





# NATEP Innovation Directory



# National Aerospace Technology Exploitation Programme

Funding new technologies and new manufacturing productivity in the aerospace supply chain

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Innovate UK







Business, Energy & Inclustrial Strategy



Welcome to this directory of over 140 exciting R&T projects supported by NATEP, the National Aerospace Technology Exploitation Programme.

NATEP assists companies in the aerospace supply chain to work collaboratively in the development of innovative technologies through a unique combination of match funding, mentoring and end user support. The mentoring is provided by a high calibre technical and management resource to help companies accelerate their technology development towards market readiness. Participation in the programme equips project partners to win new business with existing customers and to diversify their customer base. Since 2013 the programme has brought together technology collaborations of more than 350 aerospace supply chain micro, small and medium sized companies.

The technologies developed within the NATEP Programme will be used on current and new aircraft programmes, increasing productivity, creating jobs and injecting new R&D capabilities into the supply chain. NATEP companies are supported to be better able to win work with existing customers and new customers, particularly in export markets, as well as in cross sectors markets such as the automotive, energy or rail sectors.

The NATEP programme, is an Aerospace Growth Partnership initiative, dedicated to supporting the future of the aerospace sector in the UK.

I hope that you will be interested to read about these exciting projects. If you would like to learn more about them, please contact the companies directly through the contacts given.



WEAF

Liywodraeth Cymru

Harriet Wollerton NATEP Programme Director









# **Lightweight Pipe End-Fittings**

Project

#### Supply chain partnership

- Sigma Precision Components UK Ltd 3T RPD Ltd
- Customer

#### Contact

#### Mike Andreae - Director of Technology and Improvement michael.andreae@sigmacomponents.co.uk

The Lightweight Pipe End-Fittings project will design rigid pipe end-fittings for minimum mass, suitable for additive manufacture technology and test them in accordance with aero engine operating conditions.



NATEP Grant

# £143,000

#### Project

# **Polymeric Additive Manufacturing for Aircraft Interiors**

#### Supply chain partnership

- Bristol Aero Ltd
- HiETA Technologies Ltd
- Ipeco Holdings (customer)
- Jet Aviation AG (customer)

#### Contact

#### Brett Peterson - Head of Engineering brett.peterson@bristol.aero

The use of recently developed, cost effective, polymeric additive manufacturing materials with sufficient levels of fire retardancy for use in high value aircraft interiors and systems is investigated through a full designmanufacture-test cycle.



# **Additive Aero Valve Optimisations (AAVO)**

#### Supply chain partnership

- Meggitt Aerospace Ltd
- Ashton & Moore Ltd
- GE Aviation (customer)

#### Contact

#### Scott Lathrope - Meggitt PLC Engineer Scott.Lathrope@meggitt.com

A program to design, manufacture and test a functional aircraft component that is fully optimised for additive layer manufacture. A standardised optimisation capability will be generated by capturing process "lessons learned".

#### Project

# **Project Fusion**

#### Supply chain partnership

#### AVPE Ltd

- South West Metal Finishing
- Airbus Group (customer)
- Renishaw plc (customer)
  - LIMA (customer)

#### Contact

#### Mark Summers - Managing Director mark.summers@avpe.co.uk

AVPE is an SME supplying directly into Airbus' MRO business. Project Fusion will develop Airbus certified "Class 2" components manufactured using ALM technology with modified post ALM machining, NDT and surface treatment processes.



NATEP Grant

# £145,500



#### **NATEP** Grant

# £142,500

#### NATEP Grant

#### £150,000

# NATE

Airbus Innovations (customer)

#### Project

# **Metrology for Additive** Manufacturing

#### Supply chain partnership

- Insphere Limited
- Renishaw
- Airbus Group Innovations (customer)

#### Contact

#### Ben Adeline – Chief Executive ben@insphereltd.com

This project will develop an innovative and highly sought after metrology verification method for additive manufacturing processes. This will enable unique techniques for additive manufacturing process control supporting the certification of AM parts for production aerospace use.



#### Project

# **ALFLEX**

#### Supply chain partnership

- 3D Metal Printing Ltd
- University of Bath
- Leonardo MW Ltd (customer)

#### Contact

#### Alberto Casonato - Managing Director alberto@3dmetalprinting.co.uk

The objective of this research is to investigate the capability of manufacturing in ALM a Tail Driveshaft Flexible Coupling for a Leonardo helicopter. The expected results are to improve damage tolerance, inspectability and eliminate the presence of fasteners and ultimately to reduce component complexity. Because this is a flight critical part, Leonardo will also be working with and supporting the partners on a less critical Fan Impeller to enable more testing that will improve and influence the Coupling design.

#### Project

# **Cooled Core Die** Blocks

#### Supply chain partnership

- Gardner BTC Ltd
- Material Solutions Invest Tech Ltd (customer)
- Contact

#### Keith Fulford – Project Manager kfulford@gardner-aerospace.com

Gardner BTC Ltd., manufacturer of Injection dies is developing new technologies to produce core dies using alternative advanced manufacturing methods, specifically focused on providing better injected parts and reduced non-conformance.

#### Project

# **ADAPT – Affordable Detail Additive Parts** Technology

#### Supply chain partnership

- Hyde Aero Products Ltd
- HK3D Solutions Ltd
- MBDA UK Ltd
- The Boeing Company (customer)

#### Contact

#### Paul Mellor - Technical Director pmellor@hydeaero.co.uk

The ADAPT project will seek to determine the applicability of Atomic Diffusion Additive Manufacturing technology for use in cost effective manufacture and optimised design of detail metallic components in aerospace when compared to traditional subtractive manufacturing strategies.



#### **NATEP** Grant

£88.200

# COMPOSITES



# **Automated Composite** Component Manufacture

- Pentaxia SHD Composites
- TIA Transcal Engineering (customer)
- Rolls-Royce plc (customer)

#### Contact

#### Russ Meddes - Business Development Director russ.meddes@pentaxia.co.uk

Pentaxia looks to develop novel automation through robot preforming to help significantly reduce the labour content in aerospace components making the UK more competitive.



#### NATEP Grant

£52,150

# NATEP Grant £98,150



# NATEP Grant

£141,000





Supply chain partnership

#### Project

# Low Cost FST **Compliant Composite Components**

#### Supply chain partnership

- CECENCE
- SHD Composites
- Wavelength NDT
- Pitch Aircraft Seating (customer)

#### Contact

#### Humphrey Bunyan - Director & Head of Innovation humphrey@cecence.com

The development of low cost, fast process methods & FST compliant thermoplastic/ thermoset materials to replace structural aluminium components. Bio resins and low toxicity recyclable solutions will be a focus.





# **Novel disruptive** composite structures

#### Supply chain partnership

- Adhesion Technologies Ltd
- Loop Technology Ltd
- Leonardo MW Ltd (customer)

#### Contact

#### Douglas Wood - Commercial Director douglas.wood@adhesiontec.com

Adhesion Technologies is developing the next generation composite fixing technology 'Attenuator' to be demonstrated in Leonardo MW's revolutionary Rotary Wing Unmanned Aerial System.

#### Project

# **CTES - Lower Cost. Higher Performance Composite Tooling**

#### Supply chain partnership

- Composite Tooling & Engineering Solutions Ltd
- SHD Composite Materials Ltd
- Applied Graphene Materials Ltd
- GKN Aerospace (customer)

#### Contact

#### Liam Moloney – Director liam@ctesltd.co.uk

To develop a lower cost, higher performance, composite tooling solution suitable for use in the production of all types of composite aerospace structures.

#### Project

# **Xenon Pulse Technology in Fibre** Placement

#### Supply chain partnership

- Heraeus Noblelight Ltd
- Hexcel Composites Ltd
- Rolls-Royce plc (customer)

#### Contact

#### www.heraeus.com

Heraeus Noblelight Xenon Flash technology offers potential cost and performance advantages in processing of composite materials for aerospace applications. This research will take the technology closer to commercialisation

#### Project

# Inhibitina **Delamination in CFRP** Composites

#### Supply chain partnership

- M Wright & Sons Ltd
- Composite Innovations Ltd
- GKN Aerospace (customer)

#### Contact

#### Simon Marshall - 3d Development Manager simon@mwright.co.uk

Delamination is a primary source of failure for composites, leading to over engineered parts. This project will investigate ways to inhibit delamination by three dimensional textile fibres in reinforced plastic composites

# Volume manufacture of a composite fixing and weight Reduction system

#### Supply chain partnership

- Adhesion Technologies
- ・ MEP Ltd
- Dopaq • Formax

Project

- Pressavon
- Loop Technologies

#### GKN (customer)

#### Contact

#### Tom Wood tom.wood@adhesiontec.com

This project provides a machine to prove mass production of Fiba Spida fixings which will facilitate weight reduction and revolutionise how composite aerospace structures are designed, and constructed.



**NATEP** Grant

£150,000



NATEP Grant

£147,225



NATEP Grant

£145,500



NATEP Grant

# £150,000

#### NATEP Grant

£150,000

# NATE

#### Project

# **TOGGLON** a bonded **Fixings Installation System**

#### Supply chain partnership

- Adhesion Technologies
- MEP Ltd
- Pressavon
- Loop Technologies
- GKN (customer)

#### Contact

#### Tom Wood tom.wood@adhesiontec.com

The Togglon project enables us to deliver the world's first installation tool specifically designed to quickly, accurately and consistently install composite bonded fastenings on to most substrates at any angle.





#### Project

# **Cure Capable** Mandrels

#### Supply chain partnership

- CTES Ltd
- Retrac Composites Ltd
- GKN Aerospace (customer)

#### Contact

#### Liam Moloney - Director liam@ctesltd.co.uk

To develop solutions for structural composite fibre placement tooling that is cure-capable and CTE-matched to the component, for use in the automated production of composite wing spars and other large composite aerospace structures

#### Project

# **Low Mass Composite** Mould Tool (LMCMT)

#### Supply chain partnership

- KAMAN Tooling Ltd
- KAMAN Composites Ltd
- Hexcel Composites
- Ten Cate Advanced Composites BAE Systems (customer)

#### Contact

#### Paul Barrett – Managing Director paul.barrett@kaman.com

The LMCMT project will revolutionise Composite tooling strategies across the Aerospace and Automotive sectors, delivering lower cost, lower energy and lower carbon footprint tooling to all of the major aerospace manufacturers making composite components. The objective of this R & D project is to Design, manufacture and test 2 off Proof of concept Low Mass Composite Mould tools.

#### Project

# Composite **Electrostatic Transport Elements (CompETE)**

#### Supply chain partnership

- AGC Aero Composites
- Element Materials Technology
- ENL Ltd
  - Technical Fibre Products Ltd
  - Airbus Operations (customer)

#### Contact

#### info@tods.co.uk

The development of lightweight, shaped and damage resistant composite fuel pipe assemblies that by virtue of their tightly controlled electrical properties can be used safely in composite aircraft fuel tanks

#### Project

# **Biocomposites for Aerospace Interiors** (BAIT)

#### Supply chain partnership

- Coventive Composites
- AIM Composites
- Composites Evolution
- AIM Cabin Interiors (customer)

#### Contact

#### Elliot Fleet - Project Manager elliot.fleet@coventivecomposites.com

The project will develop pre-impregnated ("Prepreg") composite materials for aerospace interior applications that are based on a novel 100% bio-based fire-safe resin system that provides an alternative to conventional petrochemically-derived phenolics

# Enterprise **Bio-Interiors Project**

#### Supply chain partnership

- SHD Composite Materials Ltd
- AIM Aviation Ltd
- Ipeco Composites (customer)

#### Contact

Project

#### Nick Smith - Technical Director nsmith@shdcomposites.com

The innovative technology to be developed is a water based resin preimpregnated glass fibre composite material (prepreg) giving good Fire Smoke and Toxicity (FST) properties for the aircraft interiors market.



