Our mission

“...through £2.1bn R&T investment grow the UK’s competitive position, ultimately safeguarding and enabling new jobs and value creation”
Agenda

Background
Strategic approach
Delivery
Engagement
Manufacturing challenges and technologies
Projects
Case studies
A large and growing market...

Share of forecast deliveries by segment in $ trillions (2013 – 2033)

Source: UKTI 2015 Market Outlook
...and delivering broader economic impact

UK civil aerospace facts 2015

- Exports £26 Billion
- Revenues £29 Billion
- 17% market share
- High productivity
- R&D intensive
- Driving a broader economic contribution

Source: ADS 2015 Industry facts and figures

November 2015
Establishing the Institute – looking back

2012
Global opportunity & strategic areas:
• Skills
• Supply chain
• Technology
• Access to finance
• Engagement

2013
Mechanisms
• NATEP
• MSc Bursaries
• ATI & £2.1bn

January 2015
Technology strategy framework
• Coherent market-aligned
• Focused on economic impact
• Initial technology themes

2014
Company established
• CEO/Chair by Q2
• EMT in September
• ~10 staff

July 2015
• 1st published strategy
• Institute embedded in strategic leadership of programme
• ~25 staff
The ATI is....

- An independent institute, not for profit company that sees the bigger picture
- Funded and governed jointly by UK Government and Industry
- Responsible for the UK’s Aerospace technology strategy
- Working with UK Government and Industry to deliver a technology programme, aligned with our strategy, to secure the future competitiveness of the UK’s national aerospace industry
- A strategic advisor to government and industry
- Representing the UK in international aerospace technology forums
- EU/ international research partnership facilitator
Strategic approach
## Priorities to achieve strategic goals

<table>
<thead>
<tr>
<th>Secure</th>
<th>Exploit</th>
<th>Position</th>
</tr>
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<tbody>
<tr>
<td>(Now - 5 years)</td>
<td>(Now - 10 years)</td>
<td>(Now - 15 years+)</td>
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<tr>
<td>Ensure vital UK technology capabilities are secured and developed, and manufacturing competitiveness is raised.</td>
<td>Accelerate technologies and capabilities to capture high-probability near to mid-term market opportunities.</td>
<td>Prepare UK aerospace for long term success by pursuing game-changing technologies.</td>
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Focused on high probability opportunities

<table>
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<tr>
<th>Year</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030+</th>
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<tr>
<td><strong>Wide body</strong></td>
<td><strong>Current</strong>&lt;br&gt;• A330 NEO&lt;br&gt;• A350-9/8/1000&lt;br&gt;• B777X&lt;br&gt;• B787-10</td>
<td><strong>Updates / derivatives (new engine options)</strong></td>
<td><strong>Updates</strong>&lt;br&gt;(new engine options and major structure/aero improvement)</td>
<td>New wide body aircraft / New entrant</td>
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<tr>
<td><strong>Narrow body</strong></td>
<td><strong>Current</strong>&lt;br&gt;• A320 NEO&lt;br&gt;• B737 MAX&lt;br&gt;• C-Series&lt;br&gt;• C919</td>
<td><strong>Moderate updates (structure/aero improvement)</strong></td>
<td><strong>Major updates / derivatives</strong>&lt;br&gt;(engines and major structure/aero improvement)</td>
<td>New narrow body aircraft</td>
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Strategic goals for technology

To ensure the UK...

- Is a global leader in:
  - civil aircraft *wings*
  - large civil aircraft *engines*
  - complex aircraft *systems*
  - civil *helicopters*

- Is providing *differentiated technologies* and *competitive supply* for associated sub-systems and components

- Is *positioned to lead* new architectures and technologies in civil aviation
Operational model

- Formally launched in London, 1st July 2015
- Identifies value streams, enablers and attributes
- Competitive calls
- All future projects to be aligned with ATI Strategy
- Small scale, open call collaborative research
- Complex umbrella programmes
Delivered through four technology themes

Aircraft of the future

Aerostructures of the future

Propulsion of the future

Smart, connected and more electric aircraft
A future Aerospace Roadmap

**Secure**

Improve fuel efficiency and reduce non-recurring, recurring and operational costs for existing aircraft and their derivatives.

**Exploit**

Be ready with technologies for higher fuel efficiency and lower environmental impact. Reduce non-recurring, recurring and operational costs for existing aircraft and their derivatives. Develop new manufacturing technologies and systems for low cost, complex geometries and novel materials.

**Position**

Enable more radical approaches to aircraft, propulsion system and complex systems architecture and manufacturing.

**Position (Blue Sky)**

Accelerate the introduction of revolutionary aircraft and systems.
Capturing the technology strategy

External publication
Fully public

Detailed technology sections
Restricted external
Market scenarios + technology implications in context of each value stream – snapshot in time, version updates continue...

Outlines the strategic themes and how these fulfil strategic aims to protect, exploit and position

Publication July 1st 2015
Engagement
Technology Advisory Structure

• Technology Advisory Group (TAG) launched in February 2015
• Specialist Advisory Groups (SAG) launched September 2015
• Members of the Advisory groups are from organisations that fund or deliver aerospace research programmes

Deliverables

• Input into strategy, road maps and programme
• Input to reports to government on Aerospace technology, programmes and issues
• Inputs to technology reports to industry leaders
• Direction of sub-groups to investigate new technology solutions

Members

• Prime, Tier 1, Research Organisations, Academia, Government organisations
Project assessment – Whole process overview

Stage 1
- Inception to initial proposal development ~ 4 weeks
- Project ideas are developed. An initial high-level proposal of work is formed.

