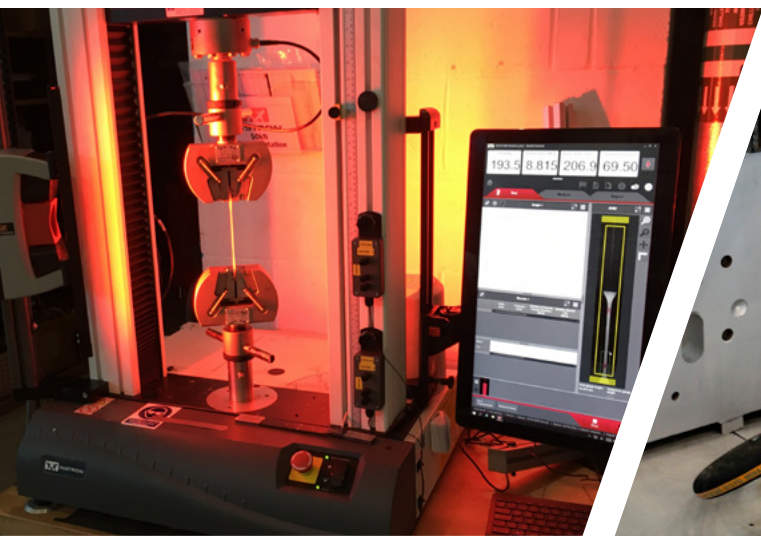
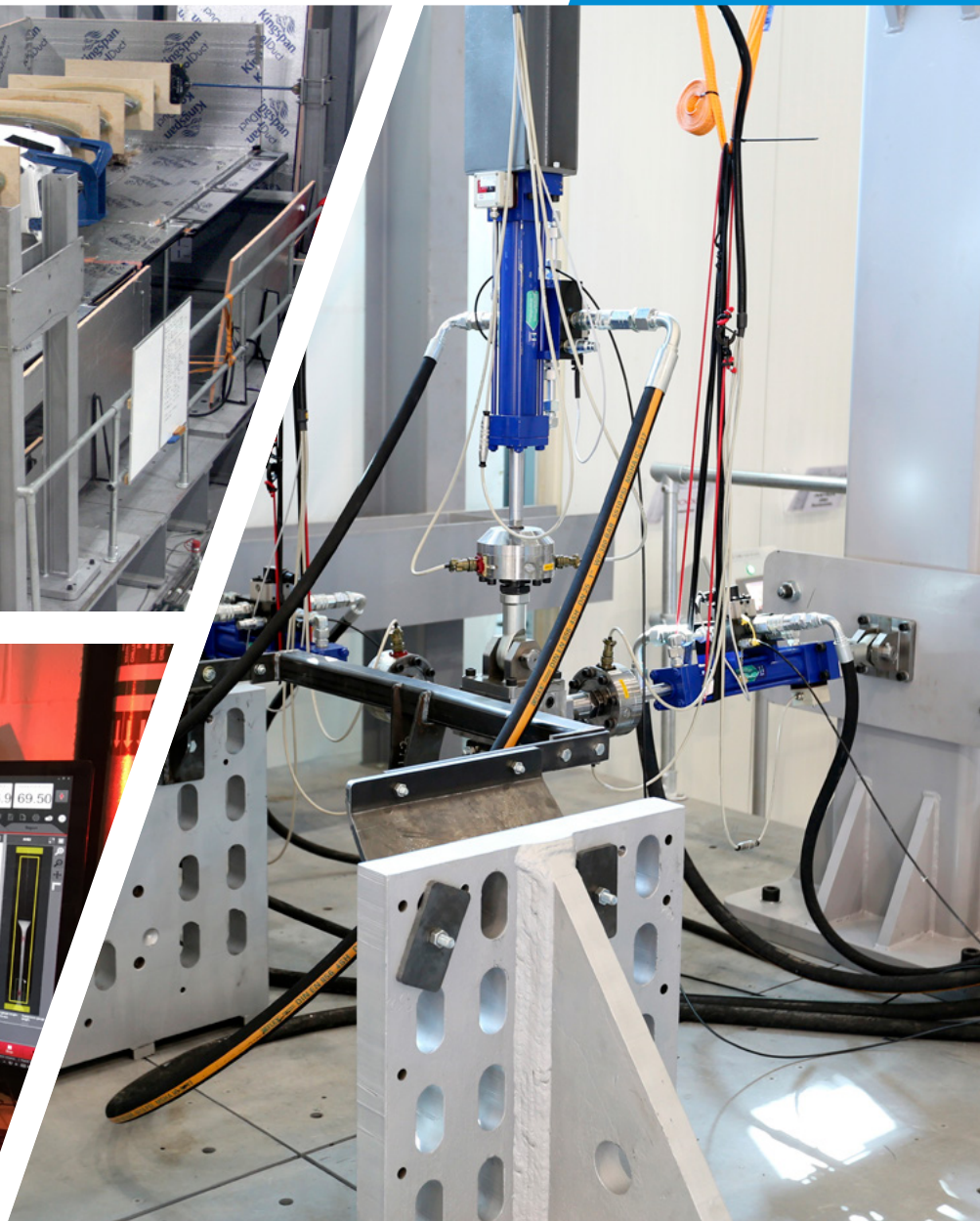
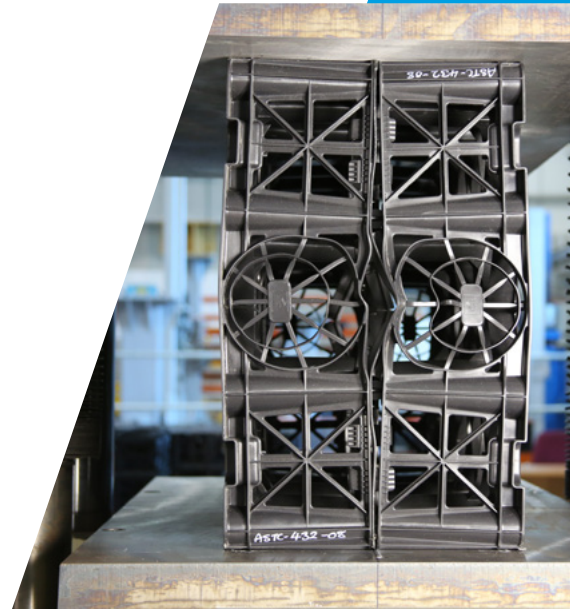


# Advanced Structural Testing Centre

Capability directory





## Based in the AMRC Design Prototyping and Testing Centre, the Advanced Structural Testing Centre (ASTC) provides the capacity, capability, and commitment to close the loop on the total engineering process within the AMRC.

