



The Ohio Aerospace Institute





INTERNATIONAL
TRADE
ADMINISTRATION

Welcome

PJ Menner, Commercial Specialist, U.S. Embassy, London

Paul (PJ) Menner has been a Commercial Specialist for the defense and aerospace sectors at the U.S. Embassy, London since July 2013. He graduated from Miami University, Ohio in 1988 with a BA in Political Science. After graduation, he was commissioned an Ensign in the U.S. Navy and qualified as a naval aviator. He spent 10 years on active duty as a helicopter pilot, during which time he participated in Operation Desert Storm and numerous other operations. He served as a Detachment Officer-in-Charge and qualified as a Combat Information Center Watch Officer. He flew over 2,000 hours and was a maintenance test pilot, standardization pilot and flight instructor.

After leaving active service in 1998, Menner continued to serve in the U.S. Navy Reserve and qualified as a commercial airline pilot, accruing in excess of 4,000 flying hours on numerous different types of multi-engine passenger aircraft for Skywest Airlines, Continental Airlines and United Airlines.

While serving in the U.S. Navy Reserve between 2002 and 2003, PJ Menner was the Joint Operations Center Executive Officer at the U.S. European Command. In 2005 he served as the U.S. Naval Forces Europe director of the Navy Maritime Partnership Program. In 2008 he served as the Assistant Naval Programs Officer in the Office of Defense Cooperation, London. In September 2008 he also deployed with the U.S. European Command to Tbilisi, Georgia and served as the Plans and Policy Officer to assess the capability of the Georgian armed forces.

Between October 2009 and June 2013 Menner worked for the Defense Contract Management Agency, Northern Europe, as a management and program analyst.



AEROSPACE, DEFENSE AND SPACE OPPORTUNITIES IN THE UK



INTERNATIONAL
TRADE
ADMINISTRATION



PJ Menner, U.S. Commercial Service UK



@Export2Europe
#Export2Europe



MIND THE GAP





Global Aerospace Market

- Of all revenue generated in the global aerospace and defense industry, the U.S. generates 60% of the revenue and Europe generates 35% leaving the rest of the world a 5% share.
- The UK is one of the single largest aerospace markets in the world outside of the U.S.



UK Aerospace Market

- UK aerospace sector has an annual turnover of approximately \$45 billion.
- The UK does not produce any large civil aircraft and 95 percent of aerospace output is exported.
- The UK has a reputation as a center of excellence for the design and production of aerostructures, aircraft propulsion, aircraft systems, aircraft interiors and through-life services.
- The UK has a large MRO sector, servicing the huge numbers of military and civil aircraft that fly through and from the UK every year.



- The UK has a highly-developed and competitive aerospace industry in which more than 3,000 aerospace companies operate.
- There are multiple OEMs in the UK aerospace supply chain, namely Rolls-Royce, Airbus, Leonardo and BAE Systems. There are many U.S. OEMs in the UK as well.
- Major players include Moog, GKN, Spirit, Meggitt, Marshall Aerospace, Honeywell, Safran, and Teledyne.
- There are 100 to 200 Tier 2 companies including Ultra Electronics, Firth Rixson, Gardner Aerospace and RLC Group.
- There are over 800 Tier 3 companies.

Disruption...

The impact of the disruption to the commercial aerospace sector has been significant and the road to recovery will be lengthy.





Becoming a supplier in Europe

On Babcock Internationals website it states:

“Becoming a supplier to Babcock - Can you do something better than a current supplier?”

And

“Based on our customer requirements, Babcock are interested in speaking to suppliers who help us to reduce the overall costs for our customers and who work with us in delivering innovative new solutions and external best practice.”



A crowded market. Where will you fit into the supply chain?

UK and European primes continue to decrease their number of suppliers, preferring to work with a handful of major tier 1 partners and referring all other potential suppliers to its supply chain at the appropriate level.

While it's possible to supply at an OEM level, getting access to the supply chain on the first, second or third tier should be faster.

The overall best prospect is through new equipment development or an increase in demand by the OEM.



A crowded market continued

Not an easy to process to determine where you fit in the supply chain and where you might have the best opportunity to succeed. Do your homework!

The Commercial Service has an extensive list of companies involved in the aerospace & defense industry and a list of events that create opportunities.

Entering the European market requires a long-term approach.



