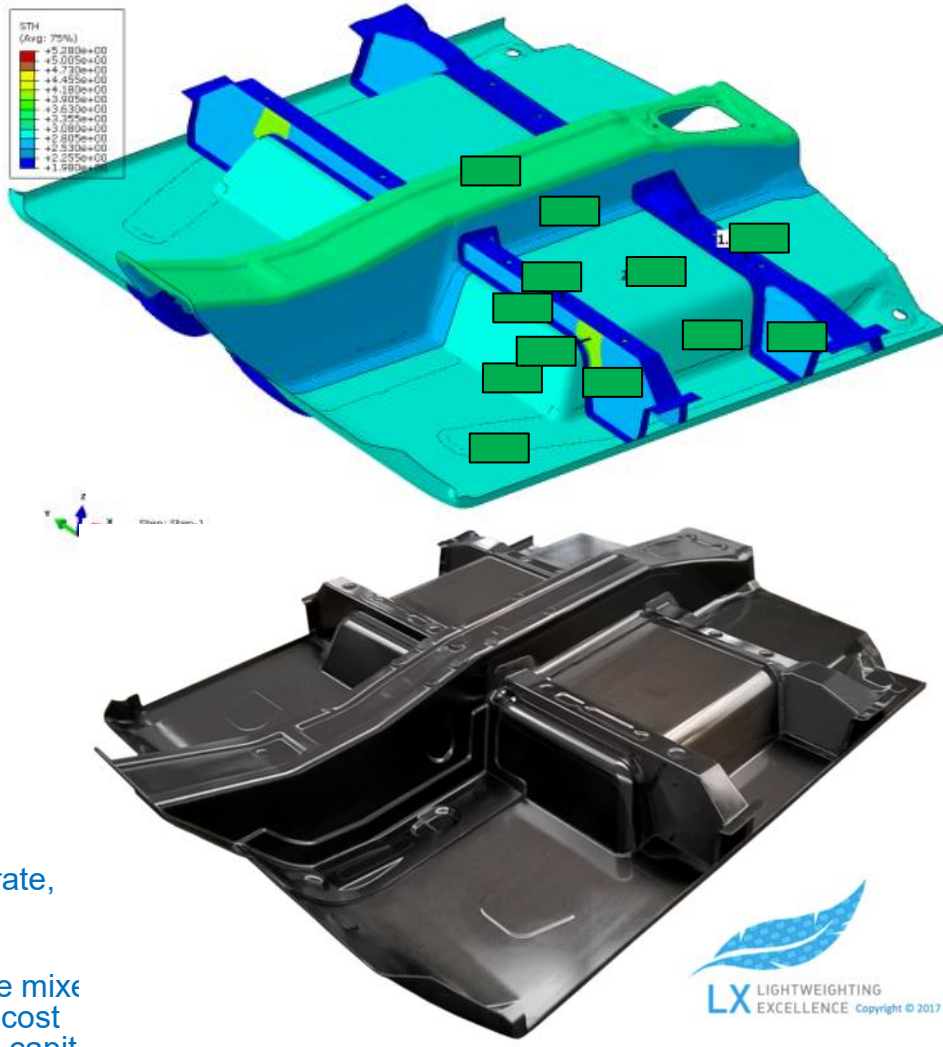
Innovate UK

LX Project

Mills Carbon Design

With Engenuity, Liberty Composites, Expert and Sigmatex





- This electric car platform was developed for a 50 000 per year rate, automated, manufacture, light-weight and crash safety
- With around 70% lower weight than the current steel design, the mixe recycled chopped and virgin fabric design has a manufacturing cost around 2X that of the steel design, but requires only 45% of the capit investment for equipment and tooling