**Test capabilities range from coupons to prove the material properties of new manufacturing processes, to complete finished components and assemblies.**

Certification and product validation are critical to the adoption of new manufacturing methods and technologies. Many of the techniques and products developed at the AMRC will be used for safety-critical components. Because even small changes can significantly affect final performance, it is vital to fully understand the performance of structures and materials.

Without the right certification, it is impossible to introduce innovative methods and technologies into the supply chain for aerospace or other highly regulated industries.

The ASTC can help you prove your technologies and achieve certification. Our capabilities are available to AMRC research groups, member companies, and external companies.

Backed up by the resources and expertise of the AMRC, we are able to physically validate research, analysis, material properties, components, sub assemblies, and full assemblies for both research and commercial projects.

The ASTC is accredited by the United Kingdom Accreditation Service (UKAS). We are currently the only structural test facility within a UK university to hold 'in-house methods' accreditation. This means that we are not restricted to

testing to specified international procedures, but can develop new test procedures in collaboration with our customers to prove out components under real-world conditions.

ILAC is the international organisation for accreditation bodies operating in accordance with ISO/IEC 17011 and involved in the accreditation of conformity assessment bodies including calibration laboratories (using ISO/IEC 17025), testing laboratories (using ISO/IEC 17025), medical testing laboratories (using ISO 15189) and inspection bodies (using ISO/IEC 17020).

Accreditation is the independent evaluation of conformity assessment bodies against recognised standards to carry out specific activities to ensure their impartiality and competence. Through the application of national and international standards, government, procurers and consumers can have confidence in the calibration and test results, inspection reports and certifications provided.

We also have specific accreditation for tensile testing to ASTM E8M, and certification for a wide range of standard tests including pressure testing up to 350Bar.

**For more information, contact:**  
Phil Spiers – head of ASTC  
[p.spiers@amrc.co.uk](mailto:p.spiers@amrc.co.uk)

**The AMRC Advanced Structural Testing Centre can bring a wide range of capabilities and expertise to our industrial partners.**

## Equipment

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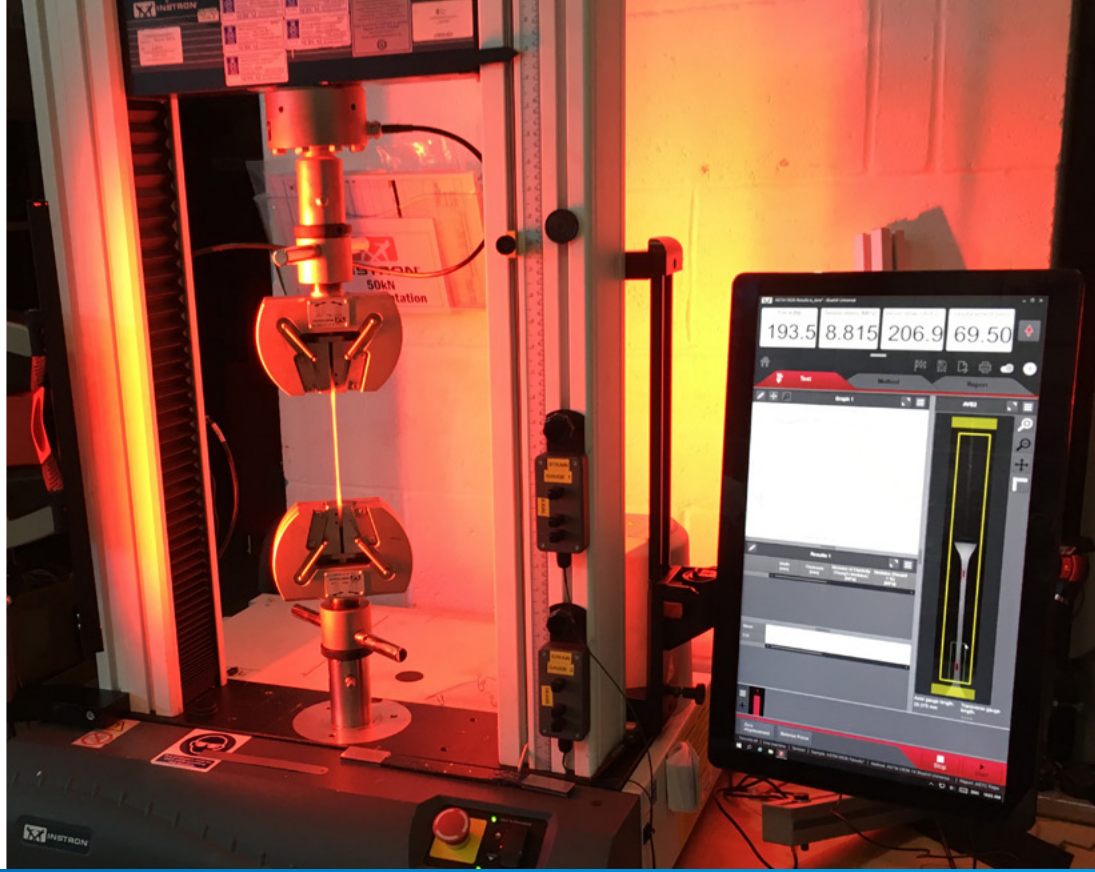
- Small 50kN Electric Test Frame ..... ▶ page 4
- Uniaxial Servo-hydraulic Machines ..... ▶ page 5
- 4 Post Hydraulic 1000kN Machine ..... ▶ page 6
- Impact Testing ..... ▶ page 7
- SATEC 2000kN capacity tension/compression frame ..... ▶ page 8
- Test Control ..... ▶ page 9
- 10m x 10m Strong Floor and a Reinforced Wall ..... ▶ page 10
- 2MN Test Frame ..... ▶ page 11
- Test Rigs ..... ▶ page 12
- Pressure Testing ..... ▶ page 13