Best prospects for the commercial UK Aerospace Market

Develop new innovative technologies that meet the customer's requirements.

- Engines
- Wings and Aero Structures
- Electrical Sensing & Controls
- Fuel Systems
- Hydraulics
- Motion Control

Best prospects for the UK Defense Market

- Full spectrum, multidomain ISR.
- Multidomain command and control.
- Technology to compete against adversaries below the threshold of conventional conflict.
- Technology to target adversaries in new ways across all domains.
- Generate affordable capabilities that can address evolving threats and can operate within a denied electromagnetic environment.

The MOD's Defence and Security Accelerator

UK Space Sector

Ambitious agenda!

- Skynet 6 satellite telecommunications program
- 4 primary segments of the commercial space:
 - Space Applications (71%)
 - Space Operations (13%)
 - Space Manufacturing (12%)
 - Auxiliary Services (4%)
- 6 commercial launch sites planned
- Technology Safeguards Agreement signed in June 2020
- Spaceflight licenses now being issued

Market Entry Strategy

How will you develop your market entry strategy?

- Direct sales?
- Collaborative Partner Search?
- Manufacturer's Representative or Consultant?
- Distributor?
- Conferences & Trade shows?



European Industry Events

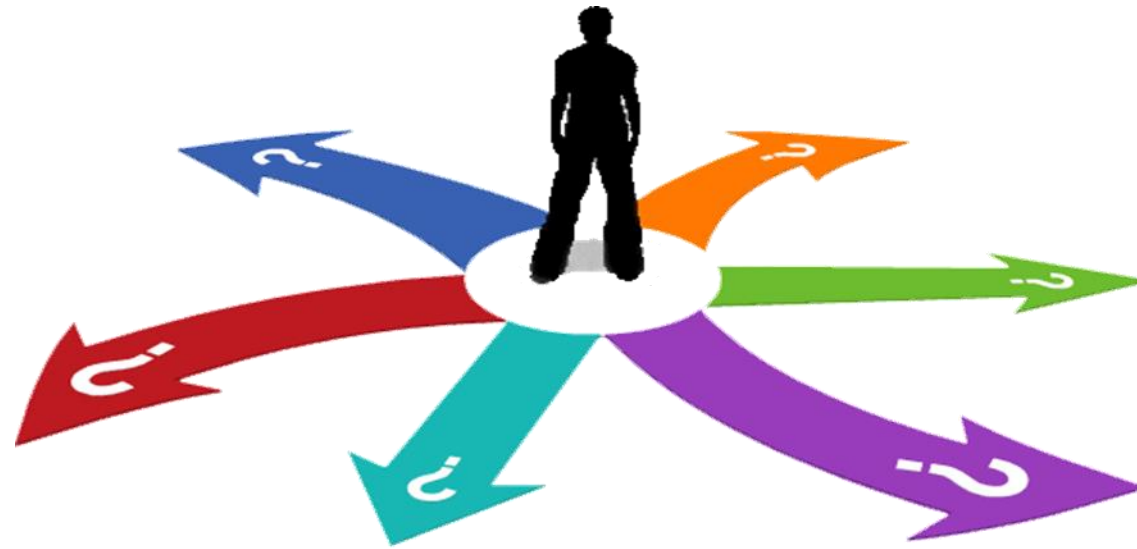
- There is an event for all aspects of aerospace & defense
- There are numerous events for everything
- Participating at events is expensive
- You need to participate!



Best European Aerospace & Defense Events?

- Events that focus on B2B meetings
- Events that guarantee pre-arranged meetings
- Events that are focused on networking

Crossroads



PJ Menner
U.S. Commercial Service UK
pj.menner@trade.gov

Bob Dirgo, Senior Program Manager, Ohio Aerospace Institute

Bob Dirgo has more than 36 years' experience in the aerospace industry working for Meggitt. He has held a number of roles within Meggitt over his career in the operations organization.

He has been the Director of Quality, Director of Continuous Improvement and the Director of Strategic Innovation.

He has a bachelor's degree in Mechanical Engineering, a Master's Degree in Statistics and has done PhD work in Operations Research at Case Western Reserve University.

Dirgo is an American Society of Quality certified Six Sigma Black Belt, Quality Engineer and Quality Auditor, certified Lean Manufacturing Practitioner, and certified Innovation Engineering Blue Belt from the Eureka Ranch.