AMSCI LX Automotive Floor Prototype - Image: Liberty Advanced Composites

Infiniti Emerge – E

- With Nissan, Lola Composites and Concept Group International

Mills Carbon Design

Upper body design using lightweight carbon fibre pre-preg

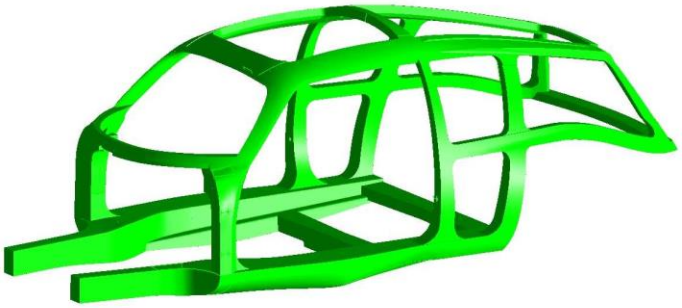
Weight - 45 kg

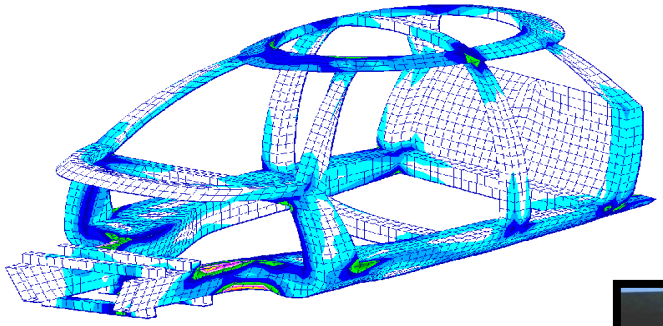
Existing GRP body – 115kg

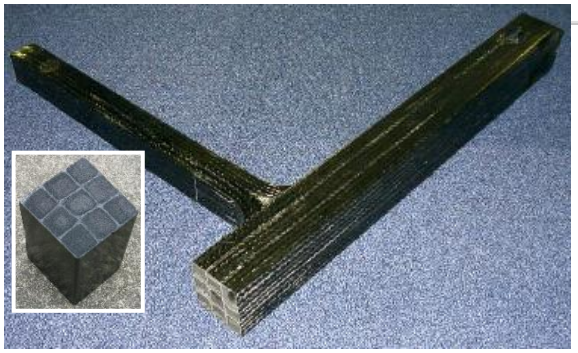
Solvay BPS Prepreg with local foam core stiffening - oven cured body panels

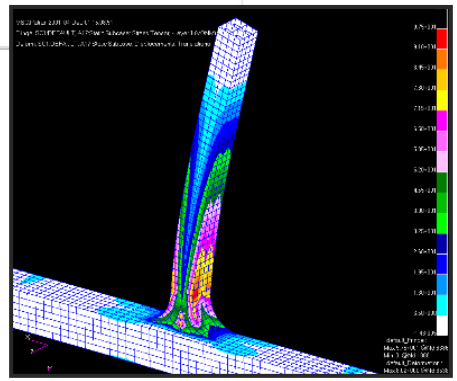
ASCC Project
Aero-stable Carbon Car
with Lotus Cars & Reynard Motorsport

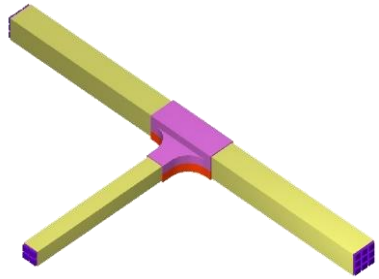
Ultra-lightweight demonstrator car
Body frame design using a novel tubular braided carbon fibre
- Axontex