**NATEP** Grant

£149,770



NATEP Grant

£146,560

# NATEP Grant

£131,090



#### NATEP Grant

£146,570

#### NATEP Grant

£74,500

#### Project

# Long/continuous **Fibre Reinforced Thermoplastic (CFRTP) Composite Processing**

#### Supply chain partnership

- CCP Gransden Ltd
- Comco
- Bombardier (customer)

#### Contact

#### ccp-gransden.com

This project will seek to develop a flexible and adaptive system for proof of concept processing continuously reinforced thermoplastic composites for aerospace applications.



Grant for R&D



#### Project

# Multifab- A Multifunctional composite fabric concept

#### Supply chain partnership

- Diversus Ltd
- University of Bath
- Leonardo MW Ltd (customer)

#### Contact

#### Chris Brill – Director info@Diversus.Technology

The main objective of this project is the development of a multifunctional fabric to be embedded as an additional layer in conventional helicopter blades. Intrinsic functionalities include anti and deicing properties, damage detection and lightning strike protection.

#### Project

# Composite Pipe Bending

#### Supply chain partnership

- Sigma Precision Components Ltd
   e-Mould (UK) Ltd
- Rolls-Royce plc (customer)
- Bentley Motors (customer)
- Contact

#### Michael Andreae – Director of Technology & Improvement michael.andreae@sigmacomponents.co.uk

The Composite Pipe Bending project will develop a repeatable, cost effective method to bend composite pipes using CNC pipe bending equipment

# Project

# Composite Baseplates for aerospace antennas

#### Supply chain partnership

- + Technical Composite Systems Ltd
- Cobham Antenna Systems
- University of Exeter
- (customer) tbc

#### Contact

#### Michael Sloan – Managing Director msloan@technicalcompositesystems.co.uk

The project consortium aims to develop, test and exploit new technologies to improve aircraft communication hardware. Structural composite materials and advanced surfacing technologies will reduce the mass of current systems.



NATEP Grant

£145,115

#### Project

# Fastening Forms in Composite Technology

#### Supply chain partnership

- Rotite Technologies
- Sigmatex
- University of Manchester
- Airbus Operations Ltd (customer)
- Aircelle Ltd (customer)
- Ejot UK Ltd (customer)

#### Contact

#### Stuart Burns – Founder and Innovation Director stuart.burns@rotite.com

Lightweight structures and assemblies are essential for fuel efficiency and sustainable design. This project will develop, for the first time, integrally formed Rotite fasteners in composites, providing structural and weight saving solutions in contemporary materials.



NATEP Grant

£148,000

#### NATEP Grant

£44,015



NATEP Grant

# £139,500

# NATEP



#### Project

# Advanced Stress Concentration Assessment Tool (ASCAT)

#### Supply chain partnership

- Cabot Design Ltd
- Gingerneering Ltd
- Safran Landing Systems

#### Contact

# David Stephenson – Engineering Manager david.stephenson@cabotdesign.com

Generation of an analysis tool which integrates into current commercial available analysis software to assess the peak stresses at stress concentrations in landing gear structures.





#### Project

# **Standardised Image Correlation for** Industry

#### Supply chain partnership

- Enabling Process Technologies Ltd Strain Solutions Ltd
- Airbus

#### Contact

#### Dr John Philip Tyler - Director philip.tyler@eptworld.com

The project will develop a new physical method for validating digital image correlation displacement/strain data by achieving traceability to the length standard at the time of test data capture.

#### Project

# **Cabin Interior** Monument Load Cell

#### Supply chain partnership

- Cabot Design Ltd
  - Gingerneering Ltd Rockwell Collins operating in the UK as B/E Aerospace (UK) Limited

#### Contact

#### David Stephenson - Engineering Manager david.stephenson@cabotdesign.com

A novel load cell developed for testing aircraft interior structures. With enhanced stiffness representation, self-calibration and interchangeable interface adapters the load cell advances the useful data obtained during test and enhances capability for correlation with analysis

# Project

# **Aircraft Ditching Loads Prediction Tool**

#### Supply chain partnership

- Stirling Dynamics
- University of Southampton
- Bombardier (customer)

#### Contact

#### Dr Simon Hancock - Research & Development Manager simon.hancock@stirling-dynamics.com

This project will produce a method and tool to predict the loads experienced by an aircraft when ditching in water. This will cover a range of aircraft configurations and could be used by any aircraft manufacturer.

#### Project

# Whole-field simulated/ experimental data comparison

#### Supply chain partnership

- Enabling Process Technologies Ltd
- Strain Solutions Ltd
- Airbus Operations Ltd (customer)

#### Contact

#### Dr John Philip Tyler - Director philip.tyler@eptworld.com

This project will develop a new method for the full-field comparison between experimentally derived digital image correlation displacement/strain data and finite element simulation results from aerospace structures, incorporating an innovative and fully automated coordinate transformation approach.

# Project

# Large Deployable **Antenna for Space**

#### Supply chain partnership

- Oxford Space Systems
- Reliance Precision Ltd
- VTOL-Technologies (customer)

#### Contact

#### Mat Rowe - Project Manager mat.rowe@oxfordspacesystems.com

Oxford Space Systems will design & develop a reflector surface for attachment to their existing scalable large deployable antenna



**NATEP** Grant

£58,142



NATEP Grant

£62,500



NATEP Grant

£166.850

# NATEP Grant

# £77,000



NATEP Grant

£150,000

# ΝΑΤΕ

MDA Corporation UK Ltd (customer)

#### Project

# **Novel training through** virtual reality

#### Supply chain partnership

- Invirt Reality
- University of Exeter
- FlyBe (customer)

#### Contact

#### Chris Jones - Director chris.jones@invirtreality.co.uk

This project is a close collaboration between a leading software engineering company, a University and an airline. It will seek to develop a novel, immersive environment utilising the latest in technology enhanced learning.









Ц Ц



# Wireless Telemetry Antennas

#### Supply chain partnership

- TBG Solutions Ltd
- G2 Communications
- Rolls-Royce plc (customer)

#### Contact

Project

#### Paul Rawlinson - Managing Director paul.rawlinson@tbg-solutions.com

Innovative antennas to be used to improve the reliability and efficiency of wireless monitoring of measurement data in aero engine development test; generic signal conditioning for signals from the measurement sensors



#### NATEP Grant

# £150,000

# Project

# **Improved Harness** Technology (IHT)

#### Supply chain partnership

- Trackwise Designs Ltd
- Boston Design Consultants
- Fokker Elmo BV (customer)
- Messier-Dowty Ltd (customer)

#### Contact

#### Philip Johnston - Managing Director philip.johnston@trackwise.co.uk

Trackwise has developed a means of producing length-unlimited multilaver flexible printed circuit boards. This project will accelerate the adoption of this technology as a weight saving replacement for conventional wiring harnesses with associated carbon reduction benefits for aerospace platforms and payloads.



NATEP Grant

# £84,000

#### Project

# **Configurable Double Sided Cooled Integrated Power** Module

#### Supply chain partnership

- Semelab Ltd
- Pre-Met
- Rolls-Royce plc (customer)

#### Contact

#### Julian Thomas Julian.Thomas@ttelectronics.com

Significantly improve power module reliability, performance and costs, increase the options for standardisation and integration whilst significantly reducing the weight and size.

Deliver a demonstration of a configurable power module that comprises a double sided cooled plug-in single switch element integrated with gate drive and control circuitry that allows for maintenance



#### **NATEP Grant**

£127,200

#### Project

# **Optical Brake Temperature Sensor**

#### Supply chain partnership

#### Oxsensis

- Meggitt Sensing Systems
- Airbus Operations SAS (customer)

#### Contact

#### Conrad Langton - Engineering Director conrad.langton@oxsensis.com

Oxsensis is working with Airbus and Meggitt Sensing Systems to demonstrate that a novel fibre optic temperature sensor can monitor the temperature of aircraft braking systems. This is a truly harsh environment in which the aircraft mounted sensors will be exposed to temperatures in range of -55°C to 1300°C.

# £150,000

NATEP Grant



#### Project

# **Digital High** Performance **Servovalve**

#### Supply chain partnership

- Moog Controls
- 4C Electronics
- Moog Inc. (customer)
- Embraer Commercial
- Aviation (customer)

#### Contact

#### Dr Phil Elliott – R&D Manager pelliott2@moog.com

The execution of electronic closed loop control within a small flight control servovalve has many benefits at the system level including: digital interface, reduced internal leakage, faster dynamic response, higher accuracy and smaller size.





#### Project

# **Single Stage Isolated AC/DC Power Supply**

#### Supply chain partnership

- On-Systems Ltd
- Peregrine Semi-conductors UK
- Raytheon UK (customer)

#### Contact

#### Mike Harvey - Commercial Director mike.harvey@on-systems.co.uk

This project will deliver a single stage AC to DC power supply with power factor, and conversion efficiency greater than 95%. The power supply will work with single phase or three phase input from 80VAC to 264VAC, frequency from 40Hz to 800Hz, and give a regulated, isolated output from 12VDC to 400VDC.





#### NATEP Grant

# £150,000



# Ultrasonic Ice Protection

#### Supply chain partnership

- Ultra Electronics Controls Southampton University
- Morgan Advanced Materials
- BAE Systems (customer)
- Contact

1283163443193108

NATEP Grant

£150,000

#### www.ultra-electronics.com

This project is to further develop a new concept for a Wing Ice Protection technology for smaller commercial business aircraft and unmanned air vehicles, and to demonstrate operation in an icing tunnel on a representative aerofoil sample.

# Project

# **Active Rapid Thermal-Transfer System** (ARTS)

#### Supply chain partnership

- TCS Micropumps Ltd
- Electrobase RP
- BAE Systems (customer)

#### Contact

#### Richard Weatherly - Director richard@micropumps.co.uk

The Innovative ART System (Active Rapid Thermal-Transfer) provides a superefficient method of transferring heat. It can be fully integrated into electronic systems and will help maximise electronic performance for the aerospace industry.



NATEP Grant

# £150,000

#### Project

# Software Defined Telemetry

#### Supply chain partnership

- TBG Solutions Ltd
- G2 Communications
- Rolls-Royce plc (customer)

#### Contact

#### Paul Rawlinson - Managing Director paul.rawlinson@tbg-solutions.com

Software controlled wireless communications system for reliable wide bandwidth remote monitoring of sensor data, initially aimed at improving efficiency and cost-effectiveness of aero engine development test

#### Project

# Low cost packages for semi-conductor devices

#### Supply chain partnership

- Semelab Ltd
- PandA Europe
- AK Industries Ltd GE Aviation Systems

# Contact

#### Liam Mills – R&D Manager liam.mills@semelab-tt.com

The project proposes to develop a recyclable high temperature polymer that can be moulded around a metal lead frame to produce a lower cost package alternative to traditional co-fired ceramic surface mount packages for current aerospace applications and future high temperature requirements



NATEP Grant

£150,000

NATEP Grant

£150.000



#### Project

# **CAUTION - CoAtings** for Ultra high **Temperature** detectION

#### Supply chain partnership

- Sensor Coating Systems
- Monitor Coatings Ltd
- MAN Diesel & Turbo SE
- NASA
- United Technologies Research Centre
- Pratt & Whitney

#### Contact

#### Dr Jörg P. Feist - Managing Director j.feist@sensorcoatings.com

The project 'CAUTION - CoAtings for Ultra high Temperature detectION' will develop a Thermal History Coating for accurate temperature profiling of critical components in the range 900°C to 1500°C and beyond.







# GRAPHENE



#### Project

# **Graphene Composites Evaluated in Lightening Strike** (GraCELS)

#### Supply chain partnership

- Haydale Composite Solutions Ltd
- SHD Composites Ltd
- Cobham Antenna Services
- Airbus UK (customer)
- BAE Systems plc (customer)

#### Contact

NATEP Grant

£150,000

#### Peter Hansen - Engineering Manager peter.hansen@haydalecs.com

The addition of functionalized graphene nanoparticles into the epoxy resin matrix of composite materials will greatly enhance the electrical conductivity thereby making them much more resistant to lightning-strike damage.