He has published two books; a business management book entitled "Look Forward Beyond Lean and Six Sigma" and a self-help book entitled "How I Reversed My Hashimotos Thyroiditis."

He has worked at the Ohio Aerospace Institute since 2020.



Update on Aerospace Trends

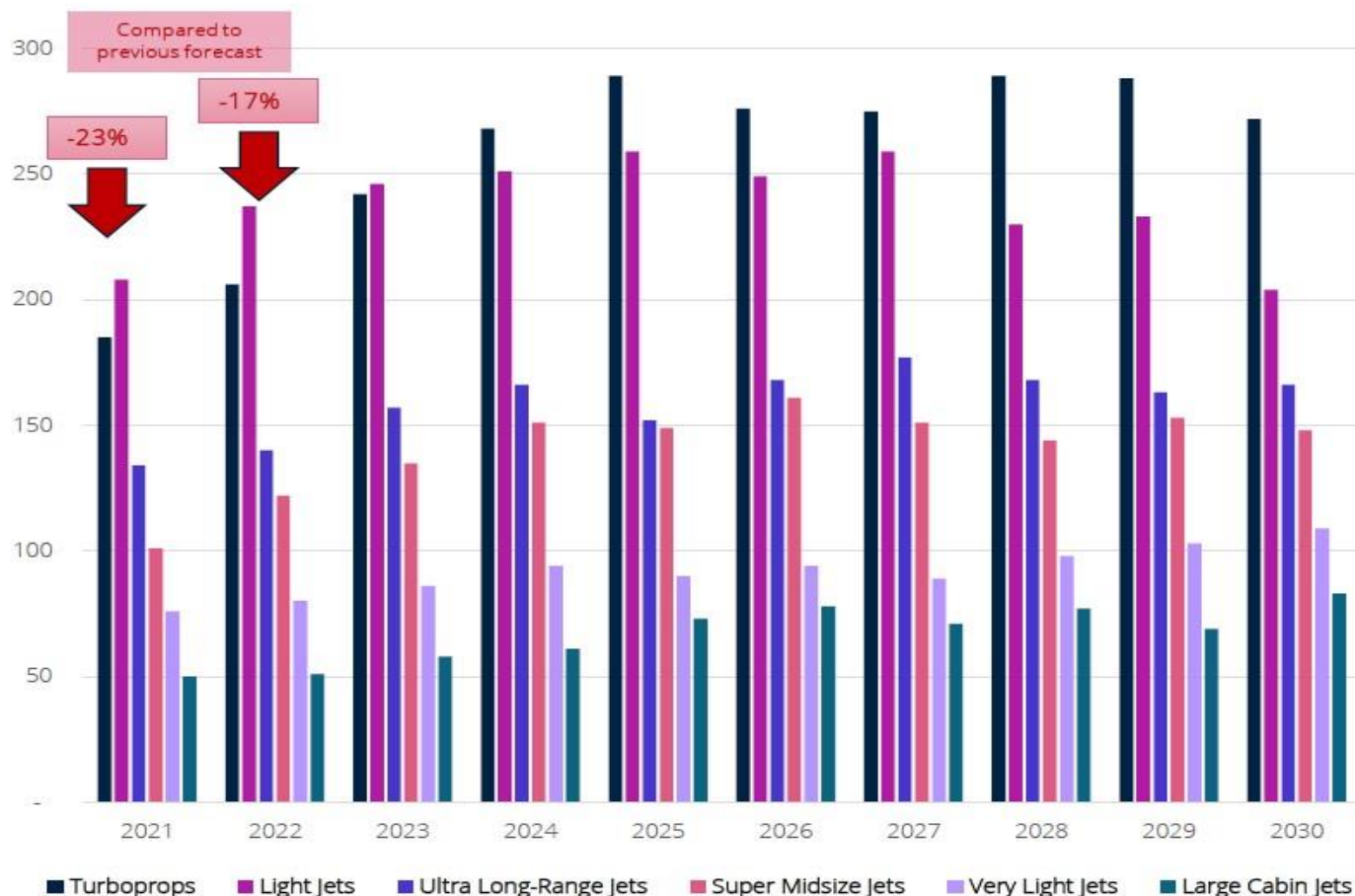
US Suppliers Perspective