## Associated Equipment and Services

- Data Acquisition (DAQ) • Strain Gauge Installation • Video Recording ..... ▶ page 14
- Small Strong Floors • People skills • Equipment

## Major Projects

- Integrated Wing • Run Flat Tyre Testing • Game Composites ..... ▶ page 15
- Materials for Demanding Applications • AK Orme • Cavotec



## Uniaxial Test Frames

### Small 50kN Electric Test Frame

#### Specification

- Instron 50kN test frame equipped with Bluehill software
- Load capacity: 50kN and 1kN load cells
- Extensometers with gauge length 6mm to 75mm
- Wedge grips
- Collet grips for tensile specimens
- Bending tests: 3 and 4 point
- Video extensometer
- Bluehill Universal

#### Testing

- Tensile test to ASTM E8M
- Tensile test of plastics
- Inter-laminar shear stress
- Crack growth testing
- Flexural testing
- Load vs. deflection testing
- Shear strength testing
- Open hole compression



## Uniaxial Servo-hydraulic Machines

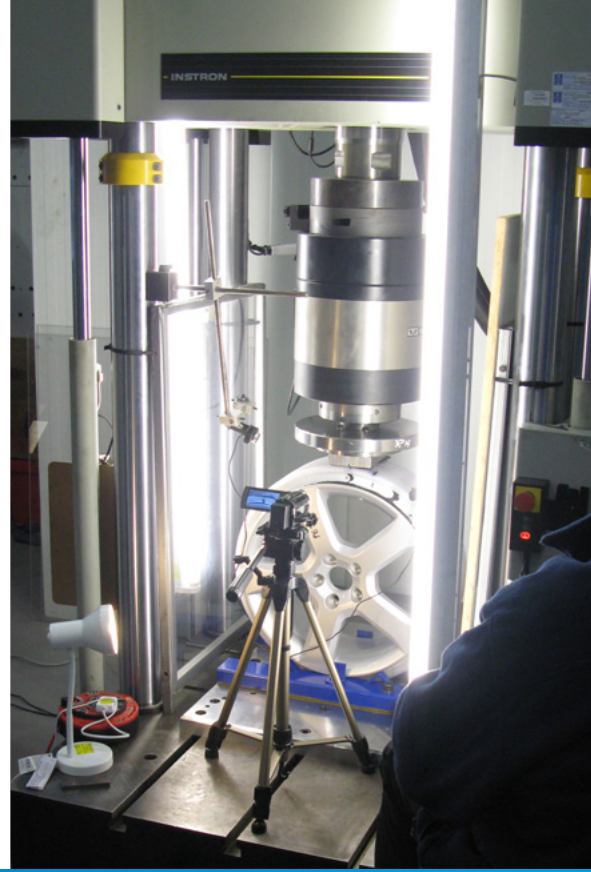
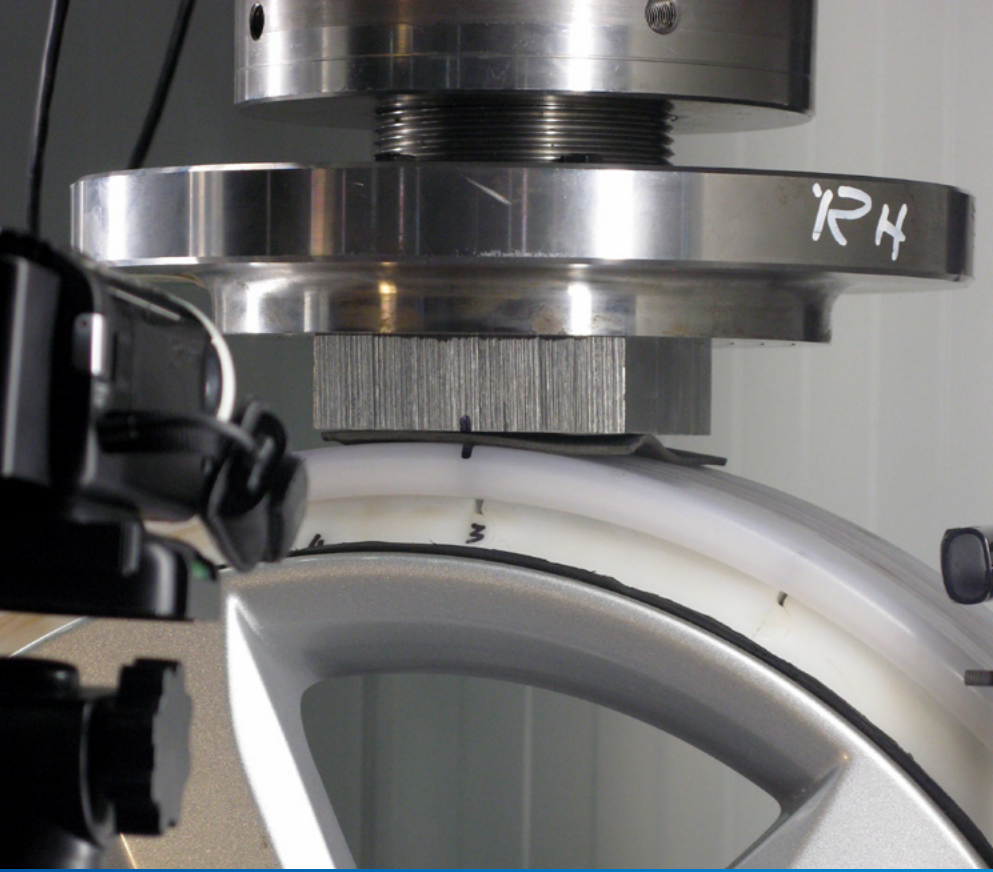
### Three machines available: 100kN and two 250kN

#### Specification

- Various frames all equipped with Instron 8800 digital controllers and WaveMatrix software
- Load capacity: 100kN, 250kN
- Max stroke length +/- 50mm
- Hydraulic wedge grips
- Bespoke grips and fixturing
- Alignment heads

