‘Wing of the Future and SME’s’

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## Content

- Wing of the Future
  - Overview
  - Bridging between NGCW and Wing of the Future

- Today’s Wing R&T Programme
  - Next Generation Composite Wing Programme
    - Work Breakdown Structure
    - Collaborators and SME involvement
    - Objectives
    - Project INTEQ outputs

- Preparing for Wing of the Future
  - Advanced Integrated Wing Optimisation (AIWO)
  - Opportunities for SME’s
Where we are today?

With the A350 XWB we are reaching the maximum efficiency we can achieve with conventional aircraft design.

The required step change in performance can only be achieved through the use of disruptive ‘Frontier’ technologies.

Efficiency

M(L/D)

Hawker Siddeley uniquely positioned to design, engineer and manufacture the first Airbus wing (A300).

Evolution enabled through integration (NGCW)

At the beginning of the Airbus project the UK capability in wing design and engineering was deep and broad and at the very cutting edge.

To achieve the required step change we need to rethink not just what we do but how we do it.
# FLIGHTPATH 2050 – Our Target

<table>
<thead>
<tr>
<th>Baseline 2000</th>
<th>2010</th>
<th>2020</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Performance</strong></td>
<td>Fuel Burn - 15%</td>
<td><strong>Fuel Burn - 50%</strong></td>
<td></td>
</tr>
<tr>
<td>Maintenance - 15%</td>
<td></td>
<td>No Unscheduled Maintenance</td>
<td>Accident Rate - 80%</td>
</tr>
<tr>
<td>Versatile Cabin</td>
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<tr>
<td>Turn Around Time -30%</td>
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<tr>
<td><strong>Business Performance</strong></td>
<td>Cost - 20%</td>
<td><strong>Cost - 40%</strong></td>
<td></td>
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<tr>
<td>Time to Market - 20%</td>
<td></td>
<td>Time to Market - 50%</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental Performance</strong></td>
<td>CO₂ - 15%</td>
<td><strong>CO₂ - 50%</strong></td>
<td></td>
</tr>
<tr>
<td>NOₓ - 20%</td>
<td></td>
<td>NOₓ - 80%</td>
<td></td>
</tr>
<tr>
<td>Noise - No Increase from 20 Years Passenger Growth (Percieved)</td>
<td></td>
<td>Noise - 50% (Perceived)</td>
<td></td>
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<tr>
<td><strong>EVOLUTIONARY TECHNOLOGY</strong></td>
<td><strong>BREAKTHROUGH TECHNOLOGY</strong></td>
<td><strong>DISRUPTIVE TECHNOLOGY</strong></td>
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The importance of A320 to the UK

• Entered into service 1988

• A320 statistics
  • Original business case 600 aircraft
  • Delivered to date 5000
  • Total orders 8380
  • Order backlog 3380

• The performance of the A320 replacement needs to be a ‘step change’ and is the focus of the Airbus Research Programme

• Future Market Size 17,000 aircraft over the next 25 years
Bridging Programme for 2025 differentiation

AIWO – Advanced Integrated Wing Optimisation

Efficiency
M(L/D)

2000  2010  2025

WING OF THE FUTURE

RATE

NGCW

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Next Generation Composite Wing is……

A multi disciplinary technology development programme  required to prepare technology for new A/C product (A30X)

Next Generation Composite Wing

MDOW – Provide framework for rapid multi disciplinary optimisation
HIVOL – Structural architecture & technology for High Rate, Low Cost Wing
INTEQ – Optimised system integration, installation, & equipping of low cost wing
MINT – Overall integration framework
NGCW Collaborative Partners & SME’s

• Collaborative Partners fund their own R&T activities and may receive grant funding from public bodies

• SME’s are usually to be found working with these partners, including Airbus, usually on a subcontract basis.
Next Generation Composite Wing Objectives

**Overall aims of NGCW**
*To ensure that mature technologies are available to enable the design, development, validation, manufacture, equipping and testing of lightweight aerodynamically efficient and economic to produce wings which are optimised with the overall aircraft ensuring minimum environmental impact.*

**Aims of MDO**
*To provide mature technologies to build a synthetic environment that will allow fast iteration of the complete wing design process.*

**Aims of HIVOL**
*To investigate and develop low cost manufacturing technologies that will enable high volume wing manufacture for next generation aircraft.*

**Aims of INTEQ**
*To develop simplified, reliable, wing system installation concepts and compact control surface actuation methods that would support high volume low cost manufacture.*

**Aims of MINT**
*To integrate the activities of the platforms throughout the project to maximise exploitable output.*

The output from the INTEQ project consist of emerging technologies for further development and disruptive technology needs.
### AIWO Partnerships

#### Main Partnership Framework

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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<tbody>
<tr>
<td>Extruded PEEK Fuel Pipes</td>
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<tr>
<td>Thermoplastic Fuel Connectors</td>
<td></td>
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<tr>
<td>Elastomeric Seals</td>
<td></td>
</tr>
<tr>
<td>Wire in Composite (WiC)</td>
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</tr>
<tr>
<td>Flexible Thermoplastic Fuel Pipes &amp; Couplings</td>
<td></td>
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<tr>
<td>Bearings</td>
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</tbody>
</table>

**PLUS** Associate Partners (1-2-1 relationships) for Installation components

<table>
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<tr>
<th>Component</th>
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<tbody>
<tr>
<td>Leading/Trailing Edge Structure</td>
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</tbody>
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**WSSI**

- Slat and Integrated WIPS
- Power Systems (tech support)
- Power Transfer Assembly (WIPS) & Data Over Power
- Electrical Raceways & Optical Components

**GOODRICH**

- Flight Controls Actuation

**Ultra Electronics**

**TE**

**SKF**

**ESRA**

**TRELLEBORG**

**bf systems**

**EATON**

**SPRIT**

**GE Aviation**

**Plus** future collaboration with LE/TE Structural Partners

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### Example SME within NGCW/AIWO

**bf1 systems**

- Founded in 1994
- Work in the fields of
  - Motorsports: F1, WRC, NASCAR, Indy Car
  - Aerospace: Airbus, Rolls Royce
  - Marine
- Technologies
  - Cutting edge racing cycles
  - Electronic systems
    - ECU’s, Tyre Pressure Monitors, Strain Gauging systems
  - Electrical Connectors, Wiring Harnesses, **Wire in Composites**
- Capabilities
  - In house design of hardware & software systems
SME characteristics sought by Airbus for R&T

• Innovative: unique technology, service or capability.

• Agile: quick to respond to changing requirements

• Flexible: able to prioritise, reschedule

All the things that larger companies may find more challenging!!