Presented By: Bob Dirgo

The Aerospace Supply Chain Current Outlook

Business Aviation New Aircraft Deliveries

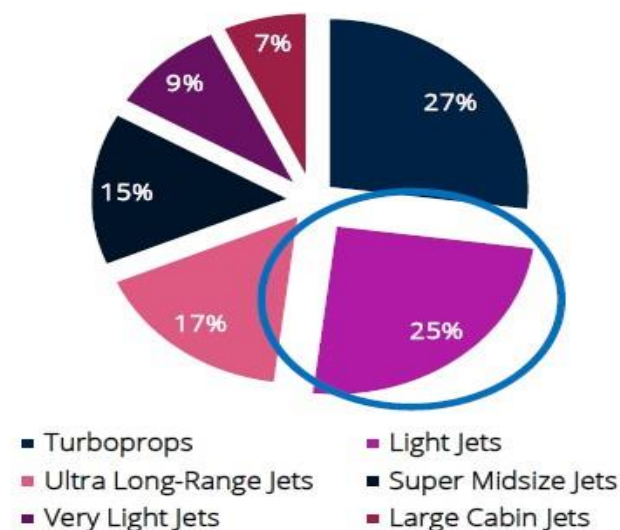
Forecast deliveries 2021-30 forecast



Highlights

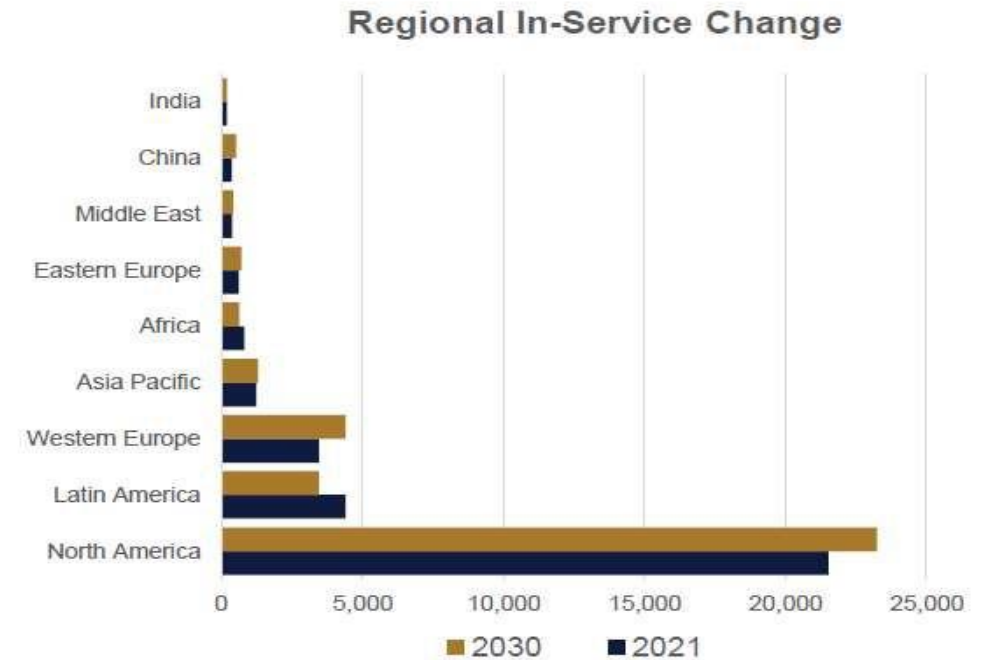
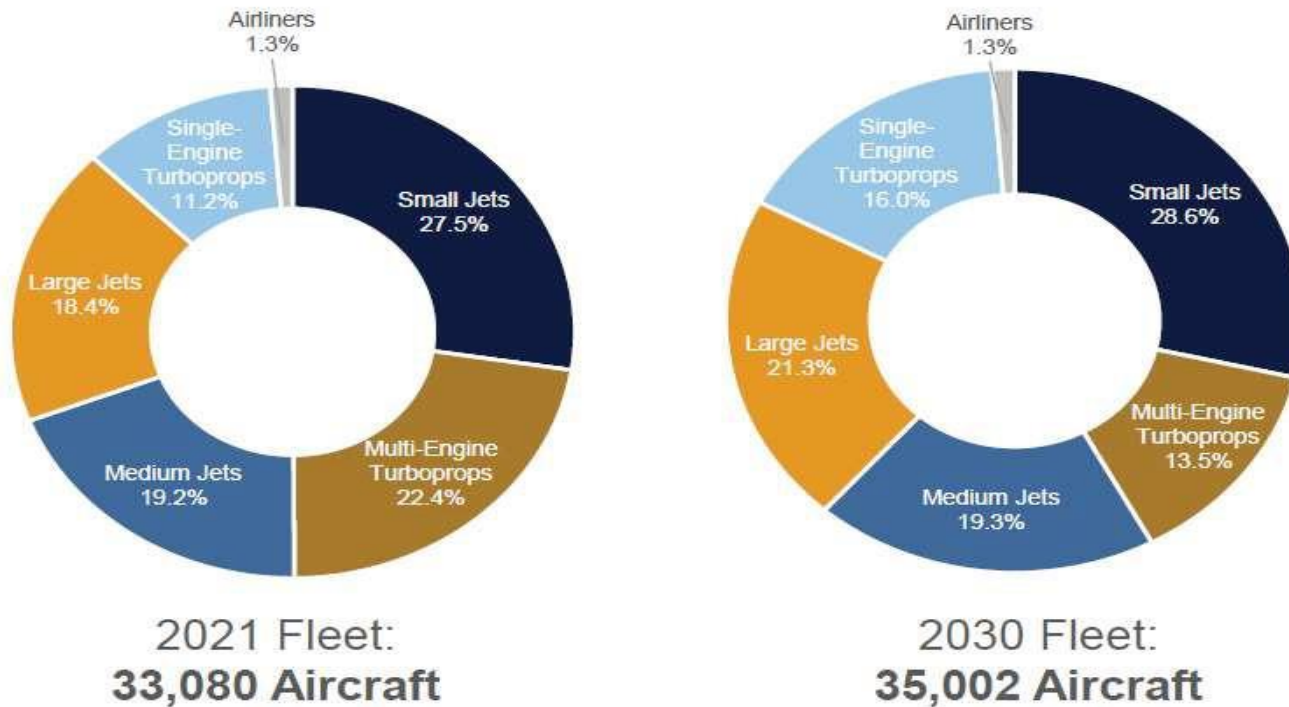
- Deliveries 8% lower than previous expectations over decade, 2021 = 21% and 2022 = 17% lower...
- 10,050 total deliveries over 10-years.
- 7,400 business Jets / 2,590 turboprops
- "Light jets" lead recovery efforts, 28% share of jets/ 25% share overall by category.
- Turbos remain strong but lower than previous expectations.
- \$236B retail delivery value over 10-years.