#### Testing

- Performance testing of laser cut rapid manufacture structures
- Fatigue testing of tubes to prove NDT crack detection capabilities
- Shear testing of composite interfaces
- Failure investigation testing of nuclear industry manipulator
- Compressive testing of composite specimens
- Push through testing of manufactured composite structures



## Uniaxial Servo-hydraulic Machines 4 Post Hydraulic 1000kN Machine

### Specification

- Load capacity: 1000kN load cell calibrated to both 1000kN and over 100kN range (both responding at 0.5% class)
- T-slot bed plate envelope size 1500mm by 750mm
- Bespoke grips and fixturing design and manufacture capability
- Extensometer connection available

### Testing

- Performance testing of composite casing structures
- Fatigue testing of hybrid composite/metallic structures
- Composite flange testing with load applied at various angles
- Luxury yacht chain plate testing
- Run flat tyre static and fatigue testing



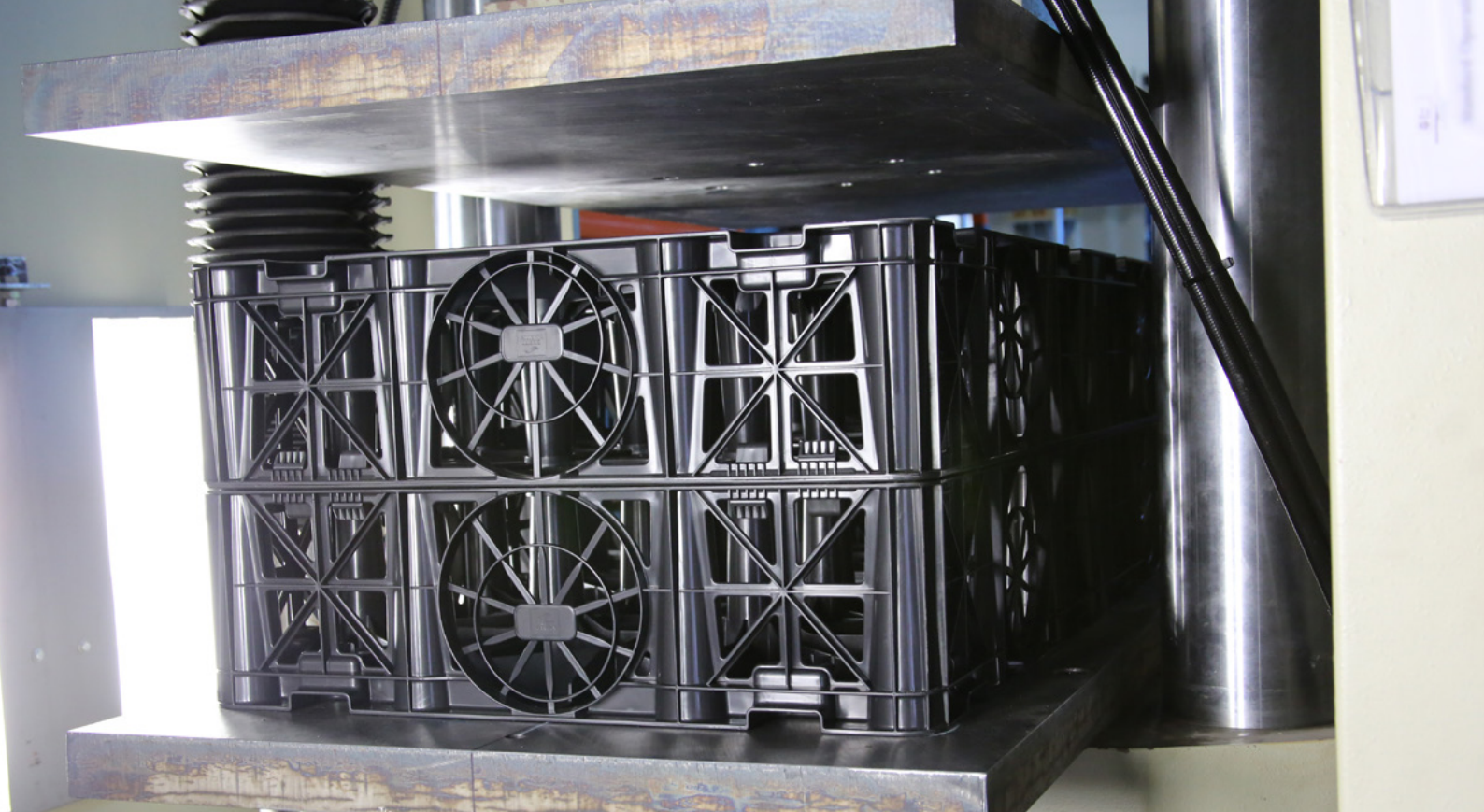
## Impact Testing

### Pendulum hammer machine

The Instron MPX is capable of testing Charpy impact from -100 degrees Celsius to +100 degrees Celsius and is available in capacities up to a maximum of 900 Joules, making it suitable for high volume testing.

### Falling weight impact machine

This machine is used for introducing Barely Visible Impact Damage (BVID) to composite specimens. The single impact machine has a 2.5 Joules to 588 Joules capacity with an operational temperature of -20 degrees Celsius to 120 degrees Celsius.