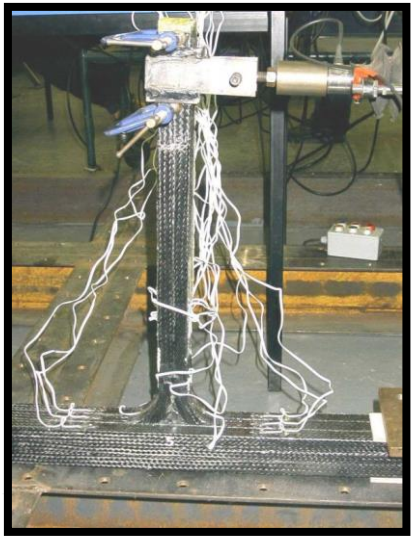












Aero-stable Carbon Car

Platform manufacture

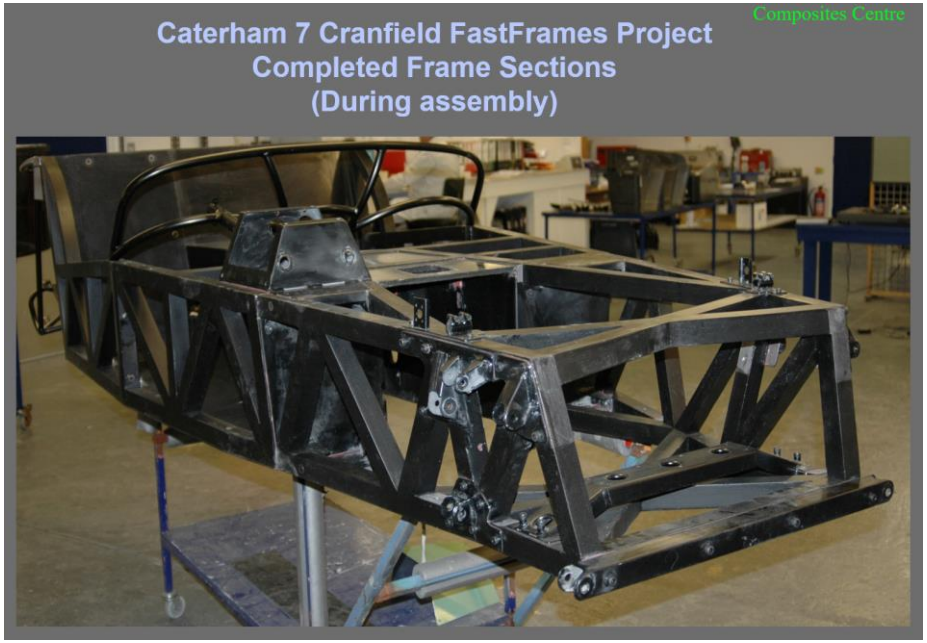
- Single piece CFC
- With HONDA UK

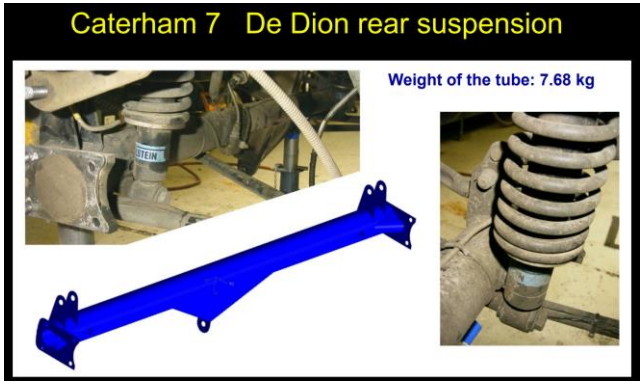
Floor frame manufactured using a low-pressure injection process

Caterham 7

Body Frame and Suspension Beam

Space-frame and suspension beam manufactured using braided and fabric carbon fibre





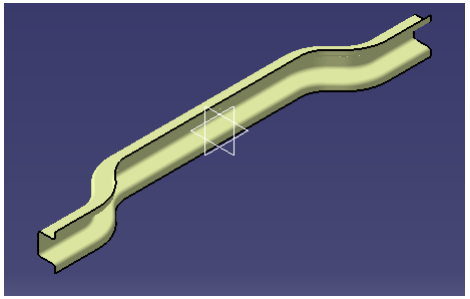
Bumper Beam Development
- with FORD UK

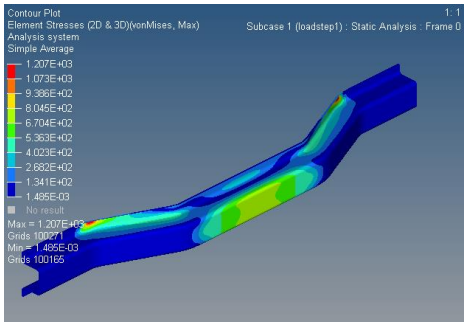
Mills Carbon Design

Ultra-light sports car bumper beam manufactured using carbon fibre thermoset RTM

CFC beam weight 2.9 kg
Existing steel design 8.3 kg

Thermoplastic compression moulding - cost and weight study – using glass and carbon fibre