2021-30 Share of Unit Deliveries



Business Aviation In-Service Fleet Forecast

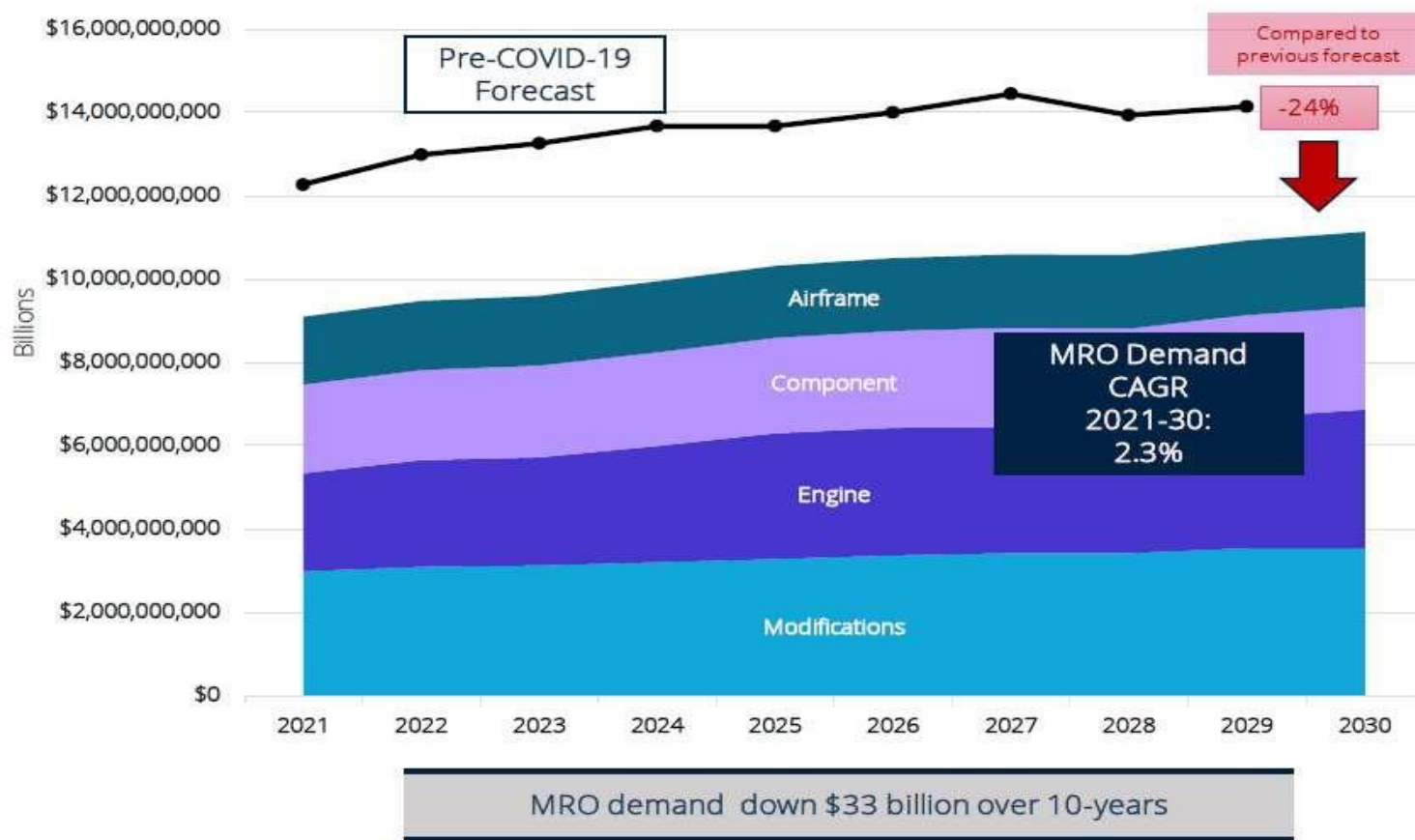
Fleet expands 6% 2021-30; grows at 0.6% CAGR over 10 years



Source: 2021 Business Fleet & MRO Forecast, Aviation Week Network, Copyright 2020

Business Aviation MRO Demand

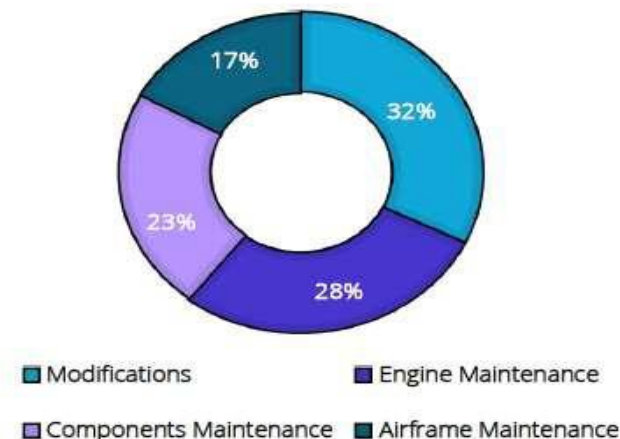
MRO aftermarket analysis and the impacts from the pandemic



Highlights

- 24% lower than previous projections, \$102 billion MRO, grows at 2.3% CAGR 2021-30.
- Modifications demand grows at 1.9% CAGR, \$33 billion demand.
- Over 57k major engine MRO events are expected during the 10-year forecast, +40 engine types...
- Engine MRO demand is \$29 billion over the decade and grows the fastest at nearly 4% CAGR.