# Project

# **Inkiet Printed Graphene Composite Materials**

#### Supply chain partnership

- Applied Graphene Materials Limited SHD Composite Materials Limited
- The Boeing Company (customer)

#### Contact

#### Steve Quinn steve.guinn@appliedgraphenematerials.com

This project seeks to produce lighter and more damage tolerant composites by optimising the application of new graphene materials and processing techniques. Successful demonstration will enable composites to achieve a step further towards their full potential. In practical terms: tougher composites means lighter composites which leads to significantly lower operating costs for the aerospace industry.

#### Project

# Graphene-**Enhanced adhesive Technology through Functionalisation**

#### Supply chain partnership

- Haydale Composite Solutions Ltd
- SHD Composites Ltd
- Element Materials Technology Hitchin Ltd
- Airbus (customer)
- GE Aviation Systems (customer)

#### Contact

#### Peter Hansen - Engineering Manager peter.hansen@haydalecs.com

Addition of functionalised graphene to epoxy adhesives will allow them to act as electrical conductors rather than as insulators allowing for an electrically unified structure

# Graphene **Enhanced Adhesive Technology through Functionalisation** (GrEAT Fun-2)

#### Supply chain partnership

- - Airbus
  - GE Aviation Systems

#### Contact

Project

#### Peter Hansen - Engineering Manager peter.hansen@haydalecs.com

Adhesive bonds using conventional adhesives are generally electrical insulators which can cause issues when the parts being joined are electrically conductive. This project aims to use graphene and other 2D nano platelets in order to improve the electrical conductivity of adhesive bonds as well as enhance the strength of the bonded layer and to build on the success of the GrEAT Fun project



NATEP Grant

# £150,000

# NATEP Grant

# £150,000

#### **NATEP Innovation Directory**

#### www.natep.org.uk

NATEP Grant

£150,000



 Haydale Composite Solutions Element Materials Technology

#### Project

# **Graphene Composites Evaluated in Lightening Strike** (GraCELS-2)

#### Supply chain partnership

- Haydale Composite Solutions
- Cobham Technical Services
- Airbus
- BAE Systems

#### Contact

#### Peter Hansen - Engineering Manager peter.hansen@haydalecs.com

The project aims to deliver a generation of carbon fibre-reinforced composites with greatly improved performance in lightning-strike combined with improvements in mechanical properties by utilising the ability of functionalised graphene and other 2D Nano-fillers in the matrix of the composite material to significantly improve the electrical conductivity of the composite material

NATEP Grant



£150,000





# **SMART Racking System**

#### Supply chain partnership

- S2 Aerospace Ltd
- University of the West of England
- Airbus Military UK (customer)

#### Contact

Project

#### Tim Shortman – Managing Director tim.shortman@s2aerospace.com

The funding supported the development of a SMART Racking System for highvalue aircraft wheels in the aerospace MRO and the introduction of new development capability within S2 (currently "build-to-print") for innovative engineering design solutions.



NATEP Grant

£154,750

#### Project

# In-loom splicing for aerospace applications

#### Supply chain partnership

- AvOptics
- TT Electronics
- BAE Systems
- MOD UK Chinook project team (customer)

#### Contact

#### Andrew Voizey - Managing Director andy.voizey@avoptics.com

To develop a simple to use, novel in-loom mechanical splicing technology to enable the repair of fibre optic harnesses on aircraft.

#### Project

# **Civil Aviation MRO Springboard** (CAMROS)

#### Supply chain partnership

- Advanced Aerospace Assembly Ltd
- NC Technology Ltd
- Replicade Ltd
- Intoware Ltd
- Argenta Nova Ltd

#### Contact

#### Jim Heley – Managing Director jim.heley@a3l.uk.com

CAMROS (Civil Aviation MRO Springboard) investigates technology & business applicability of:

Ingestion & delivery of digital work-cards

Technician support via telepresence

Visualised tracking of MRO history

Focused on the needs of end-user BAE Regional Aircraft, CAMROS is a crossborder SME consortium

NATEP/Scottish Enterprise Grant

# **GNSS Interference Location and Survey**

Project

#### Supply chain partnership

- Forsberg Service Ltd
- Rockwell Collins
- Ros Technology Ltd
- Ferrovial (Amey OWR)

#### Contact

#### Charles Forsberg – Director charles.forsberg@forsbergservices.co.uk

Developing a GNSS Jammer detection capability to identify and locate illegal jammers that are stopping or adversely affecting GNSS navigation. The development will be based around airport infrastructures.





NATEP Grant

£150,000

£150,000

MRO SUPPORT / ROUND Б

NATEP Grant

£149,760





# **INSTRUMENTATION**





# **Piezoelectricity**enabled Aero Controls

#### Supply chain partnership

- Ionix Advanced Technologies Ltd
- Linwave Technology
- Rolls-Royce plc (customer)

#### Contact

#### Dr Tim Comyn - Chief Technology Officer tim.comyn@ionix.at

Using novel piezoelectric materials integrated into engine components, lonix and its project partners, supported by NATEP aim to make a significant impact on the fuel efficiency of gas turbine engines through improvements to the cost, reliability, accuracy, and response time of electromechanical components operating in extreme environments.



# **Finite Measurement** Supply chain partnership

- Powerkut Ltd Coventry University
- Winbro Group (customer)

#### Contact info@natep.org.uk

NATEP Grant

£150,000

#### The project will build and market a new machine that is capable of processing gauge block calibration in an automated environment. This will address a market need for measurement results to improve at the same rate as materials technology in the aerospace sector and meet an increasing demand for consistent quality of results accessible for the whole supply chain.



**NATEP** Grant

£127,170



**AIRCRAFT INTERIORS** 

#### Project

# **Novel Miniature Actuator**

#### Supply chain partnership

- CNR Services International
- Midland Aerospace
- BE Aerospace, Florida (customer)

#### Contact

#### Chris Reckless – Managing Director creckless@cnrdesign.co.uk

CNR have designed a concept selfcontained Novel Miniature Actuator (NMA) specifically for the aircraft passenger seat actuation market. This NMA is expected to provide cheaper manufacturing costs per actuator, lower mass, more reliability, greater efficiency and guieter and smoother performance than current seat actuators.

#### Project

# **Modular Galley for** Assembly

#### Supply chain partnership

- Belfast Aircraft Stress Engineers Ltd
- Moyola Precision Engineering Ltd
- Denroy Plastics Ltd SR-Technics (customer)

#### Contact

#### Peter Hinds - Strategic Business Director Pete.Hinds@basegroup.co.uk

The project collaborators will develop a modular design concept for an aircraft galley. The modular concept is to enable a simplified manufacturing and assembly process





R&D Grant awarded

£95,025

# ΝΔΤΕ

#### Project

# Featherlite Aircraft Seat

#### Supply chain partnership

- Magnesium Elektron
- Mettis Aerospace
- Kenard Engineering (Tewkesbury) Ltd
- · Geven SPA (customer)

#### Contact

#### Martyn Alderman – Director of Technology martyn.alderman@luxfer.com

Magnesium Elektron has joined forces with a forging company, machinist and aircraft seat OEM to develop a lightweight forged magnesium aircraft seat component. The object of the NATEP project was to reduce the barriers to an OEM using UK sourced magnesium. This was achieved by optimising the supply chain value of the forged magnesium component by maximising the fly to buy ratio and to minimise the material cost through full economic recovery of all process scrap arisings. The project produced a lightweight demonstrator component in a finished condition that can be retro-fitted to an existing design or incorporated in a newly designed aircraft seat that gives at least a 15% weight saving by component.



# NATEP CASE STUDY

# Modular galley promises big gains in time, cost

NATEP helped three Belfast SMEs develop a successful new approach for aircraft galleys partly inspired by the high street.

The project's industrial partners are now marketing their novel modular galley build concept that promises reduced build cycle and customer lead times and ultimately a lower cost of assembly. NATEP supported the project with £95,000 in research funding.

The new galley was exhibited at Aircraft Interiors Expo (AIE) by Causeway Aero Ltd, the joint venture set up to combine the aerospace offers of the original project partners, Belfast Aircraft Stress Engineers (BASE), Moyola Precision Engineering Ltd and Denroy Plastics Ltd. They were joined on the project by SR Technics as the end-user.

Causeway Aero chief executive Michael Rice said the group was set up as a Tier 2 aero integrator, providing turnkey engineering services, production management and final assembly "to give our customers a single product, with a single point of contact". He said the company sees "a real opportunity" in the aircraft galley and interiors market. "Causeway Aero is most definitely open for business. It is an exciting time, and the company, with the continued commitment and focus of our staff, is moving at a fast pace in this sector."

Kevin McNamee of Denroy Plastics said the aerospace industry recognises aircraft interiors as an area of potential bottlenecks.

He said the partners had observed that the manufacture and assembly of aircraft galleys was "based on traditional manufacturing and assembly techniques which can be labour intensive.

"We thought making galleys modular would be a more efficient way of designing and manufacturing them," he said.

Joining forces as Causeway Aero brought the capabilities of all the partners under one umbrella with a full design and manufacture proposition.

Last year they took a renovated galley to AIE to show what could be done at refit with the modular concept; this year what was on display was all new. McNamee said the modular galley has been well-received by the industry, not least for its efficiency. "Any time an aircraft is on the ground, it's extremely expensive. If you can remove the old galley and install the new one quickly – in days, not weeks – it's attractive to the airline.

"With the modular approach, it should be like choosing from a menu of off-theshelf components," he added.

To date, Causeway Aero has made inroads in the MRO sector where there are savings to the fit-out company to have the galley designed, manufactured and installed fast.

Commercial discussions are also under way with prime contractors in pursuit of the company's longer-term aspiration of fitting out new airliners.

Meanwhile, in Bangor, Denroy has plans for a 15,000sq ft extension to its premises – an increase of 25 per cent – partly due to potential component manufacture for the modular galleys. The company is also recruiting.

McNamee said NATEP helped develop a product that's "exciting and innovative. It's created jobs in the UK and given us technological development that's protectable. We're proud of it."



Causeway's demonstrator galley has attracted attention at trade shows.

"With the modular approach, it should be like choosing from a menu of off-the-shelf components."

# A New Suppry A New Suppry in Solution abin Interiors

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Ney systems:

line





# ð **MANUF**



# Project

# **Process Optimisation** for Aerospace Alloys

#### Supply chain partnership

- ANT Industries
- Arrowsmith Engineering
- Technoset
- Pattonair Ltd (customer) ITP SA (Spain) (customer)

#### Contact

#### Mark Harriott - Technical Manager mark.harriott@antindustries.com

The project will:

improve manufacturing processes on exotic metals that will substantially increase capacity in the Aerospace supply chain.

Utilise the expertise of the Manufacturing Technology Centre, Coventry, to undertake research into specific machining processes.

Optimise production methods for machined aerospace parts to secure UK supply chain competitiveness and reputation for providing a world class service.

#### NATEP Grant

# £90,000

# Project

# **Precision Deep Hole** Boring

#### Supply chain partnership

- Perfect Bore Manufacturing Ltd
- Dickinson Legg Ltd
- Gemms Ltd
- Impcross Ltd (customer)

#### Contact

#### Jon Waghorn - Project Manager jon.waghorn@pbm-ltd.com

PBML and DLL are collaborating to produce more accurate, robust and enhanced geometric tolerance bore solutions to the aerospace industry

NATEP Grant

# £150,000

#### Project

# **Rapid Development** Compressor Component Manufacture

#### Supply chain partnership

- Centrax Turbine Components
- Mettis Aerospace
- West Country Tools (WCT)
- Rolls Royce plc (customer)

#### Contact

#### centraxqt.com

Providing a full commodity manufacturing solution to the production of HPC components to meet cost, quality and delivery targets in a flexible design sphere

# **Plasma Cleaning** in MCM Advanced

Project

#### Supply chain partnership

#### Welwyn Components Power & Hybrid

- Accelonix
- Rolls Royce plc (customer)

#### Contact

#### Lisa Dunn - Engineering Manager lisa.dunn@ttelectronics.com

This project will demonstrate that an innovative cleaning process can be introduced into the manufacture of advanced MCM (multi-chip module) devices for avionic engine controls, and automated to improve both yield and quality.



