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The UK Advanced Tooling Grand Challenge

Developing composites capability for Aerospace and critical manufacturing tooling supply chains

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The Advanced Tooling Grand Challenge - Online Briefing - 31 March 2026

- The focus from the Composites Working Group on Tooling
- The Grand Challenge Consortium stages and timeline
- Technology Development Goals from the upcoming ATI Composites Strategy
- How to join the UK Advanced Tooling Grand Challenge Consortium
- Next Steps & Contact Information

The focus from the Composites Working Group on Tooling – GKN

The Advanced Tooling Grand Challenge

- Last year, the Aerospace Technology Institute (ATI) published a Market Spotlight: Growing UK Composite Capability and convened an industry-led Composites Working Group, which has identified the UK needs to develop a high-rate automated, intelligent, and fully instrumented, supply chain for turnkey advanced tooling solutions, to satisfy demand of technology in critical manufacturing processes.
- GKN Aerospace has volunteered to lead an Advanced Tooling Grand Challenge programme developing aerospace, and cross sector, tooling outcomes with support from an ATI strategic programme funded initiative, where relevant.
- To achieve this ambition, solutions are being sought from both UK and international organisations willing to collaborate and invest to develop UK capability with support from ATI Grant Funding.

The Opportunity

- To address the Composites Working Group's central challenge of scaling UK capability, GKN Aerospace and Challenge Owners from across the sector are inviting organisations to join the industrially led Grand Challenge programme to develop an integrated tooling capability by 2030.
- The focus of the programme will be to collaborate on an application for ATI funding in 2026, and, upon successful funding, engage in a sprint project, of up to three-year collaboration from 2027 to develop and demonstrate both technology and capability to meet the Tooling Challenges in the UK by 2030.

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The Grand Challenge Consortium stages and timelines

A Strategic Opportunity:

- To achieve the ambition set by the upcoming ATI strategy a range of solutions are needed from both UK and international organisations willing to locate and invest in developing UK capability.
- From May 2026 the focus of the Grand Challenge is to collaborate on raising funding needed to launch the cornerstone of UK Advanced Tooling Capability.
- From May to October 2026, we will develop an ATI application for both sprints and sustained projects, which when integrated will demonstrate the Challenge Owner use cases.
- From Q1 2027 the collaboration will develop contracts to deliver both technology and capability outcomes needed to meet the market opportunities by 2030.

Planning for Success:

- GKN Aerospace, Axillium and Composites UK will lead the funding application with a proven plan for success, built on open collaboration with shared support to access public funding.
- Organisations are invited to join the self-funded consortium phase in order to raise ATI match funding to deliver the Tooling Grand Challenge from Q1 2027.
- Upon award the consortium will contract with Innovate UK to develop the UK composites capability for Aerospace and critical manufacturing tooling supply chains.

Axillium
Innovation | Insight | Investment

Composites UK
Trade Association

The Grand Challenge from Consortium to Award

March 2026	April 2026	May 2026	October 2026	December 2026
1	2	3	4	5
Challenges Defined	Consortium Defined	ATI Application Launched	ATI Application Submitted	Funding Award *

1: Challenge Owners engaged to lead the UK Advance Tooling priorities of upcoming ATI Composites Strategy.

2: Challenges and Technology Goals published, Solution Providers interest engaged and consortium formed.
3: Solution Providers and Challenge Owners prepare funding application to the ATI Strategic Programme.
4: Consortium funding submitted to develop and address the UK Tooling Challenges from 2027 to 2030.

5: ATI funding awarded to launch the UK Advanced Tooling Grand Challenge in Q1 2027, *subject to ATI approval.

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The Grand Challenge targets a central ATI Goal within the upcoming strategy

Challenge Areas and Technology Development Goals from the upcoming ATI Composites Strategy

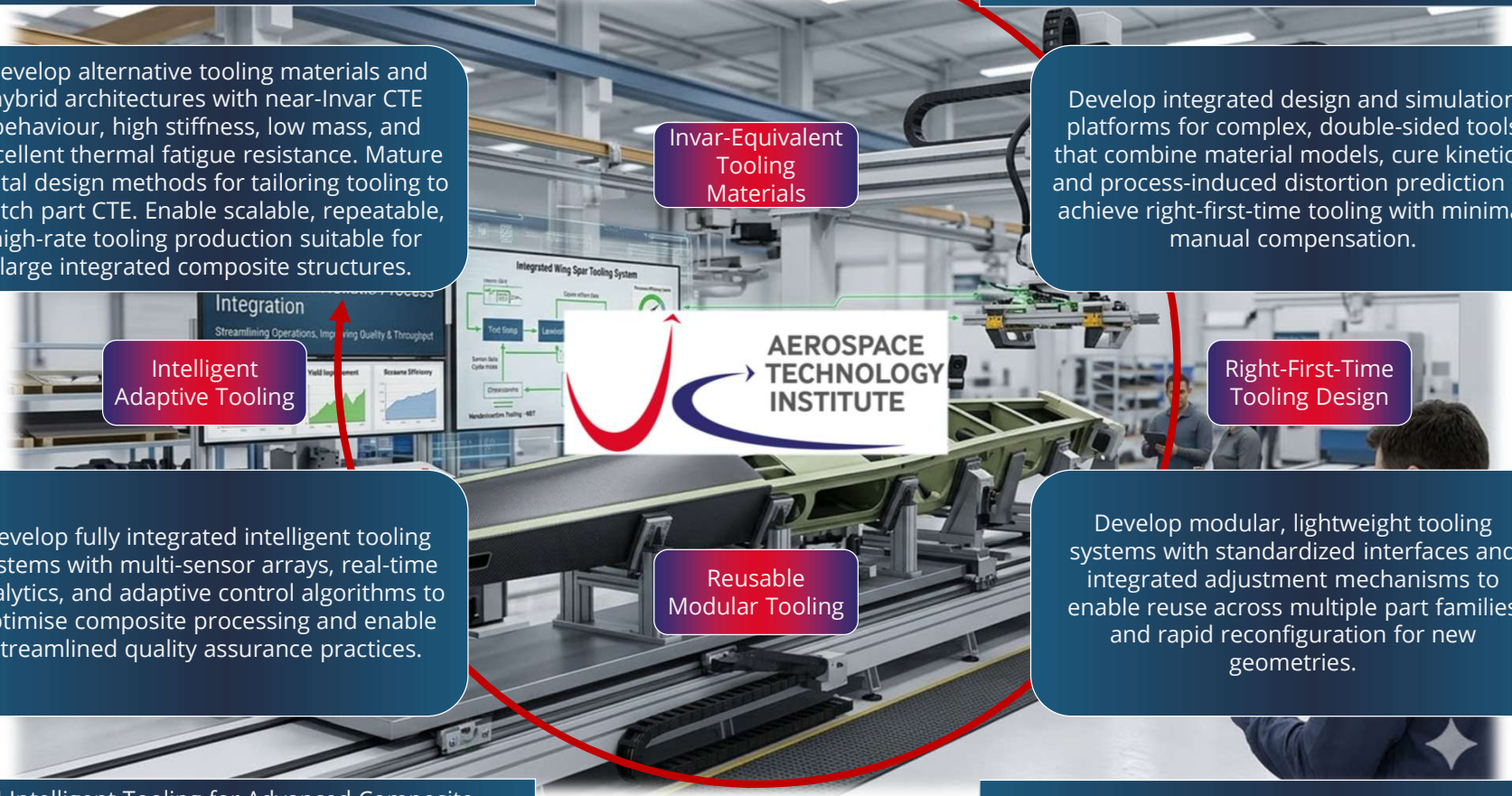
GC-01 Alternative Materials for CTE equivalence