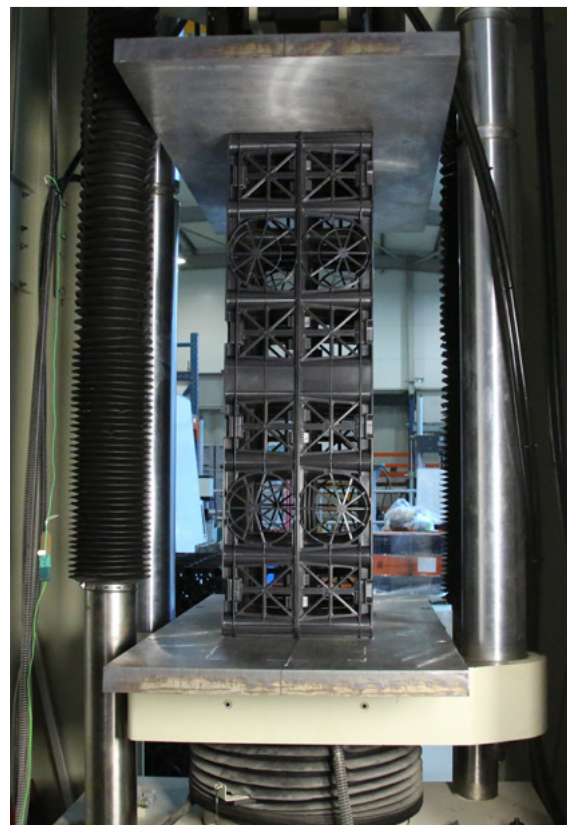
## **SATEC 2000kN capacity tension/compression frame**

### **Specification**

- Digital control via Zwick Cube Controller software
- Loading plate envelope size 710mm by 750mm
- Max specimen length 2m
- Bespoke grips and fixturing design and manufacture capability
- Platen parallel and flatness within 0.2mm

### **Testing**

- Composite Panel compression testing
- Integrated Wing structural testing
- Attenuation crate testing







## Test Control

The ASTC has the ability to control tests of up to 8 loading points via MOOG control systems portable test controllers. Tests can be conducted in load or displacement control. 'Real world' data can be transferred into test programmes and accelerated fatigue tests or multi-load strength testing can easily be carried out at the ASTC.

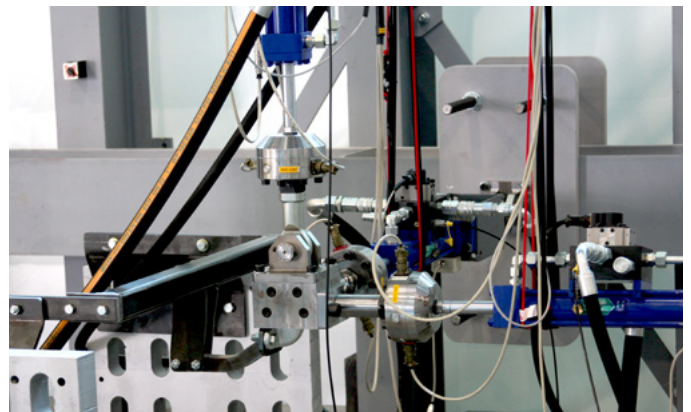
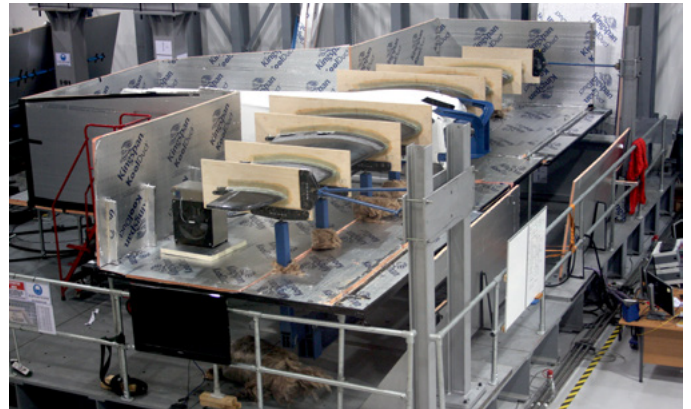


## ➤ A 10m x 10m Strong Floor and a Reinforced Wall

As part of the construction of the AMRC Design, Prototyping and Testing Centre, significant investment has been made to enhance the structural testing capability of the ASTC.

The strong floor enables the creation of bespoke frame rigs to test large size and high-load components or assemblies. The floor is of a design that enables it to be reconfigured to a 20m x 5m test area.

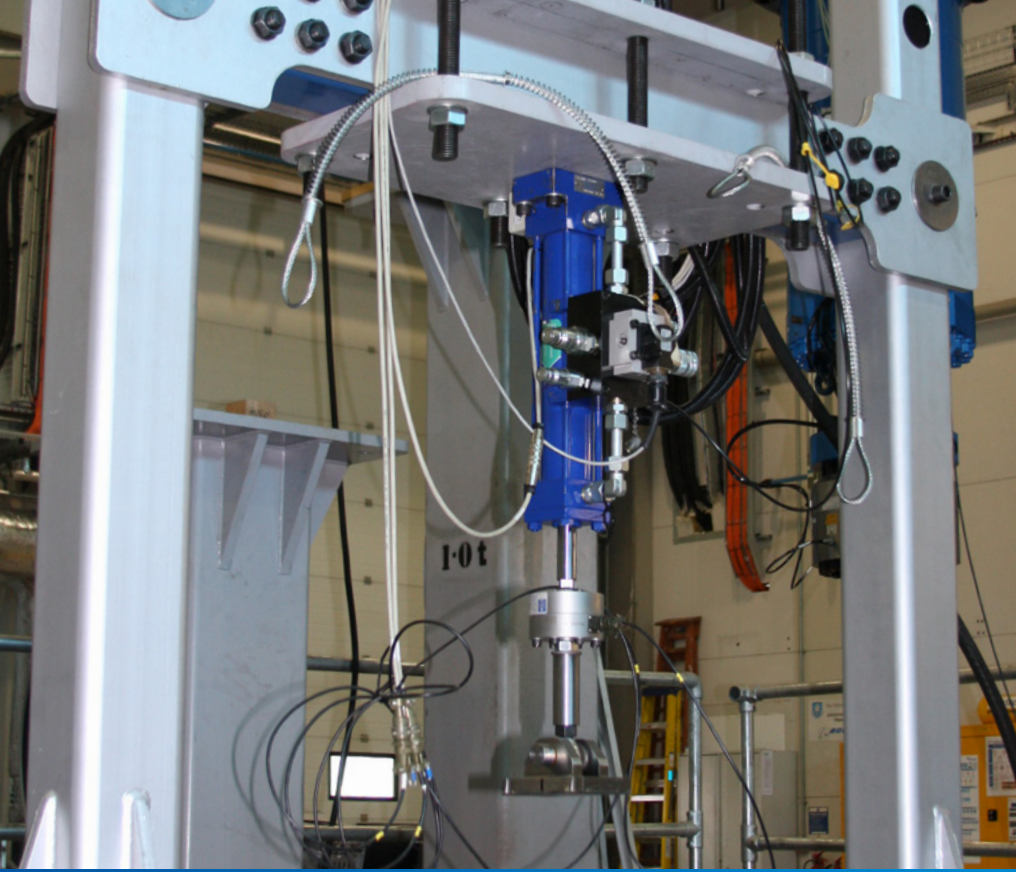
We also have the capability to box up and test full structures at elevated or lower temperatures.