#### **NATEP Grant**

£149,340



#### NATEP Grant

£70,000



# Manufacture

#### Project

# **Automated** Manufacture of Slot Liners (AMSL)

#### Supply chain partnership

- MEP Ltd
- Jackson Design Ltd
- SAFRAN Labinal Power Systems (customer)

#### Contact

#### Phil Hart - Managing Director phil.hart@mep.co.uk

Aerospace power generators operate at high temperatures; moulded components which act as insulators must cope with demanding electrical output, stresses and strains. This technology delivers high quality, safe products whilst retaining manufacturing in the UK in the long term.



NATEP Grant





# **New Muffler Ducting** for Air Distribution

#### Supply chain partnership

- AVS-SYS Ltd
- Arville
- Foam Techniques Ltd
- Raytheon (customer)

#### Contact

#### Andrew Whitehead - Engineering Director awhitehead@avsupport.org.uk

The project is to design weight-saving and cost saving aerospace muffler ducts which will support the development of a new manufacturing facility in the North West of England providing employment opportunities and increased exports.



Grant for R&D

£123,320

#### Project

# **Prep'ing Composite Moulds with Lasers For Enhanced Productivity** and Quality

#### Supply chain partnership

- Advanced Laser Technologies Ltd
- CNC Robotics
- Cobham Antenna System (customer) EPM Technology (customer)

#### Contact

#### Roger Hardacre – Managing Director roger.hardacre@altlaser.co.uk

The project will develop an advanced system that can clean, polish and repair moulds made of metal or composite used to produce composite parts. The intention is that a successful outcome will lower supply chain costs & improve productivity of skilled labour by developing an automated technology for cleaning composite material moulds The system can be in a bureau format for low frequency users, or for high frequency users it can be a factory based solution.



#### NATEP Grant

# £150,000

# Project

# HoleGun+

#### Supply chain partnership

- Third Dimension
- Insphere Ltd
- Airbus (customer)
- GKN Aerospace (customer)

#### Contact

#### Dr Tim Monks - Chief Technical Officer tim.monks@third.com

The development of Third Dimension's "Optical Countersink Hole Inspection Solution" will dramatically improve manufacturing of complex aerospace components by simplifying inspection, reducing rework time, improving cycle time and significantly reducing overall cost of manufacture.



NATEP Grant

# £147,760

#### Project

# **3D Moulded Circuits**

#### Supply chain partnership

- Laser Optical Eng. Ltd
- Moulded Circuits Ltd
- MBDA UK Ltd (customer)

#### Contact

#### John Tyrer johntyrer@laseroptical.co.uk

Develop a laser writing system capable of producing 3D copper tracks or circuits on 3D aerospace lightweight structures.

Create the ability to produce fully functional circuitry directly onto 3D parts, enhancing functionality and enabling them to become part of a larger product or system, thereby reducing size, weight and cost.

# **Cryogenic Research** of Efficiency on Structural Titanium (CREST)

#### Supply chain partnership

- Hyde Aero Products Ltd
- Starrag UK Ltd
- Walter GB Ltd BAE Systems (customer)

#### Contact

Project

#### Paul Mellor – Technical Director pmellor@hydeaero.co.uk

The objective of this project is to determine and understand the benefits of Cryogenic rough machining strategies when applied to prismatic Titanium Structural Airframe components in comparison to the traditional emulsion application



#### NATEP Grant

£101.670



#### Project

# **Distortion and Residual Stress Control for** Manufacture

#### Supply chain partnership

- Silcoms Ltd.
- The AMRC with Boeing
- Sandvik Coromant
- Craftsman Tools Ltd
- Rolls-Royce plc (customer)

#### Contact

#### Andy Morris - Engineering Manager andrew.morris@silcoms.co.uk

The partnership is working on a collaborative project looking to utilise the latest in FE analysis, residual and distortion stress management to optimise the engineering of high value, thin walled aerospace components. The project is aiming to keep the UK at the forefront of this highly skilled and competitive market.





#### Project

# **Combustion Chamber Process Innovation**

#### Supply chain partnership

- Nasmyth Technologies Ltd
- Hucknall Sheet Metal Ltd
- GE Aviation Czech (customer)

#### Contact

#### www.nasmythgroup.com

Nasmyth Technologies Ltd will develop innovative processes for the manufacture of combustion systems in aircraft engines and support long term growth of jobs in the high value-added aerospace sector.

#### Project

# **Integrally Bladed** Rotor (IBR) – Abrasive **Barrel Milling Cutter**

#### Supply chain partnership

- ITP Engines UK Ltd
- Technicut Ltd
- Geo Kingsbury
- Industria de Turbo Propulsores, SA (customer)

#### Contact

#### www.itpaero.com

Industrial research to develop the capability to manufacture gas turbine integrally bladed rotors (IBR's) using barrel milling tools thereby reducing manufacturing time and improving guality.

# Project

# **Integrally Bladed** Rotor (IBR) – Abrasive Flow Machining

#### Supply chain partnership

- ITP Engines UK Ltd
- Extrude Hone Ltd
- Brunel University
- Industria de Turbo Propulsores, SA (customer)

#### Contact

#### www.itpaero.com

Industrial research to model the effects of an Abrasive Flow Machining polishing process on aerofoil profiles and the development of predictive process controls which will lead to a reduction in manufacturing time and an improvement in quality.

#### Project

# **Innovative Aerospace Transport Tooling**

#### Supply chain partnership

- Datum Tool design
- Fleet Maintenance Ireland Ltd
- Bombardier (customer)

#### Contact

#### Michael Maguire - Director michael@datum-design.com

The project will gain understanding of cost effective and re-configurable tooling, to permit the manufacture

of multiple transport systems for aerospace assemblies.

# **Hydraulic Hand Tool** Development

#### Supply chain partnership

- FE Robinson Ltd
- Klauke UK Ltd
- Airbus Operations (customer)

#### Contact

Project

#### info@natep.org.uk

UK SME FE Robinson is leading the design and development of a range of lightweight "Smart" Hydraulic hand tools tailored for use in the aerospace sector. For the first time, the customer will be enabled in achieving substantial efficiency improvements in certain manual operation wing production processes



#### Grant for R&D

# £150,000

# NATEP Grant

£131,650



NATEP Grant

# £107.350

# R&D Grant awarded NATEP Grant £150,000

#### NATEP Innovation Directory

#### www.natep.org.uk

£47.640



#### Project

# Hot Isostatic **Pressing of Titanium Components** (HIPNOTIC)

#### Supply chain partnership

- Maher Ltd
- Nikken Innovation Centre Europe Ltd
- Replicast Ltd
- Westmoreland Testing & Research Ltd
- Airbus (customer)

#### Contact

#### Gerry Clark - Managing Director gerry.clark@maher.com

The aim of the project is to deliver component demonstrators for the Wing of Tomorrow programme led by Airbus. Novel technology delivered by a newly established local supply chain will be used to manufacture the components.









# **Forging Near Net Shape Titanium Components** (FRANTIC)

#### Supply chain partnership

- Maher Ltd
- Bifrangi UK
- Westmoreland Testing & Research Ltd
- The Boeing Company (customer)

#### Contact

#### Gerry Clark - Managing Director gerry.clark@maher.com

The FRANTIC project aims to establish a new supply chain in the UK for titanium aero structures. Using novel forging techniques to manufacture near net shape components will result in cost competitive solutions for the end user



#### Supply chain partnership

- Adhesion Technologies Ltd ENL Ltd
- Dopag (UK) Ltd
- Loop Technology Ltd
- Pressavon

Project

- Leonardo MW Ltd (customer)
  - Jaguar Land Rover Automotive PLC (customer)

#### Contact

#### Tom Wood tom.wood@adhesiontechnologies.com

Adhesion Technologies Ltd is developing a 'Fastener and Stress Attenuator' to replace rivets and underperforming laminate in aerospace structures. This will enhance payload capability and lifetime operating costs across the aerospace sector.



Grant for R&D

£97,040



#### NATEP Grant

# £150,000



<u>MATERIALS</u>

#### Project

# **C-MET Composite Metal Engine Technology**

#### Supply chain partnership

- Aerospace Metal Composites Ltd
- Cosworth Ltd
- Rolls-Royce plc (customer)
- BRP-Rotax (customer)

#### Contact

#### Dr Stuart Godfrey - Business Development Manager stuart.godfrey@materion.com

The C-MET project will develop the use of metal matrix composites for aeroengine applications, lighter weight designs will enable lower costs and significant reductions in aero-engine emissions.



#### NATEP Grant

£150,000

#### Project

# **Advanced Magnesium Investment Casting** (AMIC)

#### Supply chain partnership

- Aeromet International Ltd
- Luxfer MEL Technologies

#### Contact

Paul Monington - Head of New Technology paul.monington@aeromet.co.uk

The development of investment casting technology to enable the casting of near net shape magnesium castings. The project utilises additive manufacturing techniques in pattern production to reduce lead time and production costs, while addressing reported casting difficulties with innovative ceramic shell solutions.



NATEP Grant

£150,000



# NATE

Spirit Aero Systems (customer)

#### Project

# **Nano-Enhanced Aerospace Interiors** (NEAT)

#### Supply chain partnership

- Coventive Composites
- Applied Graphene Materials Ltd
- Composites Evolution Ltd

#### Contact

#### Gary Foster - Senior Project Manager gary.foster@netcomposites.com

The project will leverage graphene's unique properties in novel aerospace interior composites to give:

- Enhanced fire, smoke and toxicity performance
- Increased mechanical performance allowing weight reduction and reduced fuel costs
- Improved handling and surface finish
- Reduced production costs





# NATEP CASE STUDY

# Breakthrough in high-strength AM powder

NATEP has helped propel an advanced aluminium powder from early-stage development into the additive manufacturing (AM) market where it has been positively received.

Now the innovative high-strength A20X powder is poised for use in serial production with key aerospace original equipment manufacturers (OEMs) and Tier 1 suppliers.

The alloy was developed and patented by Aeromet International and aerospace-approved as A205 alloy. The powder is also covered by the patent.

The NATEP-supported project, led by Aeromet with partners Phoenix Scientific Instruments (PSI), Renishaw and Rolls-Royce as the potential enduser, succeeded in enhancing the understanding of a more robust powder for AM.

Mike Bond, Director of Advanced Material Technology for Aeromet, said the project was designed to realise the AM potential of Aeromet's nextgeneration aluminium alloy which was already being used in castings for highstrength, high-temperature aerospace applications.

"The progress we've made under NATEP has rapidly moved our concept from developing a metal power for the AM industry to commercialisation," he said, adding that it is "receiving market acceptance" after potential end-users conduct their own trials and manufacture parts by AM.

The NATEP project set out to optimise the casting alloy into an AM powder with the chemistry and powder distribution to maintain the alloy's advanced properties at room and elevated temperatures. A20X is described as having a highly refined microstructure and unique solidification mechanism which give it greater strength and better fatigue and thermal characteristics than other alloys used in AM such as AlSi10Mg.

Project partner PSI contributed the knowledge of processing and handling aluminium powders for AM, converting the Aeromet-manufactured alloy using technology that combines vacuum induction melting (VIM) furnaces with inert gas atomisation. The powder was further developed using Renishaw's AM systems. Innovations such as the development of the new A20X powder are important to Aeromet, whose business is still predominantly metal castings for aerospace. "Powder is the key to our growth into high-tech manufacturing and AM," said Bond.

The company has set up a business unit specifically for advanced materials technology to exploit this important alloy. It also forecasts a growth in this business area, which the NATEP project has been a major factor in achieving.

Bond said NATEP has been "a wonderful vehicle for moving us forward" as the project – the fourth the company had been involved in – enabled Aeromet to work with the right people and technologies, without which progress would have been much slower.

Paul Murray, Principal Materials Engineer at Rolls-Royce, said the Midlands-based engine maker was "excited to participate in this project and contribute to the development of this promising new aluminium alloy.