GC-02 Design and Simulation Methods and Tools for Right-First-Time Tooling

Develop alternative tooling materials and hybrid architectures with near-Invar CTE behaviour, high stiffness, low mass, and excellent thermal fatigue resistance. Mature digital design methods for tailoring tooling to match part CTE. Enable scalable, repeatable, high-rate tooling production suitable for large integrated composite structures.

Invar-Equivalent Tooling Materials

Develop integrated design and simulation platforms for complex, double-sided tools that combine material models, cure kinetics, and process-induced distortion prediction to achieve right-first-time tooling with minimal manual compensation.



Intelligent Adaptive Tooling

Right-First-Time Tooling Design

Develop fully integrated intelligent tooling systems with multi-sensor arrays, real-time analytics, and adaptive control algorithms to optimise composite processing and enable streamlined quality assurance practices.

Reusable Modular Tooling

Develop modular, lightweight tooling systems with standardized interfaces and integrated adjustment mechanisms to enable reuse across multiple part families and rapid reconfiguration for new geometries.

GC-04 Intelligent Tooling for Advanced Composite Processing

GC-03 Re-usable and Re-configurable Tooling

Examples of Challenge Areas identified with solution opportunities to meet the ATI Development Goals

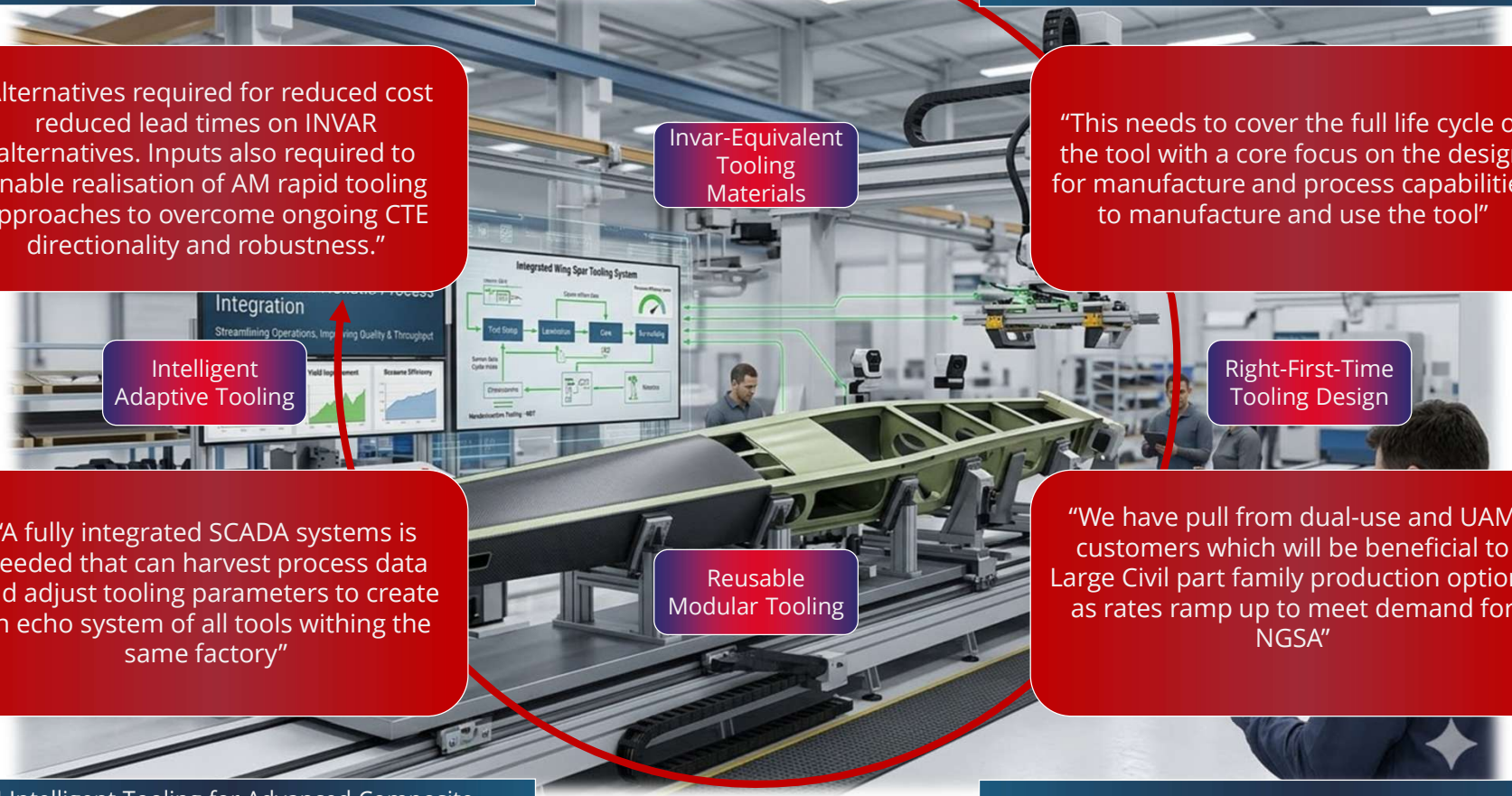
GC-01 Alternative Materials for CTE equivalence

GC-02 Design and Simulation Methods and Tools for Right-First-Time Tooling

"Alternatives required for reduced cost reduced lead times on INVAR alternatives. Inputs also required to enable realisation of AM rapid tooling approaches to overcome ongoing CTE directionality and robustness."