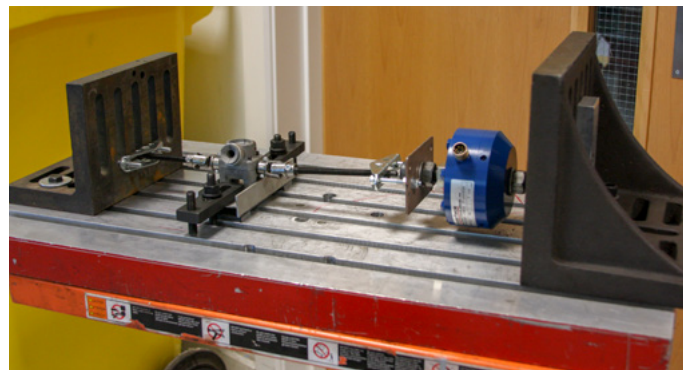
## 2MN Test Frame

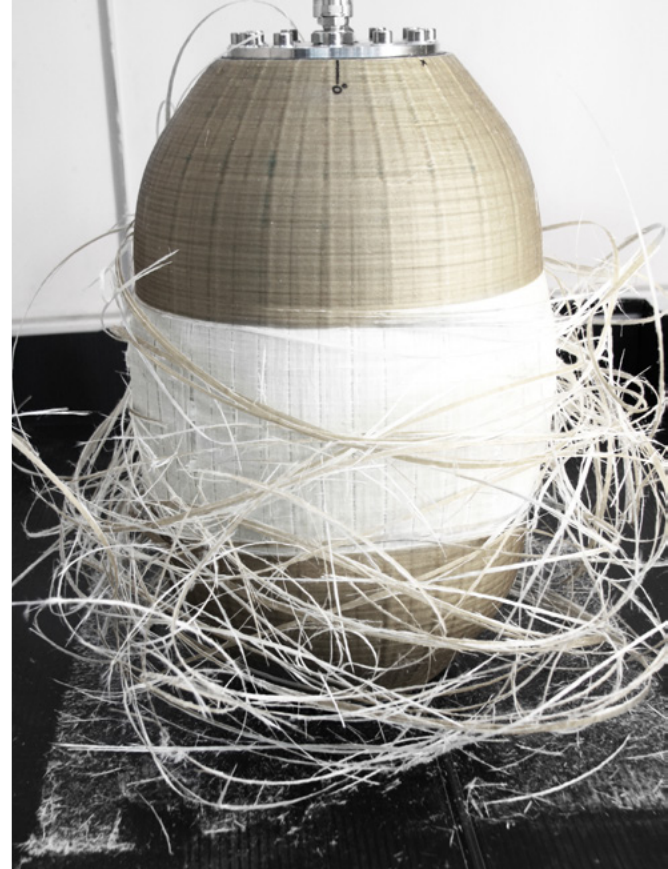
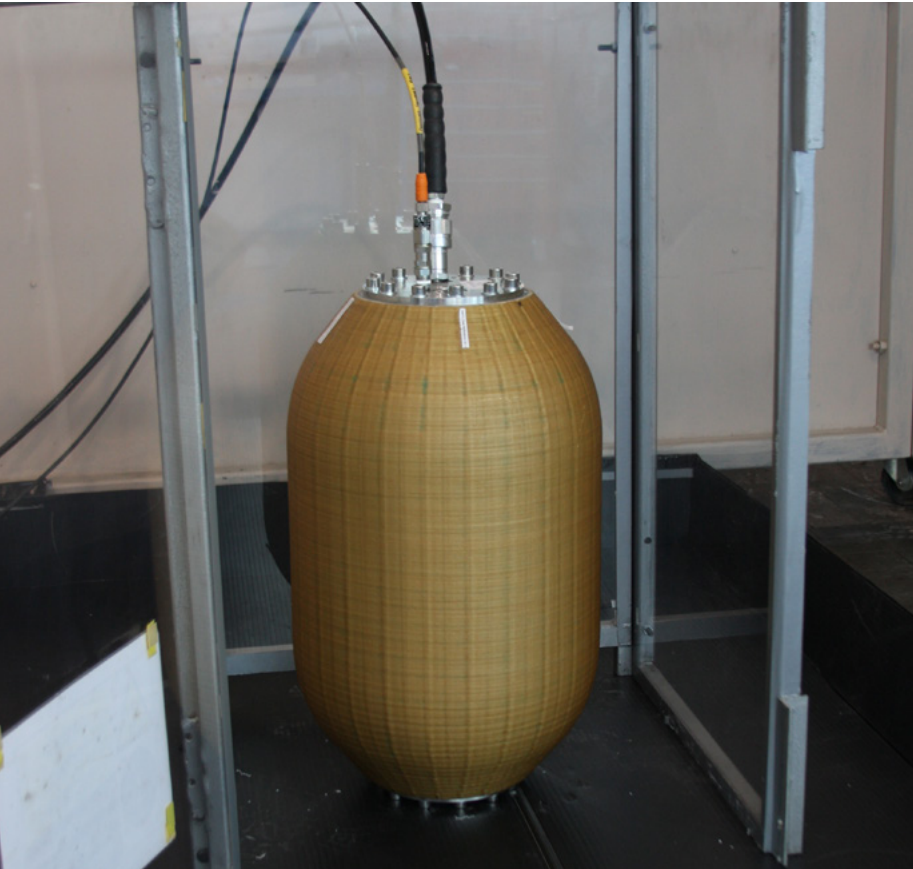
The strong floor provides the base for our 2MN actuator – the frame is capable of loading in both tension and compression and able to run fatigue profiles using our MOOG Smartest controller. The frame has a 2.2m square footprint available but we have tested narrow items up 5m in length by loading the specimen at an angle to the frame. As with all equipment in the ASTC this machine has a UKAS calibration for both load and stroke.



