

COMPOSITES TECHNOLOGY FORUM FOR UK DEFENCE

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Empowering UK Defence with Advanced Composite Technologies

The Composites Technology Forum for UK Defence brings together the Ministry of Defence, large industry primes, academia and SMEs to share knowledge, expertise and opportunities for future collaboration. It facilitates a technical exchange between leading organisations in the industry to drive innovation, and help position the UK as an epicentre for composites in the defence sector.

The National Composites Centre facilitates a series of Technology Days as part of the Composites Technology Forum for UK Defence. Each event focuses on a priority technology theme that has been identified and selected from consultation with industry and the Ministry of Defence.

Each Technology Day provides a collaborative discussion space between the Forum Steering Board, the UK industrial supply chain and academic communities.

For the 2024/2025 cycle, our Technology Days will focus on and revolve around three key themes:

- High Temperature
- Survivability
- Extreme Environments

Cross-cutting threads include:

- Joining and Repair Methodologies
- Inspection, Testing and Standards
- Emerging Technologies
- Cost Efficiency
- Digital Integration
- Sustainability Practices



# Enhancing Survivability in Defence Systems

Survivability of materials is paramount in future defence engineering to ensure mission success and personnel safety. By integrating composite materials with high durability, ballistic protection, and specific functionalities, defence systems can withstand threats such as explosions, projectiles, laser energy and electromagnetic weapons. Prioritising material survivability enhances the longevity of defence assets, reduces maintenance requirements, minimises downtime, and enhances the readiness and capability of armed forces.

#### **Priorities**



## Addressing Extreme Environments

Developing materials capable of withstanding extreme environments is essential for future defence engineering. These materials endure corrosive conditions, chemical immersion, electromagnetic radiation and other unique environments. Additionally, these materials perform under the demanding high-stress situations encountered in combat across all operational domains: air, land, sea and space.

By creating new composite materials with exceptional environmental resilience, defence systems can operate reliably in such extreme conditions, maintaining functionality and mission readiness. With climate change affecting domain conditions and creating an unpredictable environment, there is an increasing need for materials to withstand changing requirements and ensure sustained performance.

#### **Priorities**

- extended UV exposure
- domains



## **High-Temperature Applications** in Defence Engineering

High-temperature advanced materials, including thermally stable polymer and ceramic matrix composites, play a crucial role in future defence engineering. Offering exceptional heat resistance combined with high strength-to-weight ratios, these materials ensure reliability and durability in demanding applications such as thermal protection systems and propulsion. Their lightweight nature enhances mobility and agility in military equipment, paving the way for more advanced defence technologies.

#### **Priorities**

- > Polymer Matrix Composites (PMCs) Polymers with thermal stability and high glass transition temperatures providing low-range thermal protection
- ▶ Metal Matrix Composites (MMCs) Composites using ceramic reinforcement with metal alloys providing mid-range thermal protection
- **Ceramic Matrix Composites (CMCs)** Oxide and non-oxide based CMCs providing high-range thermal protection

> Armour Systems – Next-generation armour systems and 3D fibre technology which can protect structures and personnel from emerging ballistic and energetic threats

**Shock Protection** – Advanced structural composites able to withstand explosive shockwaves above and below water

**Electromagnetic Protection** – Composites technology which can reduce radar cross-section and provide adaptive functionality for mitigating electromagnetic effects

Marine Environment – Composites technology adapted for the marine environment, protecting from thermal fatigue, salt water effects, corrosion and

► Fatigue, Ageing and Fire, Smoke and Toxicity – Composites technology developed to reduce the effect of ageing, fatigue damage in harsh environments in particular mitigating fire threats and toxic smoke exposure for personnel in all

**Radiation and Plasma Effects** – Materials adapted to radiation protection. ionising and non-ionising effects, exposure to hypersonic plasma and in-space conditions such as solar radiation and atomic oxygen

## Accelerating innovation in defence

The National Composites Centre is a world leading UK research and development facility that provides access to state-of-the-art engineering capabilities and technology. Collaborating to address the most complex engineering challenges of our time, we deliver increased quality and enhanced security for the UK through our culture of innovation and collaborative relationships in research and development.



### Contact

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