Small Business Innovation Research for Defence (SBIR&D) Program

TOPIC: A Joint Effort – Integrating Advanced Materials onto Military Platforms
SBIRD & the Next Generation Technologies Fund

- $730M over 10 years
- Described in the Defence Industry Policy Statement 2016
- For investment in new innovative game changing technologies

**Areas of focus:**
- Sensors & Hypersonics
- Medical Countermeasures
- Surveillance
- Quantum Technologies
- Space Capabilities
- Human Performance
- Cyber
- Material Sciences
- Autonomous Systems
The SBIRD Program

What is SBIRD?
• Competitive merit based competition
• Companies submit proposals in response to Calls

Two Stage Program

Stage 1 – Technology Feasibility
• Funding up to $150,000 per project
• 6-9 month duration
• Research into the technical feasibility of an innovative idea or technology

Stage 2 – Technology Application
• Additional Funding per project
• 12-24 month duration
• Testing of the idea or technology against the application

Four Aspects to the Topic:
1. Integration of Composites
2. Adhesives for Structural Joining
3. High Temperature Structures
4. Improved Armour Systems
The Parallel Call

- SBIRD & DASA similar framework
- Both countries release the same call for proposals
- Proposals lodged and processed through the DASA automated online system
  - Link available from the Defence Innovation Portal
- Proposals assessed jointly by subject mater experts from DST and the UK Defence Science Technology Laboratory (dstl)
- Successful proposals funded by country of origin
- Both countries providing a similar level of funding
Parallel Call Assessment Criteria

• **Desirable**
  – Strategic fit
  – End User Pull
  – Defence & Security Compatibility

• **Feasible**
  – Technically credible
  – Innovation & Risk
  – Expertise & capability

• **Viable**
  – Project Delivery
  – Exploitation beyond SBIRD
  – Costs & Value for Money
What to Think About in Developing Your Proposals

Area of particular interest include:

• Enabling new material combinations;
• Novel approaches to the integration of advanced or novel materials;
• Increasing joint durability in military operating conditions;
• Joints that allow easier modification/replacement of components or subsystems on a platform;
• Health and usage monitoring of joints
Parallel Call Contracting

• Applications through Australia
  – Standard terms and conditions
  – Industry: Next Generation Technologies Fund Research Contract
  – Academia: Defence Science Partnerships Deed

• Applications through DASA
  – Standard terms and conditions
  – DEFCON 705
A Joint Effort – Integrating Advanced Materials onto Military Platforms

Technology Brief: Integration of Composites

Andrew Rider
Integration of Composites

• Composite use established on aircraft and push to expand their use on ships and land vehicles
• On aircraft many uses and benefits including reduced corrosion and weight
• Composite benefits include reduction in weight topside for maritime platforms
• Land vehicle applications include wear resistance and lightweight for greater mobility
Integration of Composites

• Composite to metallic joint issues:
  – Thermal mismatch
  – Response to fire
  – Reaction to shock
  – Reaction to water: swelling, corrosion in joints
  – Closure openings: doors, hatches, covers

• Rapid repair of composite interfaces

• Joining of Additively Manufactured parts
  – Reliability
  – Build of AM parts using different materials
A Joint Effort – Integrating Advanced Materials onto Military Platforms

Technology Brief:
Adhesives for Structural Joining

John Wang
Adhesives for Structural Joining

• Advantages of Adhesives
  – Reduction in weight
  – Reduced damage to substrates
  – Increased fatigue performance
  – Ability to join dissimilar materials
  – Eliminates corrosion due to dissimilar metals
  – Reduced manufacturing cost

• Disadvantages of Adhesives
  – Surface preparation requirements
  – Adequate non-destructive inspection techniques (material state awareness)
  – Environmental exposure
  – Long term durability
  – Disassembly issues
Adhesives for Structural Joining

• Defence environments
  – In field contaminants
  – Variable surface preparation
  – Exposure conditions (UV, salt, humidity, temperature...)

• Novel fabrication and bonding
  – Initial and on-going bond structure integrity assessment/monitoring
  – Temporary repair technologies
  – Dissimilar materials (e.g. composite to metal; aluminium to steel)
  – Bond disruption on demand
  – Replacement for welding
A Joint Effort – Integrating Advanced Materials onto Military Platforms

Technology Brief: High Temperature Structures

John Thornton
High Temperature Structures

- Requirement for materials and structures that can operate at high temperatures
- Airframe and propulsion systems
- Complex loadings
  - Geometry, Out of plane loading, Shock and vibration

Ultra-High Temperature Ceramic During Thermal Testing at 3000°C

Ceramics Protecting Metals in Gas Turbine Engines

Zirconia Ceramic
NiCoCrAlY Bond Coat
0.1 mm Nickel Superalloy
High Temperature Structures

- Thermal protection skins
- Refractory metals may be pushed to their thermal and structural limits
- Ceramic or ceramic-matrix-composites
- Joints must accommodate thermal expansion mismatch between materials

The Silicon Carbide Ceramic for Oxidation Resistance

Thermal Expansion Mismatch Leads to Cracking

Carbon/Carbon for structural strength and toughness at extreme temperatures
A Joint Effort – Integrating Advanced Materials onto Military Platforms

Technology Brief: Improved Armour Systems

Darren Edwards
Improved Armour Systems

• A need for platform and soldier armour for a range of operational situations
  – New and constant evolving threats
  – Extremes: temperature, loading
  – Increased mobility

• Requirements
  – Maintain protection capability
  – Lightweight
  – New materials and solutions
  – Low maintenance, reduced through-life costs
  – Availability
Improved Armour Systems

- Transparent armour systems
  - Lightweight transparent ceramics
  - High performance interlayers and polymers
  - High integrity bonding
- Durability- environmental exposure
- Interface enhancement- resist de-bonding
- Novel manufacturing processes
- Innovative inspection techniques
  - Quality and degradation assessment
## Key Dates

<table>
<thead>
<tr>
<th>Topic</th>
<th>Date/Time</th>
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<tbody>
<tr>
<td>Topic Open</td>
<td>28th November 2018</td>
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<tr>
<td>Information Event</td>
<td>28th November 2018</td>
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<tr>
<td>Pre bookable 1 on 1 telecom sessions</td>
<td>December 2018 – January 2019</td>
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<tr>
<td>Topic Closes</td>
<td>2300 (Eastern Daylight Savings Time (1200 GMT) 1 February 2019</td>
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<tr>
<td>Contracting</td>
<td>Aim to start in March / April 2019</td>
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Questions

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