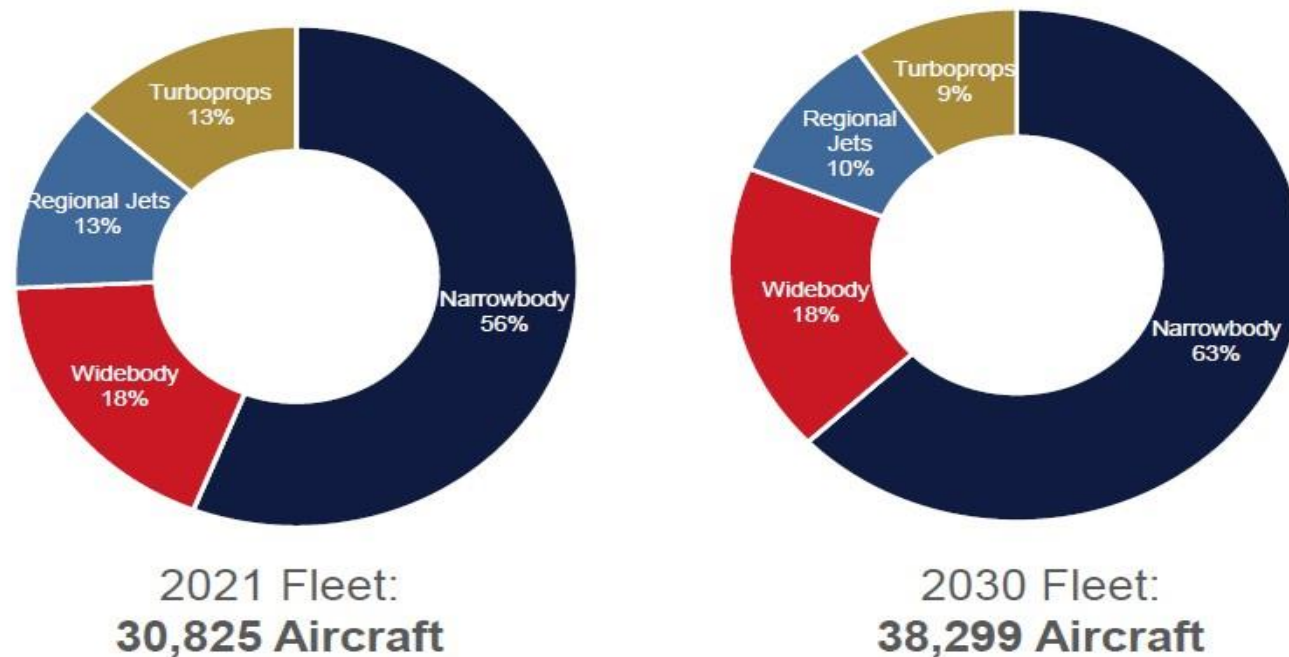
MRO DEMAND 2021-30 \$102.1 BILLION



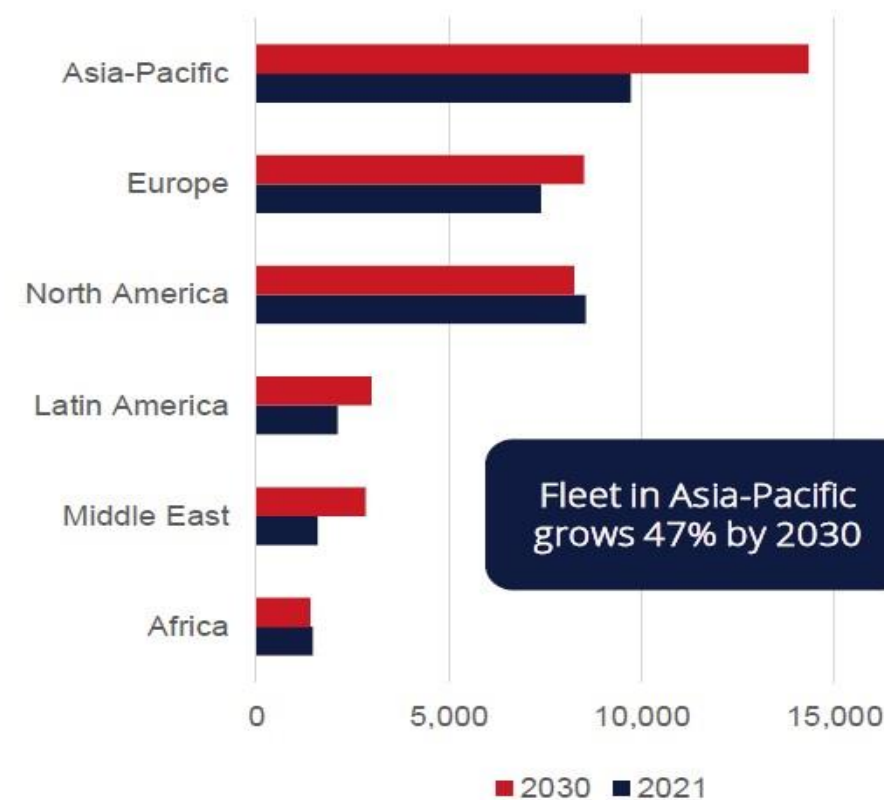
The Aerospace Supply Chain Current Outlook