Invar-Equivalent Tooling Materials

"This needs to cover the full life cycle of the tool with a core focus on the design for manufacture and process capabilities to manufacture and use the tool"



Intelligent Adaptive Tooling

Right-First-Time Tooling Design

"A fully integrated SCADA systems is needed that can harvest process data and adjust tooling parameters to create an echo system of all tools withing the same factory"

Reusable Modular Tooling

"We have pull from dual-use and UAM customers which will be beneficial to Large Civil part family production options as rates ramp up to meet demand for NGSA"

GC-04 Intelligent Tooling for Advanced Composite Processing

GC-03 Re-usable and Re-configurable Tooling

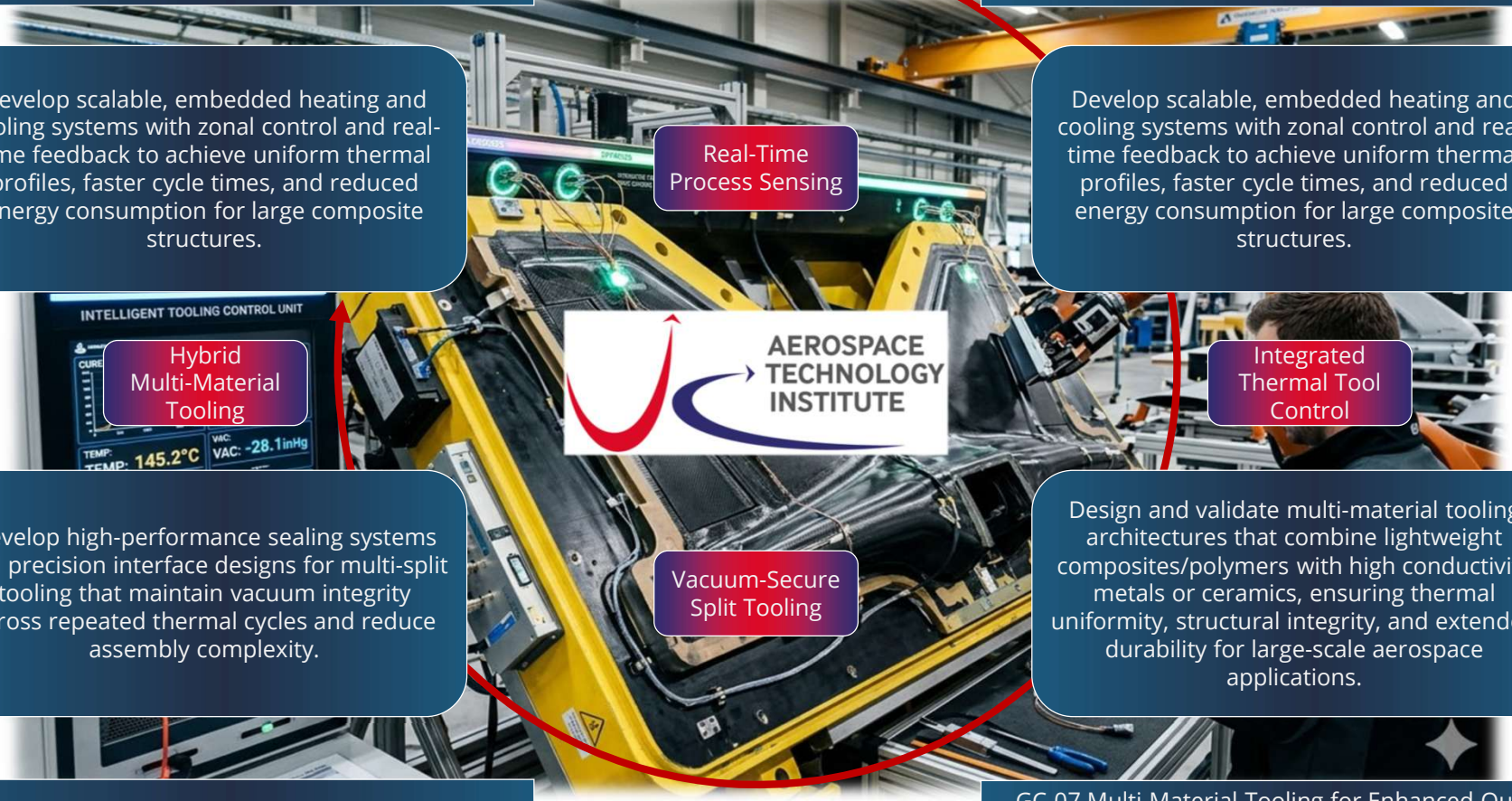
Challenge Areas and Technology Development Goals from the upcoming ATI Composites Strategy

GC-05 Novel Sensing for Process Control

Develop scalable, embedded heating and cooling systems with zonal control and real-time feedback to achieve uniform thermal profiles, faster cycle times, and reduced energy consumption for large composite structures.

GC-06 Integrated heating and cooling for large scale and high integrity

Develop scalable, embedded heating and cooling systems with zonal control and real-time feedback to achieve uniform thermal profiles, faster cycle times, and reduced energy consumption for large composite structures.



Develop high-performance sealing systems and precision interface designs for multi-split tooling that maintain vacuum integrity across repeated thermal cycles and reduce assembly complexity.

Design and validate multi-material tooling architectures that combine lightweight composites/polymers with high conductivity metals or ceramics, ensuring thermal uniformity, structural integrity, and extended durability for large-scale aerospace applications.