"NATEP is a proven programme with a strong track record of supporting innovation in the UK aerospace supply chain," he added.



Operator (above) removes a substrate from the AM system while (right) customer induction is carried out at the AM Solutions Centre.

"The progress we've made under NATEP has rapidly moved our concept from developing a metal power for the AM industry to commercialisation."









#### Project

# **A20X Surface Treatments** Development

#### Supply chain partnership

- Aeromet
- Poeton Industries
- Boeing (customer)

#### Contact

#### Mike Bond - Director of Advanced Material Technology mike.bond@aeromet.co.uk

The project will develop and verify the performance on a range of metal finishing treatments (anodic and chemical conversion coatings) for Aeromets A20X family of casting alloys without using hexavalent chrome compounds (which have a limited life under REACH legislation).

#### Project

# **Flexible Air** distribution ducting

#### Supply chain partnership

- · AVS- SYS Ltd
- Arville Textiles Raytheon (customer)

#### Contact

#### Andrew Whitehead - Engineering Director awhitehead@avsupport.org.uk

The project is to design weight-saving and cost saving flexible aerospace ducts which will support the development of a new manufacturing facility in the North West of England providing employment opportunities and increased exports.

# Project

# **Metal Matrix Composites** for Helicopter **Applications**

#### Supply chain partnership

- Aerospace Metal Composites Ltd
- Mettis Aerospace
- Leonardo MW Ltd (customer)

#### Contact

#### Dr Stuart Godfrey - Business Development Manager stuart.godfrey@materion.com

This project will develop both an aluminium and Silicon Carbide (SiC) metal matrix composite (MMC) material and create a forging supply chain specifically for helicopter applications. The funding will thus create a UK source (for the first time) for this high performance material which is required in the aerospace market.

#### Project

# **SmartHUD**

#### Supply chain partnership

- Artemis Optical
- Plessey Semiconductors Ltd
- BAE Systems (customer)

#### Contact

#### Stuart Allan - Technology Director stuart.allan@artemis-optical.co.uk

SmartHUD aims to use the recent proliferation in LED light sources and design unique and novel thin film coatings to enable their use in Head Up Display systems. The advantages sought are reduced weight, longer useful life of the light source and enhanced optical performance of the overall module.

# Project **High Strength Aluminium Alloy**

#### Supply chain partnership

- Cabot Design Ltd
- Ginaerneerina Ltd

# Contact

#### David Stephenson - Engineering Manager david.stephenson@cabotdesign.com

An advanced material model which facilitates the accurate analysis of high strength aluminium alloys under complex loading conditions, with specific application to the prediction of the initiation of failure under load.



**NATEP** Grant

£35,000



NATEP Grant

£127,850



NATEP Grant

£150,000

#### NATEP Grant

£102.890

NATEP Grant

£150,000

# ΝΑΤΕ

# **Failure Modelling**

#### Airbus Operations (customer)

#### Project

# **Mouldable Liners**

#### Supply chain partnership

- SKF
- WMG HVM Catapult
- Leonardo MW Ltd (customer)

#### Contact

#### Grant Dennis - Project Manager grant.dennis@skf.com

This project will develop greater flexibility and customisation to plain bearings technologies, permitting them meet the changing and demanding requirements of the aerospace market.







# Textilub - a novel self-lubricating liner

#### Supply chain partnership

- SKF
- Tiab Limited
- Leonardo MW Ltd (customer)

#### Contact

#### Michael Colton – Local Product **Development Manager** Michael.Colton@skf.com

Textilub will deliver the next generation of novel plain bearings to the meet the changing and demanding requirements of the aerospace market

#### Project

# Fe-36Ni MMC for space and aerospace applications

#### Supply chain partnership

- Aerospace Metal Composites Ltd ExoTec Precision
- NASA Goddard Space Flight Centre

#### Contact

#### David Tricker - Technical Manager david.tricker@materion.com

This project will develop a Fe-36Ni metal matrix composite (MMC) material. Specifically this composite material will have reduced density and improved thermal expansion properties compared to more conventional Invar® type systems

# Project

# **COP-E4** Combustion **Optimisation Program**

#### Supply chain partnership

- Weslake Air Services Ltd.
- Aerospace Metal Composites Ltd
- EFI Ltd
- Swift Air (customer)
- Axter Aerospace (customer)
- Britten Norman Aircraft Ltd (customer)

#### Contact

NATEP Grant

£150,000

#### John Lamberton - Managing Director John.lamberton@weslake.eu

The COP-E4 project will develop a novel heavy fuel powertrain for lightweight, safe and more fuel efficient aero-engines with significant reductions in cost and emissions.

#### Project

# **Developing** a new ultra-low temperature Hardide coating

#### Supply chain partnership

- Hardide Coatings Ltd
- Westmoreland Testing & Research Ltd
- Perfect Bore Manufacturing
- Airbus (customer)
- Leonardo (customer)

#### Contact

#### Dr Yuri Zhuk – Technical Director vzhuk@hardide.com

Development of, and characterisation of properties, of an ultra-low temperature CVD nano-structured tungsten/tungsten carbide based coating to increase wear, galling and corrosion resistance for low-tempering temperature steels. Providing an alternative to Hard Chrome, HVOF and other similar coatings on a wider range of materials.

# Water Soluble **Ceramics for** Aluminium investment casting applications

#### Supply chain partnership

- Aeromet Intl. Ltd
- Adaptive Engineering Solutions
- Airbus (customer)

#### Contact

Project

#### Mike Bond - Director of Advanced Material Technology mike.bond@aeromet.co.uk

The project will develop a water soluble ceramic material which offers significant improvement potential in the investment casting industry. Once mature, this technology will allow components to be manufactured with features which today cannot be produced, thus opening up the product design space for parts count and component size reduction.



NATEP Grant

# £148,000



NATEP Grant

£120.000

#### **NATEP** Grant

# £150.000

#### NATEP Innovation Directory

#### www.natep.org.uk

NATEP Grant

£150,000



#### Project

# **Thermoplastic Composite Fusion** Welding (CoFusion)

#### Supply chain partnership

- AGC AeroComposites
- The National Composites Centre
- Ten Cate Advanced Composites Ltd
- Rolls-Royce plc (customer)

#### Contact

#### info@tods.co.uk

The CoFusion project builds on previous development work to optimise the efficiency and applicability of an innovative, rapid, low cost and flexible thermoplastic composite welding process to aerospace standards.





# **High Strength Aluminium Powder for** additive manufacture (HighSAP)

#### Supply chain partnership

- Aeromet
- Phoenix Scientific Industries Ltd (PSI)
- Renishaw plc
- Rolls-Royce plc

#### Contact

Mike Bond - Director Advanced Material Technology mike.bond@aeromet.co.uk

To optimise the A20X casting alloy into an additive manufacturing powder with high strength and temperature capabilities with optimised chemistry and powder distribution, with essential design and data (mechanical and fatigue properties at room and elevated temperature).



NATEP Grant

£150,000

# Project **Lead-Free Detonating** Cords

#### Supply chain partnership

Chemring

NATEP Grant

£128,890

- Brunel University Martin Baker Aircraft (customer)

#### Contact

Andrew Bentley - BD Technology & Innovation Executive – Devices and rew.bentley@chemringenergetics.co.uk

The identification of suitable alloys and manufacturing processes to replace lead in the explosive detonating cords used in aircraft and space launch vehicles.



#### Project

# **Fit and Forget Cable** Harnesses

#### Supply chain partnership

- Scientific Management International Ltd
- Concept Cables Ltd
- · Safran Landing Systems

#### Contact

Glen Richardson - Chief Technical Officer glen.richardson@smi.group

Fit and forget design solution to avoid any water or moisture ingress into aircraft landing gear connector harnesses.

#### Project

# **Portable Pulse Oxygen Assembly (PPOCA)**

#### Supply chain partnership

- Avia Technique
- Meditech Systems
- Air Liquide
- Airbus Operations (customer)

#### Contact

Barry Wood - Senior Design and Development Engineer barry.wood@airliquide.com

Using pneumatic pulse technology in onaircraft portable oxygen cylinders.





NATEP Grant

£150,000

£150,000

# NATE

#### Project

# **Pulse Passenger** Service Unit (PPSU)

#### Supply chain partnership

- Avia Technique
- Meditech Systems
- Air Liquide
- Airbus Operations (customer)

#### Contact

#### Barry Wood – Senior Design and **Development Engineer** barry.wood@airliquide.com

The project will use Pneumatic Pulse Technology to deliver oxygen through the passenger service unit.







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#### Project

# **Enhanced Safety for Small to Medium-Size** Helicopters

#### Supply chain partnership

- Helitune
- Prosia
- University of Bristol
- · Castle Air (customer) Leonardo MW Ltd (customer)
- MD Helicopters (customer)

#### Contact

#### Peter Morrish - Technology Manager peter.morrish@helitune.com

The goals of this project bring the safety and cost-saving benefits of Health & Usage Monitoring (HUMS) to the small and medium-sized helicopter market. New hardware and data processing technologies will be combined and applied, resulting in a cost-effective 'Mini-HUMS' prototype for exploitation through the UK aerospace supply chain.

#### Project

# **Precision Back-up Navigation for UAVs**

#### Supply chain partnership

- Forsberg Services Ltd VTOL Technologies Ltd
- Rockwell Collins (customer)
- Locanis (customer)

#### Contact

#### Charles Forsberg - Director charles.forsberg@forsbergservices.co.uk

Forsberg Services Ltd propose an enhanced air navigation system for safe operation of UAVs during critical parts of the flight envelop, in particular landing and take-off. These phases of low-level flight are subject to object avoidance and safe navigation.

# Project

# **New Photonic Architectures using GaAs Modulators**

#### Supply chain partnership

- aXenic Limited
- University of Bedfordshire
- Selex ES (customer)

#### Contact

#### Steve Clements - Managing Director steve.clements@axenic.co.uk

The project will develop a novel photonic architecture to allow hi fidelity, high bandwidth, remoting of microwave sensing in harsh avionics environment. Photonic signal pre-processing will also be used to produce a better performance than from pure electronics.

#### Project

# **Novel contra-rotating** propellers for electric aircraft

#### Supply chain partnership

- Hercules Propellers Ltd
- Contra Electric Propulsion Ltd
- Falcomposite Ltd (customer)

#### Contact

#### Rupert Wasey - Managing Director rupert@hercprops.com

This collaboration between a propeller manufacturer and electric aircraft innovator will investigate novel contrarotating blade designs.



#### Supply chain partnership

- The Great Circle Ltd
- University of Central Lancashire

Project

# Contact

#### Adam Berrington - Director adam@thegreatcircle.co.uk

Project SAFER (Secure Authentication & Flight Evidence Recorder) exploits a number of recent innovations in encryption and authentication technology, together with the power of the 'cloud' to create a novel UAV pilot authentication system, which logs and communicates flight hours and flight data.



# £150,000

#### NATEP Grant

# £143,000



#### NATEP Grant

# £130,000



#### NATEP Grant

# £146,780

#### NATEP Innovation Directory

**NATEP** Grant

£150,000

# **Recorder (SAFER)**

 Distributed Management Systems Ltd ProFlight UAV Suppliers (customer)

#### Project

# **Helicopter Auto Regime Recognition** and Continuous RTB

#### Supply chain partnership

- Helitune
- University of Bristol
- Prosia
- Castle Air (customer)

#### Contact

#### Dominic Southgate - Project Manager dominic.southgate@helitune.com

This project will use novel algorithms that automatically detect helicopter flight regimes to enable continuous recording of rotor track and balance data. The outcome will be a reduced number of dedicated maintenance flights, increased helicopter availability and reduced overall costs to aircraft operators.







# HP1 Impact **Classification System** (HP1ICS)

#### Supply chain partnership

- HP1 Technologies Limited
- University of Central Lancashire
- Centre for Process Innovation (CPI)
- BAE Systems
- GKN Aerospace

#### Contact

#### Andrew Howes - Director Andrew@hp1t.com

This project will develop a printable intelligent flexible, thin and durable sensor array that will collect and analyse data relating to impact events on aircraft.