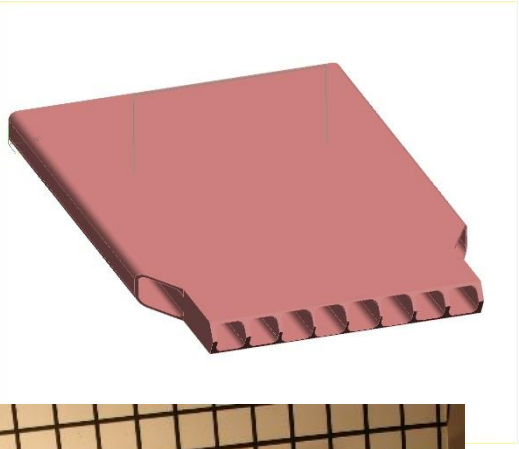


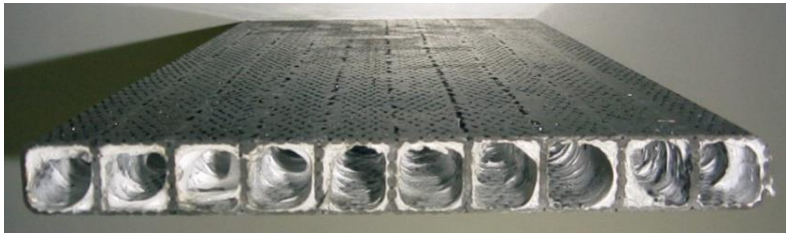


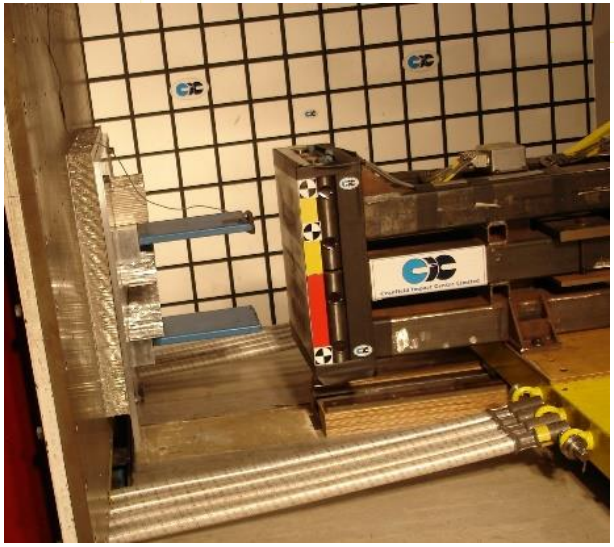
Automotive Crash Safety Structures

Mills Carbon Design

Manufactured using braided CFC for extreme energy absorption and low cost







Hi-rate, Complex Shape Parts Manufacturing Process

Hybrid CFSMC – UD Prepreg Compression Moulding

Mills Carbon Design

Highly loaded motorcycle sub-frame

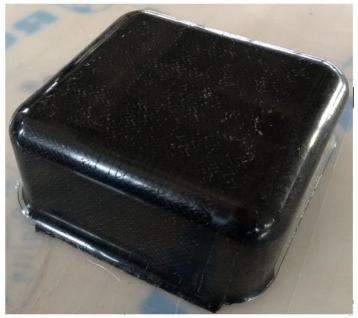
Metisse Motorcycles

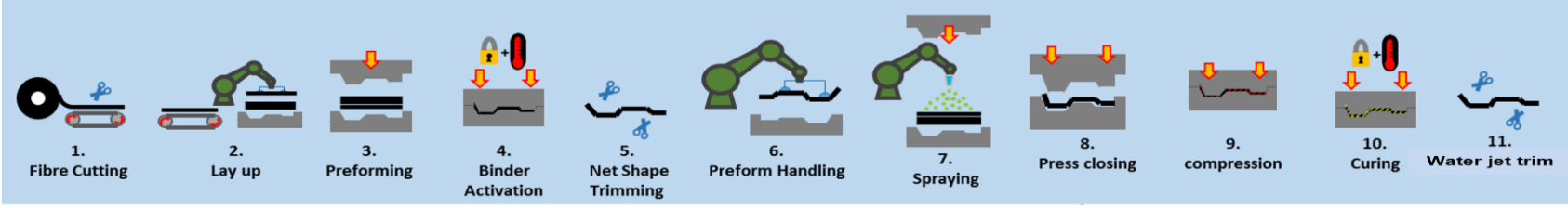
E-Vehicle Battery Boxes

With Nissan UK, Sigmatex, Autostructures UK, Airborne and the AMRC

Mills Carbon Design

Fire resistant high-rate wet compression moulding using recycled and UD carbon fabrics