## Test Rigs

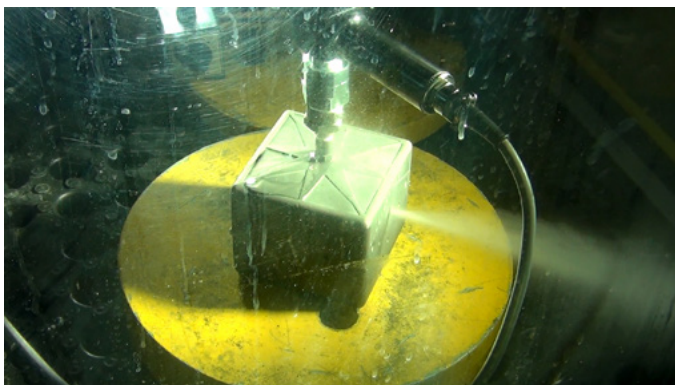
As well as having generic test frames available we have a rig design and manufacture capability in house. Test rigs that have been constructed include a 4m daylight test rig for long, low-load buckling tests, a test rig for evaluation torsional strength of small gearboxes, and a pure torsion rig for the testing of steering rack components.

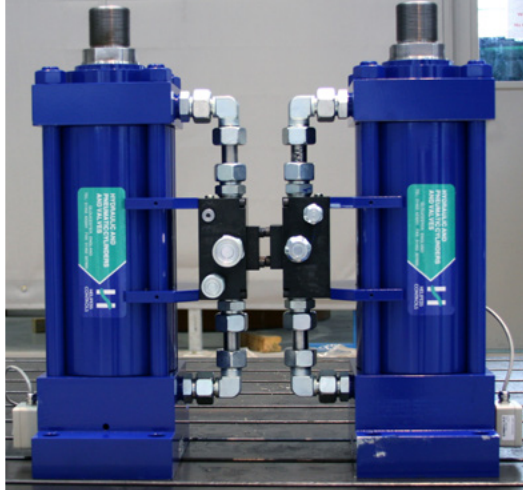
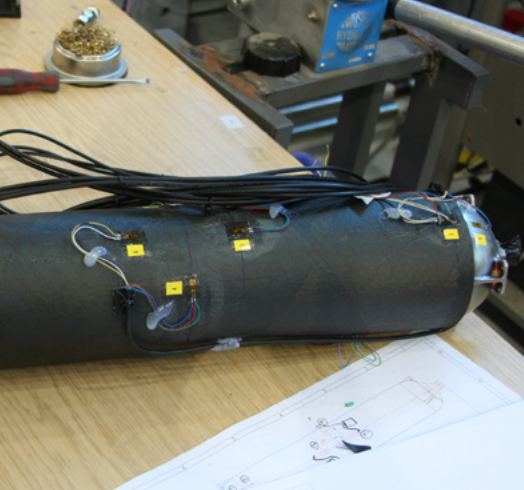




## Pressure Testing

The ASTC has a UKAS certification for pressure testing up to 250 bar and has performed hydraulic pressure testing on gas pressure vessels ranging from 3D printed satellite fuel tanks to air storage chambers for UAV applications. Testing to burst pressures is completed using a hydraulic fluid and as much volume as possible is filled using plastic beads to reduce the compressible volume in the vessel.





## Associated Equipment and Services

### Data Acquisition (DAQ)

At the heart of any structural test laboratory is the ability to accurately record the test data. Input and outputs from the unit under test must be time linked and recorded in a reliable and calibrated method. The ASTC uses HBM data acquisition equipment to log the required information produced on a test campaign. The DAQ is fully configurable to acquire time based data up to speeds of 19200Hz.

### Strain Gauge Installation

The ASTC is able to source and apply strain gauges to many different materials. The system uses a 4-wire 350 Ohm gauge as standard. However, other systems can be accommodated with prior notice. All gauges are fitted by trained and certified engineers in accordance with BSSM specifications and international standards.

### Video Recording

The importance of recording in detail, the inputs, actions and outputs of a test campaign often conducted on expensive components is understood by the ASTC. Standard HD video is recorded of each critical test together with high quality photographic evidence of test set-up and post-test condition. The ASTC is fortunate to have a former professional photographer on the team to ensure that the quality of images and videos are exceptional.

### Small Strong Floors

Smaller strong floors 2.5m x 3.5m and 2m x 6m

### People skills

Between us, the ASTC staff have a century of combined experience in specifying, developing, realising and reporting on testing from a wide and varied industry background. We have performed 6-axis testing of the concrete inside nuclear reactors and the full certification of landing gear structures and systems for both the Eurofighter and the Korean T-50 aircraft.

### Equipment

We have a good stock of various capacity and size of actuators available in the department suitable for the majority of testing applications from low-load long-stroke to high-load linear actuators, rotary actuators and simple mass loading. We also have a selection of load cells to suit any application from 500N to 1MN. Servovalves are generally selected to give the best performance and control for any given test.

## Major Projects

### Integrated Wing

The nature of the partners and the research at the AMRC has led to significant developments in the ASTC capability to test full scale components. The Integrated Wing project was a Technology Validation Programme and a national collaboration project among 17 UK leading organisations.

The project involved the manufacture of various demonstrator components that were tested under service conditions for static strength and fatigue life durability. As the test partner on the project, ASTC tested components to a maximum load of 130 tonnes and in fatigue for a test duration of 6 weeks. The fatigue spectrum applied was a complex flight-by-flight loading sequence supplied by the project partners from real-world on aircraft data.

### Run Flat Tyre Testing

Runflat Systems Ltd and Performance Engineered Solutions collaborated on a project developing a new vehicle run flat insert system. Static load and cyclic fatigue testing was carried out at the ASTC to prove the concept and investigate potential failure modes within the laboratory environment.