#### Project

# **Intelligent Diversion** Assistant (IDA)

#### Supply chain partnership

- The Great Circle Ltd University of Central Lancashire
  - Pooleys Flight Equipment Ltd

#### Contact

#### Adam Berrington - Director adam@thegreatcircle.co.uk

The Intelligent Diversion Assistant (IDA) improves aircraft safety in emergencies, using data obtained from real-time digital aircraft and weather feeds, coupled with a detailed airfield navigation database, to provide real-time optimum re-routing and emergency landing decision support to pilots.

# Project

# **Flight Guardian**

#### Supply chain partnership

- The Great Circle Ltd
- University of Central Lancashire
- McLaren Applied Technologies (customer)

#### Contact

#### Adam Berrington – Director adam@thegreatcircle.co.uk

Flight Guardian is a first of a generation disruptive cockpit technology to improve the safety of aircraft. It uses body worn sensors and computing devices to act, in many respects, as a virtual co-pilot, providing a pilot with an extra pair of eyes to monitor the aircraft instruments, spotting and even predicting problems before they occur. It will produce warnings for the pilot and offer advice on a course of mitigating action to take to prevent accidents.

#### Project

# **GOCOM** - Ground **Operations Control** Monitoring

#### Supply chain partnership

- HW Communications Ltd
- NEDEAS Ltd
- Rinicom Ltd
- Airbus Operations Ltd (customer)
- Ultra Electronics Controls (customer)

#### Contact

#### Michael Szczygiel - Research Projects Manager mszczygiel@hwcomms.com

GO-COM is a collaborative R&D project to identify airport impact incidents between aircraft and external ground objects (aircraft, equipment and structures) using wireless sensor networks on board the aircraft. Its aim is to immediately alert airline maintenance and airport ground services that an impact has occurred: where, when and with what force. It will also provide visual evidence via airside cameras.



#### NATEP Grant

£149,790

# Project

# **Prometheus: Novel Hybrid Power Technology for** Aerospace

#### Supply chain partnership

- EU ECO Technology
- Innovation Works & Systems
- Blackburn College

# Stavros Kindylides - Technical Director

Passenger aircraft are becoming more electric in order to reduce fuel consumption and CO<sub>2</sub> emissions. Prometheus is a game changing technology, based on thermoelectric generators which are energy harvesting devices that can generate power from excess heat sources which exist on aircraft components such as engines, fuselage skin and cabin, Prometheus is a technology which will complement existing power sources and reduce directly operation costs on aircraft while increasing UK competitiveness.

NATEP Grant

£149,150



**NATEP** Grant

£149,926



NATEP Grant

£143,767



NATEP Grant

£126.800



 Cranfield University United Technologies Research Centre BAE Systems Contact

# skindylides@eu-eco.com



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# NATEP CASE STUDY

# NATEP project experience leads to SME support

Teer Coatings Ltd (TCL) has seen the benefits of NATEP funding and support. Now the Droitwich-based company is helping other SMEs see it for themselves.

TCL worked on three projects under NATEP and its Midlands-based predecessor, the Aerospace Technology Exploitation Programme (ATEP). Dr Kevin Cooke was involved in all of them.

TCL's first project, with ATEP support, was 'Forging tools using nano engineering (FORTUNE)', with Anopol as the other industry partner, University of Birmingham as the academic subcontractor and Rolls-Royce Inchinnan as end-user.

The company later teamed up with the tool-maker Kyocera-Unimerco on NATEP-funded projects to develop 'Dry drilling of aluminium alloys', with the University of Manchester and enduser Airbus; and 'Ultrasonic assisted machining of aerospace composites (USAMAC)', with the University of Warwick's Advanced Manufacturing Group and end-user BAE Systems. Some years ago, Cooke was recruited onto the Midlands Regional Advisory Panel (RAP), the committee of subject matter experts and regional alliance representatives which assesses project proposals, for his expertise in materials science. It's an industry network whose importance to SMEs was illustrated in the chain of events that led to the dry drilling project.

"It came about through a question to the MAA's technology manager, Peter Knight, at Farnborough from Colin Sharples of Kyocera-Unimerco," said Cooke. "Peter thought TCL might be able to help and called me. I was on the platform at Crewe station at the time. It all grew from there."

"I was impressed with the NATEP model – an SME can get help through the whole process from submission to prosecution." For SMEs such as TCL, ATEP/NATEP presented "a unique opportunity" to work with the likes of Rolls-Royce and Airbus as potential end-users and customers. "They allowed us to work on high-performance coatings for forging and forming tools, which played to our strength," said Dr Cooke.

A key factor, he added, was the help and insight the SMEs received from MAA's technical managers, first in defining their proposed projects and later in monitoring and reporting on progress to justify the funding. "The programme's strength is knowing how to portray and present things. Those at the coal face are often not best placed to do so."

Even so, unexpected outcomes are common, Cooke said. The FORTUNE project, for example, succeeded in developing a coated clipping tool that didn't need lubricating oil and thus eliminated a cleaning operation, but it could not quite match the performance of the traditional, lubricated process.

Cooke said the project was "positive and interesting [but] not directly transformative": TCL got a publication in the Journal of Physics D: Applied Physics out of it, a useful marketing aid, and Rolls-Royce gained new knowledge



NATEP collaborators Colin Sharples (left), Dr Kevin Cooke and Sue Field study the analysis of the coating thickness on a witness sample from the dry-drilling project.

about tool design and coatings. "The benefits of the project are in the industry."

Similarly, the USAMAC project's results proved the project had merit although it failed to produce a 'eureka' moment and has yet to be commercialised. The aim, said Cooke, was to improve the lifetime of tooling and reduce the thrust force needed to drill advanced composites, both advantages as aerospace manufacturers moves to more robotic machining.

Cooke was happy to join the Midlands RAP and remains a member with TCL's support. From a company perspective, he said, "it's great to see new problems, ideas and future collaboration possibilities while you're giving back to the industry.

"I was impressed with the NATEP model – an SME can get help through the whole process from submission to prosecution." he said. This, to his mind, compares favourably with other funding models that TCL had worked with which are more 'hands-off'.

"I could see where companies less experienced than us might struggle. The

RAP can offer advice on what they might have to think about for a realistic chance of success in their bid."

Industry participation is a cornerstone of NATEP. For an SME, having a representative on a RAP allows it to punch above its weight and helps raise its profile with primes and top tier contractors. Said Cooke: "The networking opportunities alone make it worthwhile."

#### Project

# Chrome Replacement Super Finish Technology

#### Supply chain partnership

- Hardide Coatings Ltd
- Perfect Bore Manufacturing
- Engis UK Ltd
- Impcross Ltd (customer)

#### Contact

#### Dr Yuri Zhuk – Technical Director yzhuk@hardide.com

Development of machining techniques to a chrome replacement coating applications on parts such as seal counter-bodies, erosion and high load bearings with complex geometries including internal bores.



NATEP Grant

£150,000

#### Project

# Temperature Indicating Paints for Aero Engines (TIPTOE)

#### Supply chain partnership

- Sensor Coating Systems Ltd
- Indestructible Paint Ltd
- MAN Diesel and Turbo (customer)

# Contact

#### Dr Jörg Feist – Managing Director jfeist@sensorcoatings.com

Thermal History Paint records temperature information by going through irreversible changes which can be detected nondestructively using specialised handheld read-out equipment. This project will support the development of the technology to demonstrate its applicability in aerospace engine development.

# Project

# Dry Drilling of Aluminium Alloys

#### Supply chain partnership

- Teer Coatings Ltd
- Kyocera Unimerco Tooling Itd
- Airbus (customer)

#### Contact

#### Dr Hailin Sun - R&D Technology Centre Manager hailin.sun@miba.com

Dry, in-situ drilling of aluminium alloys, with no significant loss of performance, will reduce costs while improving the work place environment. The project facilitates dry-drilling with newly designed tools exploiting the latest high performance solid lubricant coatings

#### Project

# Ultrasonic Assisted Machining of Aerospace Composites (USAMAC)

#### Supply chain partnership

- Teer Coatings Ltd
- Kyocera Unimerco Tooling Ltd
- BAE Systems (customer)

#### Contact

#### www.teercoatings.co.uk

USAMAC will demonstrate a new generation of drills, where tool design and state of the art coatings will enable the full benefits of ultrasonic assisted machining technology to be realised in the drilling of advanced composite stacks.



NATEP Grant

£122,500



NATEP Grant

£105,670



#### NATEP Grant

# £137,600



**NATEP Innovation Directory** 

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#### Project

# Wet Fit Slave Fasteners

#### Supply chain partnership

- Kwikbolt Ltd
- i2M
- Wesco Aircrafts (customer)
- GKN Aerospace (customer)
- Lockheed Martin Aeronautics (customer)

#### Contact

# Mr Jan Niklewicz – Technical Director jan@kwikbolt.com

The project will design and develop, in collaboration, new innovative wet fit slave fasteners to be used during composite aircraft assembly. Providing a more efficient and effective working environment as well as a more cost effective, environmentally friendly and reliable method of production.





#### Project

# Engineering Training Augmented Reality "ET-AR"

#### Supply chain partnership

- VR Simulation Systems Ltd
- Blue Flame Digital Ltd
- Wolverhampton University
- Rolls-Royce plc
- Stadco UK Ltd

#### Contact

#### Tim Luft – Director tim@vrsimulation.co.uk

VRSS propose the research, development and industrial trial of a new form of learning for the aerospace engineering/ manufacturing industry – combining Augmented Reality (AR) with a set of new AR glasses for intuitive point-of-need training and knowledge.

#### Project

# Slave Fasteners for Automation

#### Supply chain partnership

- Kwikbolt Ltd
  i2M
- Wesco Aircraft (customer)

#### Contact

#### Dean Carran – Operations Director dean@kwikbolt.com

To align with the future of aerospace manufacture this project aims to design and develop single sided temporary fasteners and their interfaces suitable for fully automated aerospace assembly processes.

# Project

# **Triaging through NDT**

#### Supply chain partnership

- Theta Technologies
- Manufacturing Technology Centre
- Rolls-Royce plc

#### Contact

#### Julian Wright – Managing Director j.wright@thetatech.co.uk

This project will investigate a novel nonlinear acoustic non-destructive testing (NDT) method for instant triaging of defective metal components in automated real-time go/no-go decision making. The state-of-the-art is too slow and too expensive for commercial applications but without NATEP funding this will remain an academic technology curiosity and industry will not benefit from the anticipated reduction in inspection times.

#### Project

# Next Generation Single Crystal Helix

#### Supply chain partnership

- Investment Casting Systems Ltd
- C&M Mould Tools Ltd
- Resinex UK Ltd
- Rolls-Royce (Precision Casting Foundry) (customer)

#### Contact

#### Mike Sloan – Director msloan@technicalcomposites.co.uk

Design and production of an innovative feature which will increase the production yield of the casting process for single crystal turbine blades & structures.



NATEP Grant

£140,000



NATEP Grant

# £150,000



NATEP Grant

£145,100



#### NATEP Grant

# £142,600

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# NATEP

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Project

# Machine Connectivity & Manufacturing Intelligence

#### Supply chain partnership

- · ATS UK
- Hitex Ltd
- Arrowsmith Engineering (Coventry) Ltd (customer)

#### Contact

# Martin Kelman – Senior MES Consultant martin.kelman@ats-global.com

The project will create a highly cost effective Machine Connectivity Module (MCM) which connects and monitors manufacturing processes using the latest technology in the fields of; embedded sensors, wi-fi communications and android based data processing & display platforms





# Hot spot heat detection system

#### Supply chain partnership

- Photon Fire Limited
- Leigh Speciality Cables
- Meggitt plc (customer)

#### Contact

#### **Bill Shepherd - Managing Director** Bill.Shepherd@PhotonFire.com

Development of an in-flight temperature monitoring system for aircraft - that localises hot-spots before an emergency incident occurs.