Aircraft Structures

AIRBUS UK & British Aerospace

Mills Carbon Design

Airbus A320 Aileron

Airbus A320 Flap Track Fairing

Demonstrator Wing Box for BAE 125 Jet with British Aerospace Hatfield

Outer wing demonstrator

Jetstream ATP Storage Tank with AIM Aviation

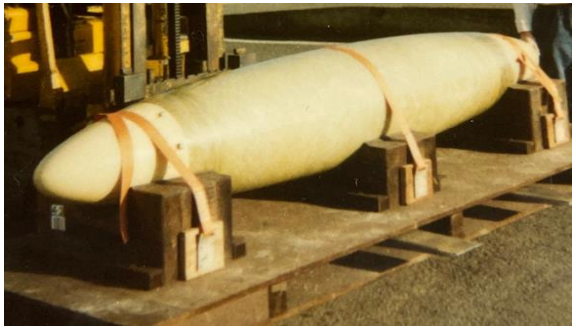
Aircraft Structures

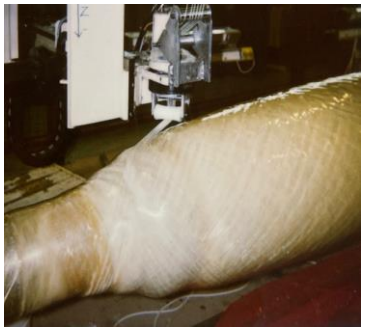
- AIRBUS UK, Courtaulds, GKN & Bombardier

Mills Carbon Design

Airbus UK Wing Box Demonstrator

Experimental High Pressure Fuel Tank





RIFT Fan Cowl Door Demonstrator

Cranfield UNIVERSITY

With GKN Aerospace

With integrated metallic hinge fittings

36

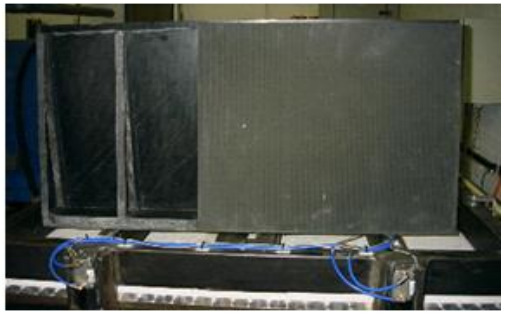
www.cranfield.ac.uk

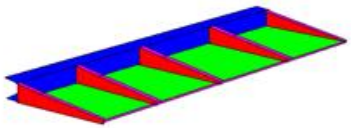
EPSRC AMICC Bombardier Shorts
– Aileron Demonstrator

Cranfield UNIVERSITY

One shot RTM moulding

- Investigation and Demonstration of:
  - Integrated moulding
  - Low cost tooling
  - Low cost materials
  - Low labour cost moulding





- Half scale
- Cutaway top skin

24

www.cranfield.ac.uk

Aircraft Structures

- BAE SYSTEMS

Unmanned Aircraft
FLAVIIR Grand Challenge

Mills Carbon Design

Demon UAV Airframe

Low-cost, ultra-light airframe manufactured using low temperature cure oven cure prepreg
– 4 metre span – 17kg weight

Low Cost Wing Box Demonstrator

Low-cost, ultra-light airframe manufactured using resin infusion and stitching with bonded assembly – eliminating structural bolting
- 45% cost saving compared to current low-cost prepreg design

Energy Generation Structures

- Experimental Ultralight Mini Wind Turbine

Height 0.6 m

Woven carbon fibre prepreg – low cure temperature
Using ALM (3D printed) plastic tooling

Awards & Patents

- BAE SYSTEMS Chairman's award Silver 2010
- Engineer magazine – Aerospace Innovation award 2010

Patents

- EP20155963.0 Aircraft Landing Gear 6 February 2020
- GB2566752A & WO2019/063980A1 Method of manufacturing a moulded article 26/09/17
- US7169343 Method of molding a reinforced nodal structure January 30 2007
- GB2430644 Method of moulding a composite article comprising a reinforcement 4 April 2007
- EP1495856 Reinforcement with a core of expansible material 1 Dec 2005
- US-6343639-B1 Machine for Laying Up Fabric to Produce a Laminate 5 February 2002