Stage 2
- Advanced proposal development ~ 8 weeks
- Companies refine and detail proposals. BIS provide a VFM brief (where applicable).

Stage 3
- Independent assessment c.6 weeks
- Innovate UK independent assessment. Duration dependent on project category.

Stage 4
- EU Commission 12 months +
- EU Commission review very large proposals
- Treasury review ~ 3 weeks
- Treasury review VFM decision

Contracting ~ 12 weeks
- Innovate UK set up contract with project participants

*Agreed ATI/BIS/IUK Position
Evaluation of programmes - Technology

• **Grant details**: Funding, partner information, project description, technology focus, linkages to UK national strategy....

• **Technologies**: Number of technologies that evolved from lower TRLs to higher TRL levels as a direct result of project execution derived from a detailed milestone plan ....

• **Performance**: Impact of performance improvements delivered by the project outcome - cost improvement, ramp rate, lead times ..... 

• **Intellectual Property**: Number of IP / patents created as a direct result of project execution .....
Evaluation of programmes - **Economic**

- **Direct value**: Quantified estimate £GBP of new business revenue created as a direct result of project execution ....

- **Direct jobs**: Number of UK engineering jobs safeguarded and created. Creation of new skills/ knowledge / productivity improvement ....

- **Spill-over impact**: Number of potential intra-sector/ cross-sector applications, number of research & academic partners involved & reach beyond aerospace ....

- **UK foundation building**: Shift in internal investment, UK capital/ infrastructure investments, dependencies on UK networks to deliver long term benefits, capability improvement achieved in supply chain ....
Manufacturing challenges and technologies

Request document from: http://www.ati.org.uk/strategy-docs/
Structure of the Technology Strategy Documents

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Manufacturing Scope

CONVENTIONAL MANUFACTURING PROCESSES

• Component product creation and finishing from multiple material types by mechanical and other means
• Application of these processes to original manufacture, in-service management, repair and end-of-life

DISRUPTIVE MANUFACTURING PROCESSES

• Component creation from numerous material types including net & near-net shape methods currently not employed at industrial scale or used for prototyping only
• Includes technology development, manufacture of raw materials, and required infrastructure
Manufacturing Scope

DESIGN AND MODELLING

• Design for Manufacture & Assembly (DfM) principles recognising through life, testing and verification requirements and impact on weight and cost
• Modelling and simulation, including the use of multi-physics for new and existing processes

DIGITAL INFORMATION & SYSTEMS DEVELOPMENT

• Treating the factory as a system to deliver productivity improvements, support new technologies and enable variable rate requirements
• Mass data capture and application at multiple levels including manufacturing informatics (incorporating Industry 4.0)
Manufacturing Scope

INTEGRATION SOLUTIONS

- New technologies and processes to enable rapid component and assembly manufacture through the supply chain; covering large structural components through to electronics
- Incorporation of technologies for sustainability, energy conservation and environmental demands
- Fast make and prototyping
- Novel tooling concepts; bespoke, low cost, reconfigurable
- Meeting customisation demands
- Achieving rate requirements; ramp-up and flow rate flexibility
- Including Pilot lines, discrete demonstration cells and building infrastructure
Projects
Strategic initiative projects (current)

Manufacturing Accelerator Programme

• Identify and develop toolkits to fast-track UK aerospace supply chain take up of manufacturing technology innovation developed with OEMs, and others; increasing capacity, reducing costs and securing competitiveness

Graphene Programme

• Identify opportunities for Graphene to secure, exploit, and position UK aerospace structural, propulsion, and system component applications that result in first mover market opportunities for new programme introduction

Additive Manufacturing Programme

• ‘End to End’ metallic process validation to facilitate rapid product certification in an operationally realistic environment, utilising a customisable and reconfigurable Proving Factory, ensuring high volume product manufacturing capability and enabling globally leading productivity
Case studies

Thank you to:
Craig Carr, GKN Aerospace
Amer Liaqat, Airbus Operations
Case study 1—Aerostructures value stream; ‘Exploit’

- Advanced torque box stress analysis
- Laminate and thickness definition
- Structural joint definition and root joint interface
- Detailed sizing
- Waffle torque box design
- Demonstrator detail design definition
- Assembly definition and drawings
- Theoretical weight analysis
- Sub scale & full scale demonstrator manufacture

Internal structures

One-shot cured stiffened structures

Spring back simulation

Complex noodle

Full scale demonstrator

November 2015
Case study 1 – detailed automation WP

- Robotic Drilling
- Robotic Fastening
- Robotic Inspection
- Metrology assisted critical positioning
- Semi-automated adhesive deposition
- Reconfigurable fixtures
- Lightweight robotic tooling
- Implemented on AWP

½ & full scale demonstrators produced  Drill & fastening heads developed  Feature Inspection  CFRP Jig
Case study 2– Secure project – ‘Quick win’

Objective:
Reduce manual workload by enabling one-shot drilling process for confined space applications

- Introduction of light weight & compact Positive Feed Drills
- Reduction in manual drilling of structures
- Removal of multiple step drilling operations
- Better process ergonomics
- Reduction in human errors
- Better factory environment through dry drilling

Standard ‘off the shelf’ device
Prototype module
Prototype module
Demonstration
Questions

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