GC-08 Vacuum Integrity of Complex Multi-Split Tools

GC-07 Multi-Material Tooling for Enhanced Quality and Durability

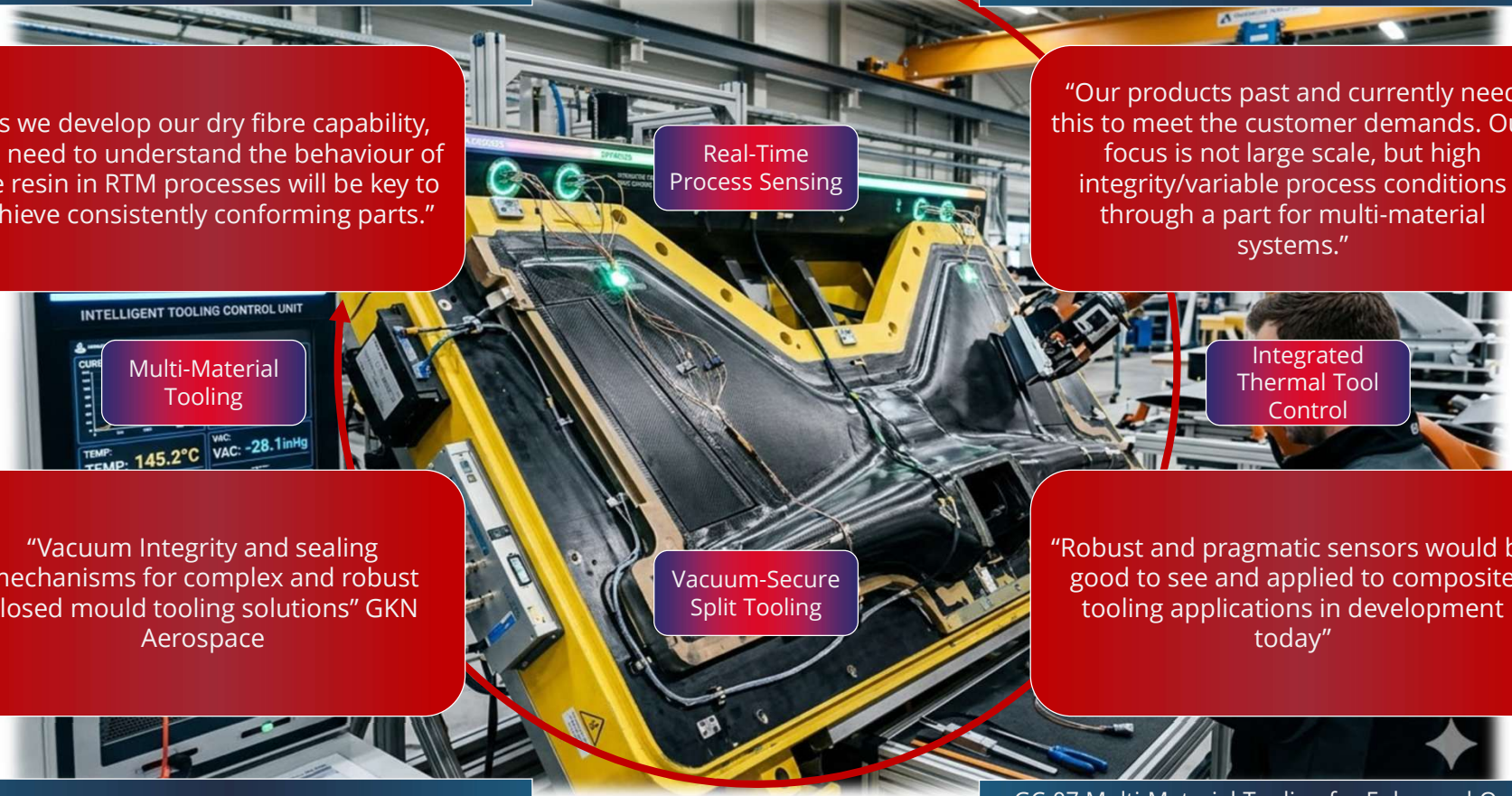
Examples of Challenge Areas identified with solution opportunities to meet the ATI Development Goals

GC-05 Novel Sensing for Process Control

GC-06 Integrated heating and cooling for large scale and high integrity

"As we develop our dry fibre capability, the need to understand the behaviour of the resin in RTM processes will be key to achieve consistently conforming parts."

"Our products past and currently need this to meet the customer demands. Our focus is not large scale, but high integrity/variable process conditions through a part for multi-material systems."



"Vacuum Integrity and sealing mechanisms for complex and robust closed mould tooling solutions" GKN Aerospace

"Robust and pragmatic sensors would be good to see and applied to composite tooling applications in development today"

GC-08 Vacuum Integrity of Complex Multi-Split Tools

GC-07 Multi-Material Tooling for Enhanced Quality and Durability

Challenge Areas and Technology Development Goals from the upcoming ATI Composites Strategy

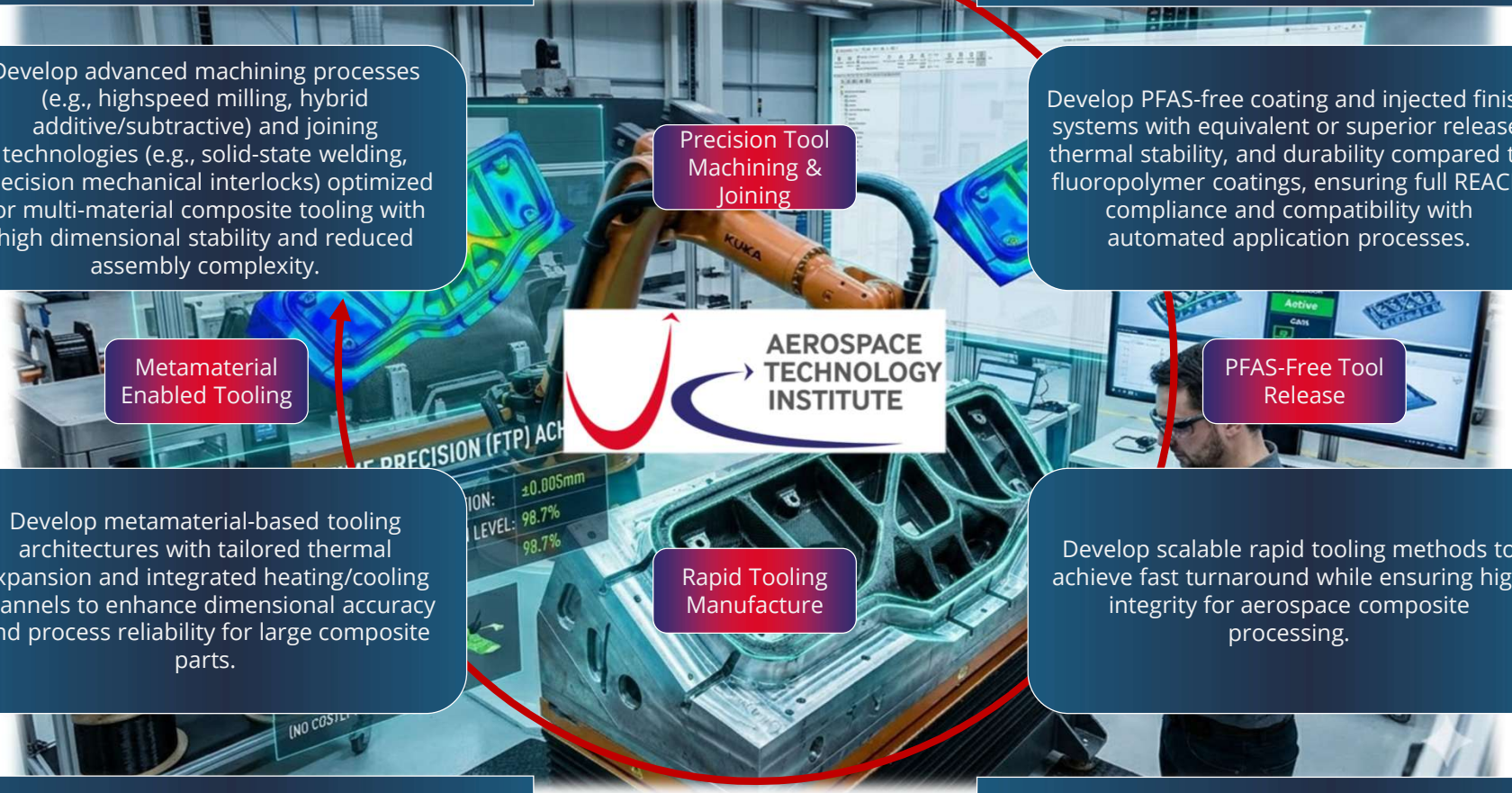
GC-09 Advanced Machining and Metallic Joining Technologies