Internal procedures that ensure the test set up, rig function and applied loads are all validated and are in agreement with the customers before starting the test. Due to the high value of the unit under test, it is important to gain as much information about the specimen as possible. Whilst the test was being conducted, the ASTC used specialist partners to obtain Digital Image Correlation (DIC) of the panel deflection, high speed video capture of the test failure, as well as shearography and innovative real-time 'lamb wave' analysis of the specimen.

### Game Composites

We broke new ground by carrying out the UK's first full airworthiness test for 30 years. Lincolnshire-based Game Composites' GB1 prototype was designed and built in the UK and their initial plan for fatigue testing involved shipping the aircraft to the Czech Republic for full airworthiness certification. But the ASTC stepped in to keep the whole production in the UK. Our engineers designed a bespoke test rig to apply forces up to ten times those exerted by gravity, simulating forces the aircraft would have to cope with carrying out high speed manoeuvres.

[Click here to find out more](#)

### Materials for Demanding Applications

The ASTC worked in collaboration with UK company TISICS exploring the development of materials for demanding environments, such as transport, energy and the manufacturing sectors. TISICS specialise in the development and manufacture of high-strength lightweight titanium metal matrix composites and as part of a programme of work co-funded by Innovate UK, the ASTC worked with TISICS to complete fatigue testing and certification on titanium composite actuator rods being developed for use in commercial aircraft assemblies such as landing gear, wings and engines.

[Click here to find out more](#)

### AK Orme

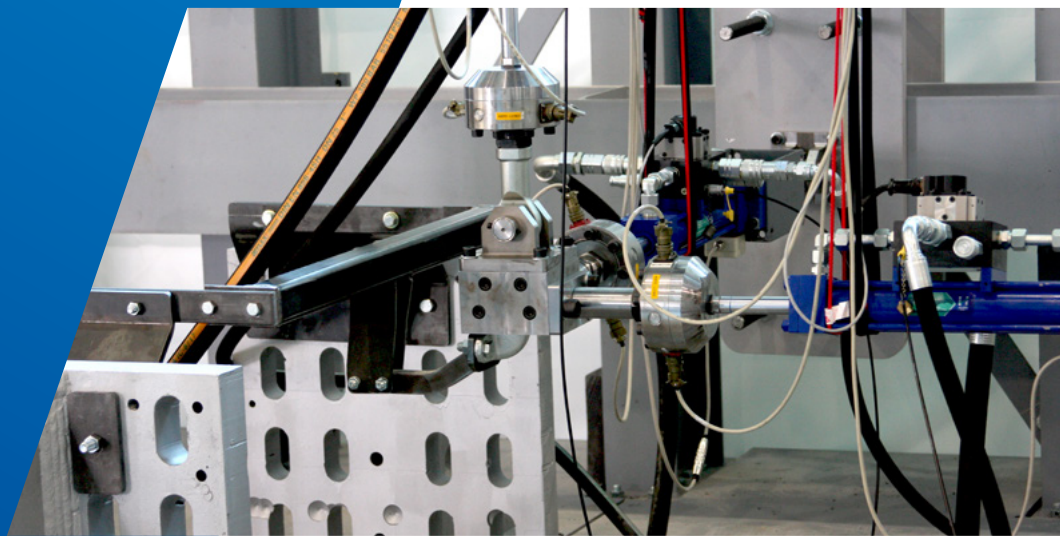
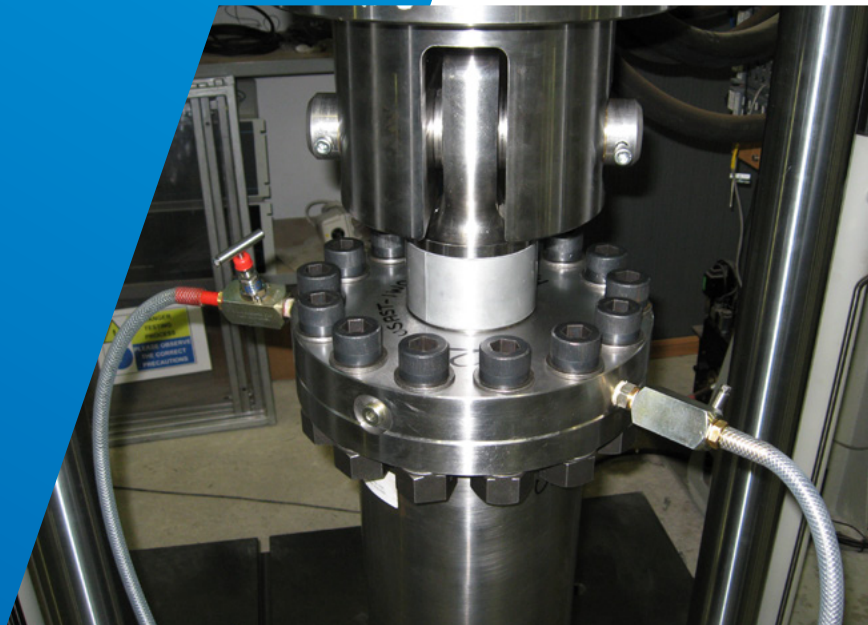
A local steel fabricator requiring quality assurance for welded rings made for an international customer work with us to verify the strength of the product. A K Orme and Son's contract involves creating reinforced rings for large grinding wheels by cutting steel rods to length, bending them and welding the ends together. The Sheffield-based company's client wanted the weld strength measuring, which meant cutting the welded section out of the ring and machining it so that the tensile strength could be measured perpendicular to the weld surface. To do this, the firm turned to us to carry out tests to verify the strength of the exported steel rings as we provides state-of-the-art means, methods and skills to validate engineering materials, components, assemblies and full products. By us doing the testing it keeps them competitive because they are able to do the quality assurance and satisfy their customer.

[Click here to find out more](#)

### Cavotec

ASTC has been performing both development and certification testing for a range of access chamber covers in both glass-filled composites and aluminium with applications ranging from pedestrian walkways to fueling covers for major international airport projects. All testing requires the UKAS certifications that we hold.

# AMRC



## AMRC

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