# Project **Thermoplastic Encapsulated**

# **Embedded Power** Modules (TEE-P)

#### Supply chain partnership

- Tribus-D Ltd Ultrawise Innovation Ltd
- Leonardo MW Ltd

#### Contact

#### info@tribus-d.uk

Assembly processes for the power electronics modules are critical for efficiency, size, weight and costs. This project will maximise thermal dissipation and minimise circuit parasitics through advanced interconnection and device encapsulation techniques



#### NATEP Grant

# £37,200



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#### Project

# **BASELINE - Rapid** Machine Tool Verification

#### Supply chain partnership

- Insphere Ltd
- Hexagon Manufacturing Intelligence (UK) Ltd
- Nuclear Advanced Manufacturing **Research Centre**
- Rolls-Royce plc

#### Contact

#### Ben Adeline - Chief Executive ben@insphereltd.com

The Baseline project will develop a solution for rapid verification of large volume machine tools. The outcome of this will be to improve machining processes, reducing scrap and improving machine uptime.



#### NATEP Grant

£107.790

#### Project

# **Airborne Software Capacity (ASC)**

#### Supply chain partnership

- Rapita Systems Ltd
- Altran UK Ltd
- Rolls-Royce plc GE Aviation Systems
- BAE Systems

#### Contact

#### Ian Broster – General Manager ianb@rapitasystems.com

"Airborne software capacity" will allow more functionality to be used in embedded aerospace systems such as jet engines by using advanced analysis for the capacity calculations of safety-critical software on single and multi-core hardware.

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# NATEP Grant

# £150,000

#### NATEP Grant

£85,480

# NATE

# Time

#### Project

# **Visual Inventory Optimisation Software**

#### Supply chain partnership

- Consult Avila
- CANDA Systems
- RLC Engineering (customer)

#### Contact

#### Dudley Wood - Director dudley.wood@consultavila.com

This project will:

Develop a visual management software tool to optimise inventory levels based on a proven best practice methodology, including data visualisation and active & dynamic inventory planning and control, segmentation, mapping, trend analysis, alerting, root-cause analysis and forecasting. This software will be supported by an inventory management and control e-learning package and will be delivered via cloud technology.





# NATEP CASE STUDY

# **Rapid tool verification aids** precision manufacturing

A rapid machine tool verification system that promises big gains in efficiency for precision manufacturing has had its inaugural launch less than two years after it received the backing of NATEP.

The BASELINE system, developed by project lead INSPHERE Ltd with partners Hexagon Manufacturing Intelligence, the Nuclear Advanced Manufacturing Research Centre (AMRC) and enduser Rolls-Royce, reduces machine downtime and material waste. The technology is designed to provide full verification of a large machine tool in less than an hour, making it easier to conduct frequent checks and maintain the machine's accuracy and consistency

Guests at the launch event on 21 March at the Nuclear Advanced Manufacturing Research Centre (AMRC) in Sheffield heard how BASELINE takes the concept of Industry 4.0 a step closer to realisation. BASELINE uses a laser tracker within the machine tool to produce clear, actionable data that

gives deeper insights into machine performance and supports a schedule of predictive maintenance – a move towards true digital manufacturing using machine learning, which lies at the heart of i4.0.

Ben Adeline, chief executive of Bristolbased INSPHERE, said his company's focus is on generating measurement data that can be used to enhance

# "NATEP gave us the breathing space and funding to develop new IP and products."

manufacturing processes. "A lot of manufacturers tend to check parts after they're made," he said. "We turn that on its head and check the manufacturing process to make sure it's right to produce the parts in the first place."

Large machine tools, which are traditionally used to produce precision parts for aerospace and other highvalue industries, are susceptible to mechanical and kinematic problems, because of their size. Traditionally

verification is costly, specialised work that takes a machine out of production for several days.

INSPHERE saw a gap in the market for a reliable, rapid system that would enable manufacturers to verify machine performance themselves. "We wanted to empower them to run their own checks in a shorter timeframe," said Adeline. "If you can do more frequent checks, you get a better body of evidence or data to see how the machine performs over time. You can identify trends and make informed decisions about routine maintenance cycles.'

Adeline said customer demand inspired the idea. "It's rare," he said, "to find both measurement and machine tool expertise in-house. Typically, a manufacturer would have an annual check by a specialist using lasers and interferometers - a procedure that could take days."

With the BASELINE system, the tool operators or maintenance partners can do the same checks more frequently.

Said Adeline: "We took a commercial off-the-shelf laser tracker - well-tested and proven technology - combined it with new software so it could be used in



INSPHERE engineers brief guests at the Sheffield launch of the BASELINE system before demonstrating the system's use of a wide-angle retroreflector (top) to reflect the laser beam back to the tracker (middle) from the tool centre point on the machine.

a user-friendly manner in machine tool verification."

Since its launch, BASELINE has received expressions of interest from across UK industry; the system holds appeal in sectors including aerospace, automotive, nuclear and oil and gas where reduced machine downtime for verification will have benefits in output, productivity and competitiveness. It also promises environmental benefits through a reduction in scrap, lowering the use of both materials and energy.

Adeline says his main focus for the next 12 months is to establish the technology in the UK before looking to export markets. He hopes to take it worldwide in due course.

INSPHERE has already expanded to 10 employees and plans to employ more people as its growth accelerates. The new roles will range from application and software engineering to sales and customer support functions.

Adeline credits NATEP with providing support when it was needed. "For

a small business, it's hard to strike a balance between generating commercial revenue and dedicating time to R&D," he said. "NATEP gave us the breathing space and funding to develop new IP and products.

"By exploring this idea through NATEP funding, we've had a chance to look at variants of the technology, for example applying it to automation systems as well. Now we have a fairly well-defined product portfolio that we can plan on implementing."



# asureSign Aero

#### Supply chain partnership

- Test and Verification Systems Ltd
- University of Bristol
- Rolls-Royce plc (customer)

#### Contact

#### Dr Michael Bartley – CEO mike@testandverification.com

The funding supports the development of a tool (asureSign™) to support Requirements Based Verification for DO-178 & DO-254 compliance in aerospace software and hardware development. Both standards mandate that developers demonstrate key safety requirements have been fully tested and that test coverage targets have been met.

#### Project

# **Supply Chain Excellence Data** Streamlining (SCEDS)

#### Supply chain partnership

- Prion Cutting Edge
- Rule IQ
- Assystem UK Ltd (customer)

#### Contact

#### cuttingedge.co.uk

NATEP Grant

£150,000

SCEDS is the new affordable technology platform that shares aerospace project data, which is centrally located and secure, with an extended supply chain (SMEs), reducing the risk of costly design and manufacturing mistakes

# Project

# **Plane Sight**

#### Supply chain partnership

- Blue Bear Systems Research
- Createc
- General Dynamics UK (customer)

#### Contact

#### **Gavin Goudie** gavin@bbsr.co.uk

Each year hundreds of aircraft are damaged during ground manoeuvre due to limited view of the operator/pilot when manoeuvring a large dynamic system within a complex and cluttered environment. Blue Bear Systems Research (BB), Createc and General Dynamics (GDUK) have teamed together to develop a novel situational awareness avionic system for commercial aircraft.



#### **NATEP** Grant

£92,000

# Project

# Valuechain.com -connecting the **Aerospace Supply** Chains

#### Supply chain partnership

- Valuechain.com
- Techni Grind Machining
- Hyde Coatings Ltd
- Alcoa (formerly RTI Forming) (customer)

#### Contact

#### Tom Dawes - Director tdawes@valuechain.com

The Valuechain.com project provides multi-tier connectivity and visibility within the aerospace supply chain through an integrated cloud-based collaborative platform to streamline inter-company operations and develop competitive high value manufacturing extended enterprises.



# NATEP Grant

# £150.000

#### Project

# Aerospacespecialprocesses.com

#### Supply chain partnership

- Valuechain.com Ltd
- Stainless Plating Ltd Blackprint Ltd t/a "Alloy Heat
- Treatments"
- Bombardier (customer)

#### Contact

#### Tom Dawes - Director tdawes@valuechain.com

Aerospacespecialprocesses.com is a cloud-based platform which aims to develop a collaborative on-line platform that streamlines communication between aerospace manufacturers and special process houses by optimising complex planning variables, sharing 2-way information with customers and co-operative partners and consolidated logistics planner providing intuitive decision support to improve service levels, productivity and therefore increase the competitiveness of aerospace special process houses.



# NATEP Grant £150,000

#### NATEP Innovation Directory

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NATEP Grant

£67,200

# ΝΑΤΕ

#### Project

# Collaborative Knowledge **Management for Aerospace Operations** Improvement

#### Supply chain partnership

- Agile Business Improvement Ltd
- Pentangle Internet Ltd
- Gardner Group Ltd (customer)
- Unilathe (customer)
- Packaging Automation (customer)
- Clwvd Compounders (customer)

#### Contact

#### support@redthorn.com

The development and deployment of persuasive technology (captology) to drive behavioural and cultural change supported by an innovative cloud-based collaborative problem solving platform to support UK aerospace supply chain companies disseminate best practice and embed standardised continuous improvement solutions. This is further supported by utilising semantic search capability and access to a shared collaborative knowledge repository with the aid of industry experts.



#### Project

# **Hands Free Inspection** Interface

#### Supply chain partnership

- Muretex Ltd
- University of Coventry
- Cranfield Aerospace (customer)
- Rolls-Royce plc (customer)

#### Contact

#### Dr J T Platts - Managing Director jtplatts@muretex.com

This project will develop an infrastructure and delivery system based on an optical head mounted display to reduce both the inspection time and the burden placed on inspection staff.

#### Project

# **ROCA: RapiTime Object Code Analyser**

#### Supply chain partnership

- Rapita Systems Ltd
  - University of York
  - Rolls-Royce plc (customer)
  - Airbus Defence and Space Madrid (customer)

#### Contact

#### Ian Broster – General Manager ianb@rapitasystems.com

ROCA is a collaboration between Rapita Systems and the University of York, developing the next generation of software verification tools to reduce the cost and effort for current and future aerospace industry needs.

# Project

# **Creating an Understanding of ILS Specifications**

#### Supply chain partnership

- Aspect Supportability Consultants RTP-UK Ltd
- Showcase Graphics
- UK Council for Electronic Business (customer)

#### Contact

#### Mark Williams - Head of Operations (ILS) mwilliams@rtp-uk.com

Aspect and RTP Ltd investigated the transition and migration complex legacy data sets into the new S3000L Logistic Support standard

#### Project

# **Proof of Systems** Assurance & Certification

#### Supply chain partnership

- D-RisQ Ltd
- Abstract Solutions Ltd
- GE Aerospace (customer)

#### Contact

#### Nick Tudor - Business Director nit@drisg.com

This project seeks to provide an automated, highly assured, systems design analysis capability tool which will enable faster and more cost effective development of constantly evolving complex systems for aerospace and other associated markets.

#### Project

# **Automated Testing of SPARK Ada Contracts** (AUTOSAC)

# Supply chain partnership

- Altran UK Ltd
- University of Oxford Rapita Systems Ltd
- MBDA UK Ltd (customer)
- Rolls-Royce plc (customer)

#### Contact

#### Stuart Matthews - SPARK development team manager stuart.matthews@altran.com

Software verification is an expensive and time consuming activity. In this project, Altran, University of Oxford and Rapita will combine SPARK specifications with automatic test vector and test harness generation thus reducing cost, risk and timescales for verification of aerospace software.



#### **NATEP** Grant

£73.800

60



NATEP Grant

# £150,000



NATEP Grant

£149,750

# NATEP Grant

# £75,000

NATEP Grant

£150,000



#### Project

# **AssystMe**

#### Supply chain partnership

- Assystem UK Limited
- Mosquito Digital Limited
- Spirit AeroSystems
- Airbus (customer)

#### Contact

#### www.assystem.com

The AssystMe tool is a portable, SMART tool that can be applied in a manufacturing environment to increase quality and reduce cost of nonconformance. Providing route cause analysis and manufacturing process trends in a closed-loop solution, it reduces concessions and repairs utilising the engineering skills from Assystem.