GC-10 Tool coatings and injected finishes, alternative to PFAS – REACH compliant

Develop advanced machining processes (e.g., highspeed milling, hybrid additive/subtractive) and joining technologies (e.g., solid-state welding, precision mechanical interlocks) optimized for multi-material composite tooling with high dimensional stability and reduced assembly complexity.

Precision Tool Machining & Joining

Develop PFAS-free coating and injected finish systems with equivalent or superior release, thermal stability, and durability compared to fluoropolymer coatings, ensuring full REACH compliance and compatibility with automated application processes.



Metamaterial Enabled Tooling

PFAS-Free Tool Release

Develop metamaterial-based tooling architectures with tailored thermal expansion and integrated heating/cooling channels to enhance dimensional accuracy and process reliability for large composite parts.

Rapid Tooling Manufacture

Develop scalable rapid tooling methods to achieve fast turnaround while ensuring high integrity for aerospace composite processing.

GC-12 Metamaterials in Tooling Applications

GC-11 Rapid response tooling manufacturing methods

Examples of Challenge Areas identified with solution opportunities to meet the ATI Development Goals

GC-09 Advanced Machining and Metallic Joining Technologies

GC-10 Tool coatings and injected finishes, alternative to PFAS – REACH compliant

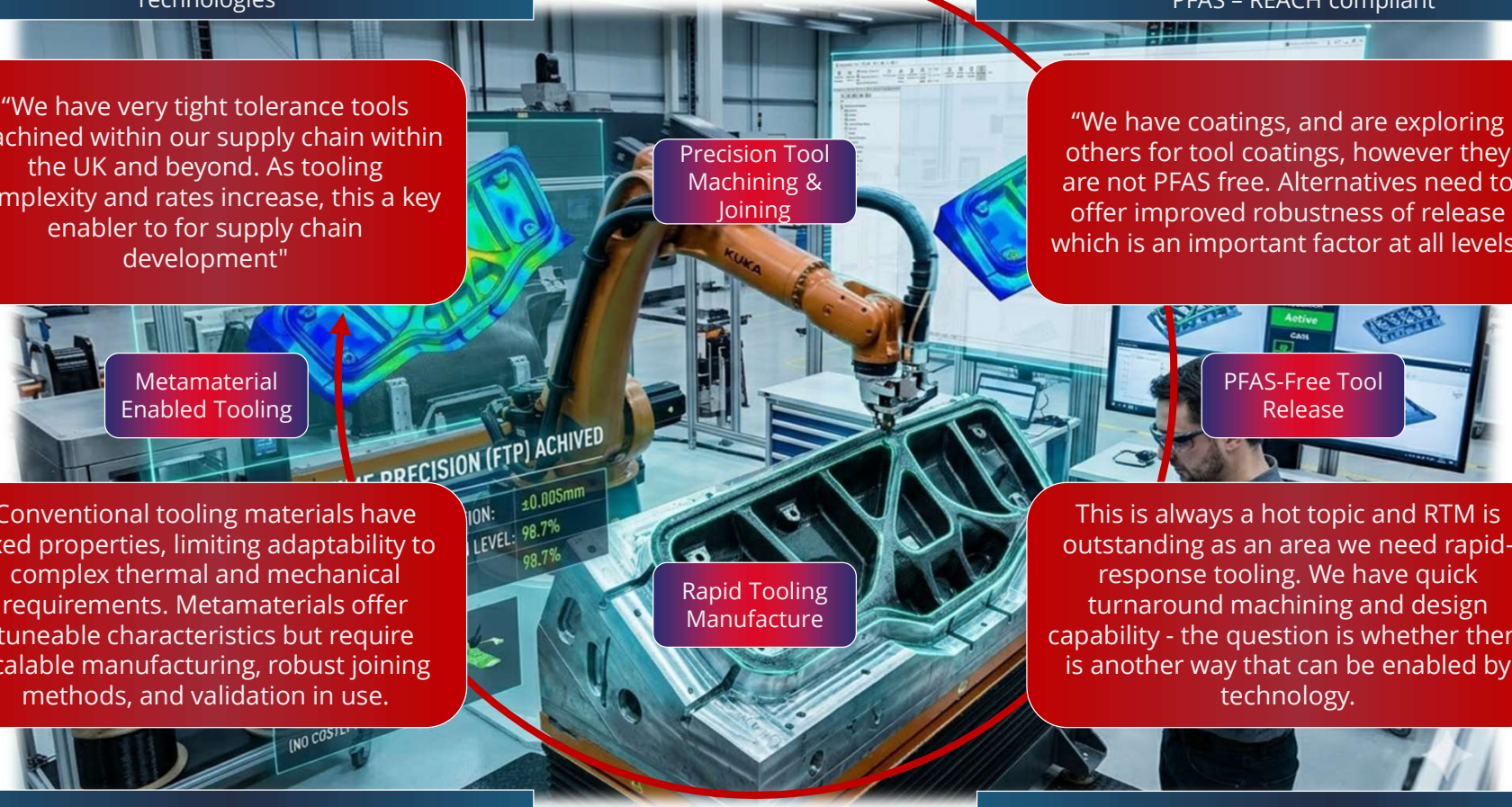
"We have very tight tolerance tools machined within our supply chain within the UK and beyond. As tooling complexity and rates increase, this a key enabler to for supply chain development"

Precision Tool Machining & Joining

"We have coatings, and are exploring others for tool coatings, however they are not PFAS free. Alternatives need to offer improved robustness of release which is an important factor at all levels"

Metamaterial Enabled Tooling

PFAS-Free Tool Release



Conventional tooling materials have fixed properties, limiting adaptability to complex thermal and mechanical requirements. Metamaterials offer tuneable characteristics but require scalable manufacturing, robust joining methods, and validation in use.

Rapid Tooling Manufacture

This is always a hot topic and RTM is outstanding as an area we need rapid-response tooling. We have quick turnaround machining and design capability - the question is whether there is another way that can be enabled by technology.

GC-12 Metamaterials in Tooling Applications

GC-11 Rapid response tooling manufacturing methods

The Grand Challenge combines the ATI Technology Development Goals for a “Tooling as a System”

Developing composites capability for Aerospace and critical manufacturing tooling supply chains

Invar-Equivalent Tooling Materials

Right-First-Time Tooling Design

Intelligent Adaptive Tooling

Reusable Modular Tooling

Real-Time Process Sensing

Integrated Thermal Tool Control

Hybrid Multi-Material Tooling

Vacuum-Secure Split Tooling

Metamaterial Enabled Tooling

Precision Tool Machining & Joining

Rapid Tooling Manufacture

PFAS-Free Tool Release

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Engaging with the UK Advanced Tooling Grand Challenge – Expressing an Interest

Building the Grand Challenge Consortium:

- We recognise that there is a lot of interest in the Grand Challenge and therefore we are offering Solution Providers a chance to pitch to the Challenge Owners at the GKN Global Technology Centre on April 16th.
- This event will be by invitation, and we are seeking expressions of Interest from organisations wishing to join the consortium and support the ATI application, on a shared cost basis.
- While we cannot guarantee everyone a place in the consortium this event will give those invited the opportunity to meet and engage with Challenge Owners and pitch their Solutions.

Building the Grand Challenge ATI Application:

- Successful Solution Providers will then be invited to join the consortium by CoB on April 23rd. For those we cannot accommodate, we will give feedback and offer next steps as we move towards establishing the UK Tooling Alliance.
- As an ambition and funding application of this scale requires a time commitment of time and investment, all partners will be requested to contribute, so please consider this when making an Expression of Interest.

Remaining Engaged and informed as of ATI Composites Strategy

- For those organisations that wish to stay informed as the upcoming strategy, further sessions are under development with the ATI team which we can introduce.

How to join the Grand Challenge Consortium

April 9th	April 16th	April 30th	May 7th
1	2	3	4
Solution Providers submit an EOI	**Solution Providers invited to Pitch**	**Successful Pitches invited to join the consortium**	**Formal ATI Application workshop GTC, Filton**

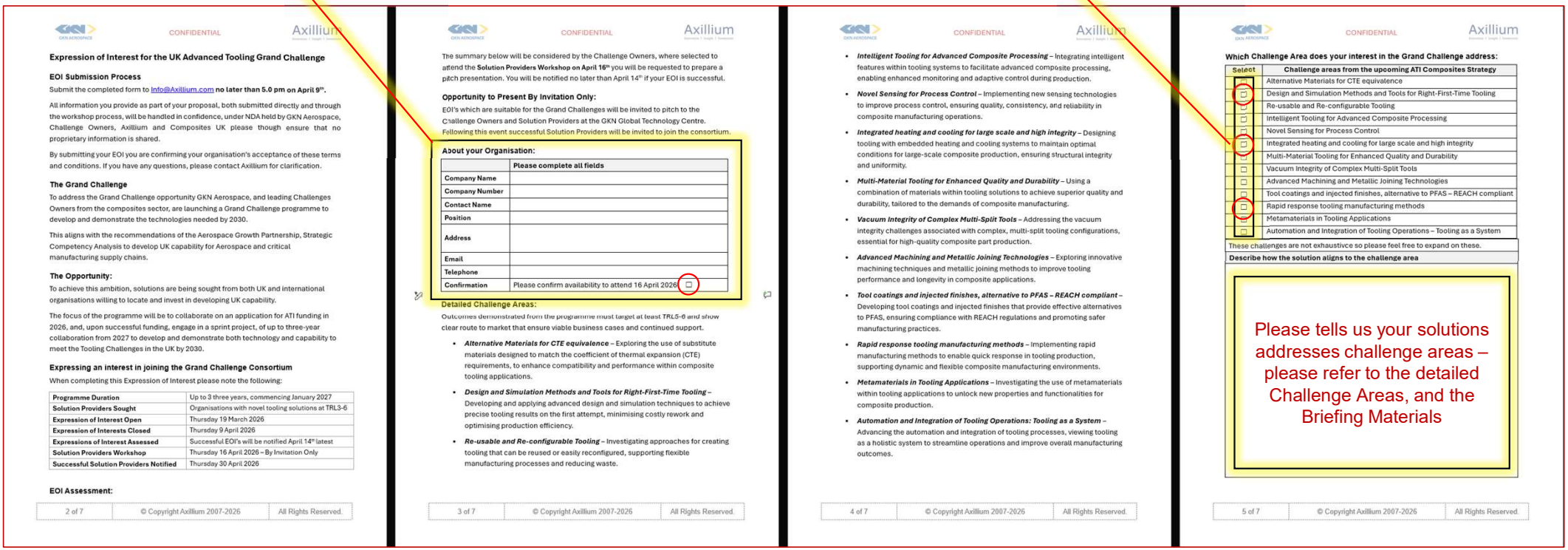
The Formal ATI Application for Batch 50 will launch on May 7th, GKN Aerospace, Challenge Owners and Solution Providers will be supported by Axillium and Composites UK to make an application in two stages:

- Outline Submission stage Thursday May 7th to Friday 17th July.
- Full Stage Application stage from Friday 31st August to Tuesday October 6th.
- All stages will require support for several workshops and ATI interviews.
- The contracting stage will be supported separately subject to the date of award granted.

Completing the EOI Form

Please confirm ALL fields and confirm availability, in person, for the April 16th Pitch Event,

Please indicate the areas where your solution applies



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Expression of Interest for the UK Advanced Tooling Grand Challenge

EOI Submission Process

Submit the completed form to Info@Axillium.com **no later than 5.0 pm on April 9th.**

All information you provide as part of your proposal, both submitted directly and through the workshop process, will be handled in confidence, under NDA held by GKN Aerospace, Challenge Owners, Axillium and Composites UK please though ensure that no proprietary information is shared.