#### Project

# **Process Control** Software Tool [PCST]

#### Supply chain partnership

- Line Business Services
- Amfax Ltd
- Cobham Mission Systems (customer)

#### Contact

#### www.linebsl.com

This project will develop a new process control tool targeted at SMEs which will help ensure that agreed processes are followed systematically, consistently and transparently within projects to support the completion of manufacturing and development projects to agreed quality, time and budget parameters

#### Project

# **BOXARR – Supply Chain Risk Analysis**

#### Supply chain partnership

- BOXARR Ltd I3 Works
- Airbus (customer)

#### Contact

#### Alasdair Pettigrew - CEO Alasdair.pettigrew@BOXARRplanning.com

The project is developing an automated supply chain risk alert system- further strengthening BOXARR's industry leading supply chain modelling, analysis and optimisation solution

# Project

# SafePilot Weather Watch

#### Supply chain partnership

- Blue Bear
- Met Office
- Hybrid Air Vehicles (customer)
- e-Go (customer)

#### Contact

#### Andrew Berry andrew.berry@bbsr.co.uk

SafePilot Weather Watch is an electronic decision aid for manned aircraft (and an automated planning tool for unmanned aircraft) that enhances tactical and strategic route planning to make operations safer and more fuel efficient

#### Project

# **Aeroelastic CFD** Manoeuvres Toolkit

#### Supply chain partnership

- Stirling Dynamics
- MSC Software
- BAE Systems

#### Contact

Dr Simon Hancock - Research & **Development Manager** simon.hancock@stirling-dynamics.com

The project will develop an innovative toolkit which will couple CFD aero loads with aeroelastic finite element models to predict more accurate gust and manoeuvre loads.





£100,130

#### NATEP Grant

# £150,000



NATEP Grant

£95,000



Image provided courtesy of BAE Systems

**NATEP Grant** 

# £150,000

# ΝΑΤΕ



Project

# **EyeQuad-T (Miniature** Thermal/Optical **Camera for UAV/UAS)**

#### Supply chain partnership

- Rinicom Limited
- HW Communications
- Eurocontrol (customer)
- THALES (customer)
- Trimvale Aviation (customer)
- German Aerospace Centre (DLR) (customer)
- ALTUS (customer)

#### Contact

#### Natasha McCrone - Project Manager natasha@rinicom.com

The overall objective of the project is to produce a small, lightweight imaging system with pan, tilt and zoom functionality that captures optical and thermal video. The miniature camera will be able to support surveillance operations from small Unmanned Autonomous Systems; potentially presenting a high market value, applicable to the robotics, security and defence markets. This is an opportunity to deliver the operational capabilities of more automated and intelligent Unmanned Autonomous Systems, through a novel offer in the area of on-board surveillance. EveQuad-T will deliver enhanced capability to build basic situational awareness and detection that is essential for decision-making.



# NATEP CASE STUDY

# **Counter-UAV system takes** video analytics to new level

The forced closure of Gatwick's air space in December 2018 dramatically drove home the issue of roque unmanned aerial vehicles (UAVs) or drones that has long perplexed authorities whose job is ensuring public safety and security.

Their first challenge, before considering the myriad approaches to removing the intruders, is to accurately and reliably identify UAVs at distance.

This was the focus of a NATEP-supported project called 'Detection, Neutralisation and Investigation (DeNI) of Threat UAVs', which has been successfully commercialised as SkyPatriot.

Lancashire-based Rinicom (through its sister company RNC Avionics) led the NATEP project, with industry partner Saher UK, a technology company specialising in security applications. West Yorkshire Police (WYP). Eurocontrol, the Police National Legal Database (PNLD) and Airbus Defence and Space were the end-users.

Having found existing counter-UAV systems expensive and unreliable, the DeNI project partners set out to develop a camera-based system to automatically detect the presence of a UAV at a distance of 500m using video analytic software developed by RNC Avionics.

Their approach involved enhancing existing dual optical and video pan-tiltzoom (Duplex PTZ) camera capability to include a novel detection. classification and tracking module. This would enable police and relevant authorities to apply the appropriate counter-measures to neutralise the UAV, and support them in identifying and prosecuting the perpetrator.

Project manager Søren Udby said the team faced several challenges, ranging from distinguishing birds from UAVs at great distance to the variety of potential operating





environments and their legal and regulatory considerations.

Like most projects, DeNI evolved during its development phase. The initial focus was on the technical challenges of using cameras to accurately identify a distant UAV, which hadn't been done up to that time.

"The engineering and technical teams had to define what made a bird different to a UAV at 500m when it is essentially just a dot of 2-3 pixels on a screen," said Søren. "RNC Avionics had worked previously on another NATEP project related to cameras on UAVs, and some of the lessons learned from this project were applicable to DeNI.

"The initial results and findings led the engineers and the technical lead to think of new methods to improve the performance and 'prowess' of the system, which led to the final system exceeding the initial expectations."

One substantial change to the original concept was the exclusion early in

the project's life of any 'neutralisation' technologies as part of the system development. After consulting with the

# "DeNI became a well-rounded solution because of the successful collaboration between all partners."

police and Home Office technologists, they concluded 'shooting down' a UAV by any of several methods studied would be legally irresponsible and potentially dangerous to the public.

Commercially, the major challenge was to convince potential end-users that SkyPatriot was a serious alternative to million-pound radar installations. Authorities in Southeast Asia and the Middle East were guick off the mark, recognising the product's potential as soon as they saw it, Søren said. European interest followed; Gatwick's UAV-related headaches brought a deluge of enquiries from major airports anxious to prevent something similar happening to them.

SkyPatriot is currently in operation in the UK and a number of on-going projects and opportunities around the world are being pursued. The largest SkyPatriot installation to date, at a major European international airport, is expected to be fully operational in 2019.

Looking ahead, Søren said development is focused on increasing the detection range - currently about 1,200m - and

SkyPatriot with RF installation

processing speed to improve the software's capability, such as its ability to detect multiple UAVs simultaneously, and to communicate with the appropriate authorities.

Rinicom has also started a new collaboration with DeNI partner Saher UK assisted by counter-terrorism experts, to train people interested in learning how to address UAV threats in general.

Spin-off projects have taken DeNI beyond aerospace. "The software that detects drones can detect a lot of other things too," said Søren. "One project related to maritime management of ships and containers is guite successful.





This and other products have the same foundation: they come from the same root of video analysis."

Researchers are even looking into possible underwater applications, he added.

"DeNI became a well-rounded solution because of the successful collaboration between all partners that would not have been possible without the support of NATEP," said Søren.

"NATEP provided support to the project by ensuring that the team addressed all angles of the project towards a successful outcome."



# **Risk Aware Mission** Planning (RAMP)

#### Supply chain partnership

- TEKEVER Ltd
- ROTRON Power Ltd
- Sovereign Global (UK) Ltd (customer)
- European Maritime Safety Agency, Lisbon (customer)

#### Contact

#### Paul Webb - Managing Director paul.webb@tekever.com

UAV market as applied to Search & Rescue, civil surveillance, environmental monitoring. Maritime vessels, land systems, planetary rovers.



NATEP Grant

£150,000

#### Project

# **Detection**. **Neutralisation and Investigation of Threat UAVs (DeNI of Threat** UAVs)

#### Supply chain partnership

- RNC Avionics Ltd Saher (UK)
- West Yorkshire Police (customer)
- Eurocontrol (customer)
- PNLD (customer)
- Airbus DS Ltd (customer)

#### Contact

#### Natasha McCrone - Project Manager natasha@rinicom.com

The overall objective of the project is to develop and implement a scalable system capable of detecting, neutralising and investigating threat UAVs. The existing Duplex PTZ (dual optical and video) will be enhanced to include a novel detection, classification and tracking module enabling the police and relevant authorities to apply the appropriate countermeasures to neutralise the UAV and a framework of operational and legislative procedures will be implemented to support all high risk scenarios with the aim of identifying and prosecuting the perpetrator.

# NATEP Grant

# £150,000

# Project

# **Heavy Fuel for UAVs**

Supply chain partnership

- Rotron Group
- General Engine Management Systems
- CybAero (customer)

#### Contact

#### Alex Head - Group Technical Director alex.head@giloindustriesgroup.com

This project is to research and develop novel methods for employing heavy fuels in high specification UAV rotary engines. If successful, the project will completely alter the market's perception of this engine category.



#### NATEP Grant

# £150,000

#### Project

# **SkyBike**

#### Supply chain partnership

- Skybike International Ltd
- Bit Parallel Ltd
- Embedded Logic Ltd
- BASF plc

#### Contact

#### Gilo Cardozo - Chief Technical Officer gilo@giloindustriesgroup.com

This project will work to develop a UAV platform with crop spraying capabilities. It will explore flight control systems and location integration with an experimental VTOL design.

#### Project

# **UAV Engine Durability**

#### Supply chain partnership

- - A&M EDM
  - Boeing (customer)

#### Contact

#### Alex Head - Technical Director alex.head@giloindustriesgroup.com

NATEP Grant

£150,000

This project has been devised to research novel methods for extending the flying durability of UAV rotary engines to a target of 1000 hours of Time Between Overhaul (TBO)



Rotron Power



#### Project

# **SPARCS Rotary Engine**

#### Supply chain partnership

- Advanced Innovative Engineering (UK) Ltd
- Vortex Exhaust Technology Ltd
- Aero Composites Innovations, France (customer)

#### Contact

#### Nathan Bailey - Managing Director nathan@aieuk.com

Design, development and testing of a SPARCS (Self-Pressurised-Air Rotor Cooling System) enabled rotary engine propulsion system for Unmanned Aerial Vehicles.





**NATEP** Grant



£130,000

#### Project

# **Hybrid Aircraft Thrust-Vectoring Propulsion** System

#### Supply chain partnership

- V-TOL Technologies
- Flow HD
- Beagle Technology Group Ltd
- Scotia Gas Networks (customer)

#### Contact

#### Ashley Bryant - Managing & Technical Director ashley.bryant@vtol-tecnologies.com

This project will directly support the development of an optimised thrustvectoring propulsion system targeted at delivering Beyond Visual Line Of Sight capabilities for the inspection of network industry based assets and infrastructure using a breakthrough Remotely Piloted Aerial System [RPAS] VTOL aircraft concept.



#### **NATEP** Grant

# £150.000

#### Project

# Hoversafe

#### Supply chain partnership

- Autonomous Technologies Limited
- Snelflight Limited Newcastle University School
- of Agriculture, Food and Rural Development (customer)
- West Midlands Fire Service (customer)

#### Contact

#### Nick Gillett nick.gillett@hoversafe.co.uk

NATEP Grant

£150,000

Hoversafe is a reliable, inexpensive UAS that anyone can fly safely. It's being designed and built in the North East and is a Great British product.

# Project

# **Small Rotary Engine Technologies**

#### Supply chain partnership

- A&M EDM Ltd
- Techteam Development LLP
- ASNU Corporation Europe Ltd
- UAV customer

NATEP Grant

£95,000

#### Contact

#### Tim Shires - Design Engineer tim@amedm.co.uk

Development of an innovative aerospace standard engine architecture to support production of small multi-fuel operation power units specifically aimed at the unmanned air vehicle (UAV) market.

#### Project

# **Advanced UAV** Thermal Imaging and

# **Video Analytics for** Search and Rescue **Missions (TIVA)**

#### Supply chain partnership

- Remvox Limited
- RNC-Avionics Ltd
- Lancashire Fire & Rescue (customer)

#### Contact

#### Steve Pearson - CEO Remvox Ltd steve@remvox.co

The overall objective of the project is to develop and implement an allencompassing system to aid search and rescue missions by automatically detecting body heat through the video analytics of thermal imaging and the incorporation of the analytics results in conjunction with the on-board navigation system to deploy resources directly to area of high potential for rescue/retrieval of personnel.



#### NATEP Grant

# £150.000

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