By submitting your EOI you are confirming your organisation's acceptance of these terms and conditions. If you have any questions, please contact Axillium for clarification.

The Grand Challenge

To address the Grand Challenge opportunity GKN Aerospace, and leading Challenges Owners from the composites sector, are launching a Grand Challenge programme to develop and demonstrate the technologies needed by 2030.

This aligns with the recommendations of the Aerospace Growth Partnership, Strategic Competency Analysis to develop UK capability for Aerospace and critical manufacturing supply chains.

The Opportunity:

To achieve this ambition, solutions are being sought from both UK and international organisations willing to locate and invest in developing UK capability.

The focus of the programme will be to collaborate on an application for ATI funding in 2026, and, upon successful funding, engage in a sprint project, of up to three-year collaboration from 2027 to develop and demonstrate both technology and capability to meet the Tooling Challenges in the UK by 2030.

Expressing an interest in joining the Grand Challenge Consortium

When completing this Expression of Interest please note the following:

Programme Duration	Up to 3 three years, commencing January 2027
Solution Providers Sought	Organisations with novel tooling solutions at TRL3-6
Expression of Interest Open	Thursday 19 March 2026
Expression of Interests Closed	Thursday 9 April 2026
Expressions of Interest Assessed	Successful EOI's will be notified April 14th latest
Solution Providers Workshop	Thursday 16 April 2026 – By Invitation Only
Successful Solution Providers Notified	Thursday 30 April 2026

EOI Assessment:

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The summary below will be considered by the Challenge Owners, where selected to attend the **Solution Providers Workshop on April 16th** you will be requested to prepare a pitch presentation. You will be notified no later than April 14th if your EOI is successful.

Opportunity to Present By Invitation Only:

EOI's which are suitable for the Grand Challenges will be invited to pitch to the Challenge Owners and Solution Providers at the GKN Global Technology Centre. Following this event successful Solution Providers will be invited to join the consortium.

About your Organisation:

	Please complete all fields
Company Name	
Company Number	
Contact Name	
Position	
Address	
Email	
Telephone	
Confirmation	Please confirm availability to attend 16 April 2026 ☐

Detailed Challenge Areas:

Outcomes demonstrated from the programme must target at least TRL5-6 and show clear route to market that ensure viable business cases and continued support.

- ***Alternative Materials for CTE equivalence*** – Exploring the use of substitute materials designed to match the coefficient of thermal expansion (CTE) requirements, to enhance compatibility and performance within composite tooling applications.
- ***Design and Simulation Methods and Tools for Right-First-Time Tooling*** – Developing and applying advanced design and simulation techniques to achieve precise tooling results on the first attempt, minimising costly rework and optimising production efficiency.
- ***Re-usable and Re-configurable Tooling*** – Investigating approaches for creating tooling that can be reused or easily reconfigured, supporting flexible manufacturing processes and reducing waste.

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- ***Intelligent Tooling for Advanced Composite Processing*** – Integrating intelligent features within tooling systems to facilitate advanced composite processing, enabling enhanced monitoring and adaptive control during production.
- ***Novel Sensing for Process Control*** – Implementing new sensing technologies to improve process control, ensuring quality, consistency, and reliability in composite manufacturing operations.
- ***Integrated heating and cooling for large scale and high integrity*** – Designing tooling with embedded heating and cooling systems to maintain optimal conditions for large-scale composite production, ensuring structural integrity and uniformity.
- ***Multi-Material Tooling for Enhanced Quality and Durability*** – Using a combination of materials within tooling solutions to achieve superior quality and durability, tailored to the demands of composite manufacturing.
- ***Vacuum Integrity of Complex Multi-Split Tools*** – Addressing the vacuum integrity challenges associated with complex, multi-split tooling configurations, essential for high-quality composite part production.
- ***Advanced Machining and Metallic Joining Technologies*** – Exploring innovative machining techniques and metallic joining methods to improve tooling performance and longevity in composite applications.
- ***Tool coatings and injected finishes, alternative to PFAS – REACH compliant*** – Developing tool coatings and injected finishes that provide effective alternatives to PFAS, ensuring compliance with REACH regulations and promoting safer manufacturing practices.
- ***Rapid response tooling manufacturing methods*** – Implementing rapid manufacturing methods to enable quick response in tooling production, supporting dynamic and flexible composite manufacturing environments.
- ***Metamaterials in Tooling Applications*** – Investigating the use of metamaterials within tooling applications to unlock new properties and functionalities for composite production.
- ***Automation and Integration of Tooling Operations: Tooling as a System*** – Advancing the automation and integration of tooling processes, viewing tooling as a holistic system to streamline operations and improve overall manufacturing outcomes.

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Which Challenge Area does your interest in the Grand Challenge address:

Select	Challenge areas from the upcoming ATI Composites Strategy
☐	Alternative Materials for CTE equivalence
☐	Design and Simulation Methods and Tools for Right-First-Time Tooling
☐	Re-usable and Re-configurable Tooling
☐	Intelligent Tooling for Advanced Composite Processing
☐	Novel Sensing for Process Control
☐	Integrated heating and cooling for large scale and high integrity
☐	Multi-Material Tooling for Enhanced Quality and Durability
☐	Vacuum Integrity of Complex Multi-Split Tools
☐	Advanced Machining and Metallic Joining Technologies
☐	Tool coatings and injected finishes, alternative to PFAS – REACH compliant
☐	Rapid response tooling manufacturing methods
☐	Metamaterials in Tooling Applications
☐	Automation and Integration of Tooling Operations – Tooling as a System

These challenges are not exhaustive so please feel free to expand on these.

Describe how the solution aligns to the challenge area

Please tells us your solutions addresses challenge areas – please refer to the detailed Challenge Areas, and the Briefing Materials

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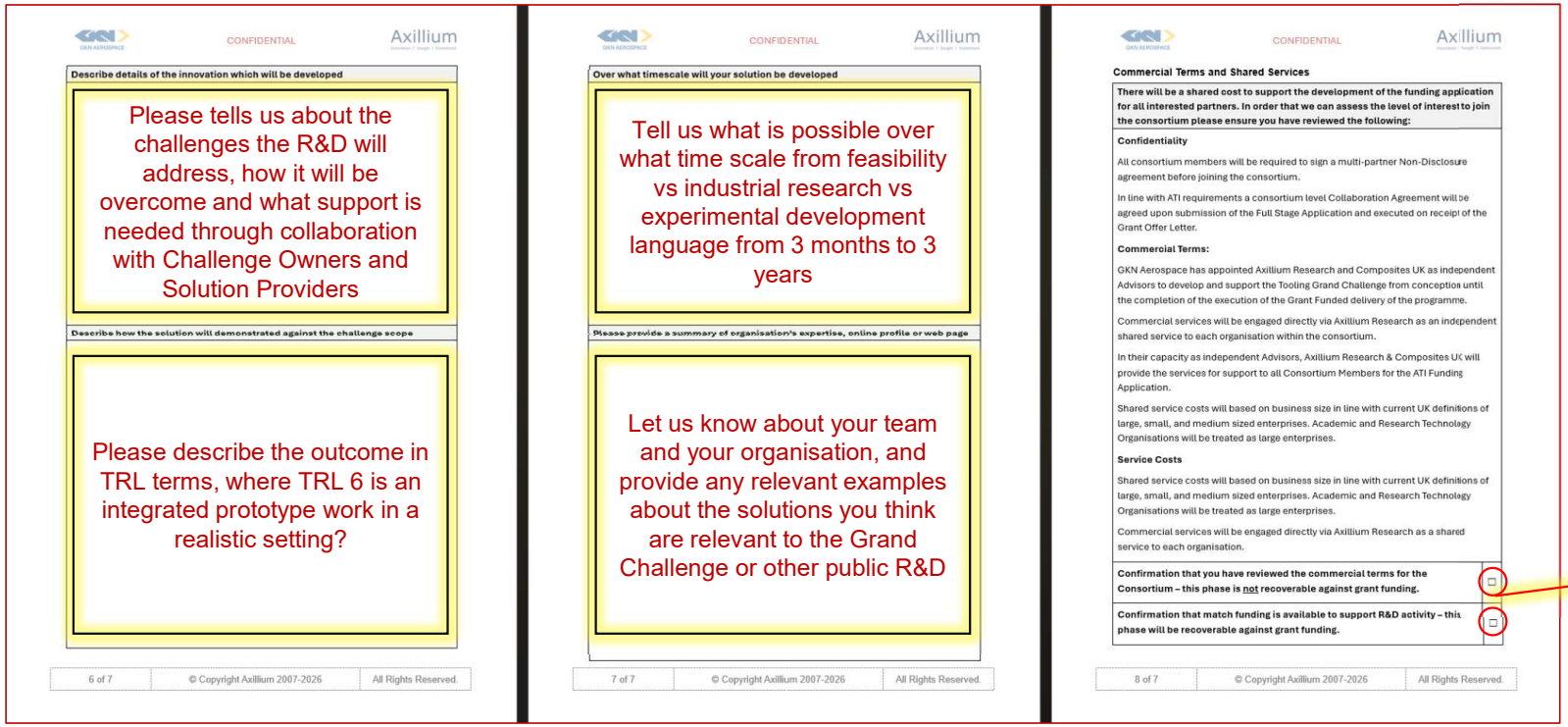
All information will be held in confidence throughout the EOI stage.

Completing the EOI Form

Please confirm you have reviewed the Commercial Terms and Shared Services



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Describe details of the innovation which will be developed

Please tells us about the challenges the R&D will address, how it will be overcome and what support is needed through collaboration with Challenge Owners and Solution Providers

Describe how the solution will demonstrated against the challenge scope

Please describe the outcome in TRL terms, where TRL 6 is an integrated prototype work in a realistic setting?

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Over what timescale will your solution be developed

Tell us what is possible over what time scale from feasibility vs industrial research vs experimental development language from 3 months to 3 years

Please provide a summary of organisation's expertise, online profile or web page

Let us know about your team and your organisation, and provide any relevant examples about the solutions you think are relevant to the Grand Challenge or other public R&D

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Commercial Terms and Shared Services

There will be a shared cost to support the development of the funding application for all interested partners. In order that we can assess the level of interest to join the consortium please ensure you have reviewed the following:

Confidentiality

All consortium members will be required to sign a multi-partner Non-Disclosure agreement before joining the consortium.

In line with ATI requirements a consortium level Collaboration Agreement will be agreed upon submission of the Full Stage Application and executed on receipt of the Grant Offer Letter.

Commercial Terms:

GKN Aerospace has appointed Axillium Research and Composites UK as independent Advisors to develop and support the Tooling Grand Challenge from conception until the completion of the execution of the Grant Funded delivery of the programme.

Commercial services will be engaged directly via Axillium Research as an independent shared service to each organisation within the consortium.

In their capacity as independent Advisors, Axillium Research & Composites UK will provide the services for support to all Consortium Members for the ATI Funding Application.

Shared service costs will based on business size in line with current UK definitions of large, small, and medium sized enterprises. Academic and Research Technology Organisations will be treated as large enterprises.

Service Costs

Shared service costs will based on business size in line with current UK definitions of large, small, and medium sized enterprises. Academic and Research Technology Organisations will be treated as large enterprises.

Commercial services will be engaged directly via Axillium Research as a shared service to each organisation.

Confirmation that you have reviewed the commercial terms for the Consortium – this phase is not recoverable against grant funding. ☐

Confirmation that match funding is available to support R&D activity – this phase will be recoverable against grant funding. ☐

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Once your EOI is ready please email this to info@Axillium.com with the Subject “Grand Challenge EOI”

Grand Challenge Next Steps

March 2026	April 2026	May 2026	October 2026	December 2026
1	2	3	4	5
Challenges Defined	Consortium Defined	ATI Application Launched	ATI Application Submitted	Funding Award *

Next Steps:

1: Download and email the completed EOI Form to the info@Axillium.com by **17.00 on April 9th**
2: The Challenge Owners will review the EOI's and provide an invitation to join the pitch day on **April 16th**
3: Solution Providers pitch and those successful will be invited to formally join the consortium by **April 30th**
4: Challenge Owners and Solution Providers with kick off the formal ATI Application at GKN GTC on **May 7th**

If you have any questions ahead of the deadline, please email info@Axillium.com with the Subject "Grand Challenge Query"

• Next Steps & How To Engage

1. Review the Challenge Form
2. Submit an EOI by 5pm on 9th April
3. Organisations which are successful in the Expression of Interest process will be invited to meet Challenge Owners at the GKN Global Technology Centre for a Solution Provider Workshop 16th April – please keep this date free.

For any questions relating to the Challenge Areas, the consortium process or event attendance please contact Axillium or Composites UK in the first instance:

- Axillium Research Info@axillium.com
- Composites UK Info@compositesuk.co.uk

For any questions relating to the ATI Programme and funding timeline please visit

- Funding | Aerospace Technology Institute
- Competition dates | Aerospace Technology Institute

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