Commercial In-Service Fleet - Fleet expands 24% 2021-30

Asia dominates while narrowbody types grow to a share of 63% post-pandemic



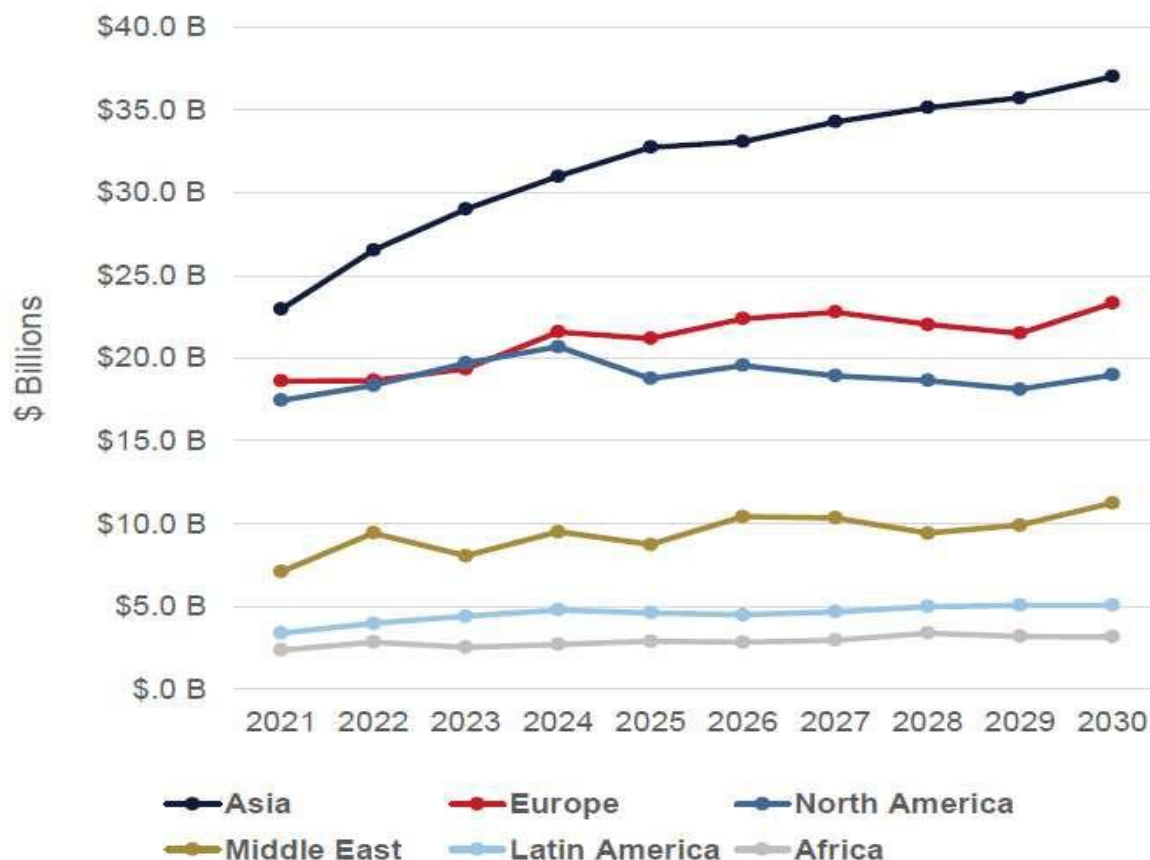
Regional In-Service Fleet 2030 v. 2021



Note: Regions at large, i.e. Asia-Pacific = India, Asia-Pacific and China

Source: 2021 Commercial Fleet & MRO Forecast, Aviation Week Network, Copyright 2020

Commercial MRO Demand by Region Grows 38%, 61% in Asia-Pacific



The outgrowth from the pandemic shows high initial growth rates from a low base. Operators in Asia will generate the largest amount of MRO demand throughout the forecast period.

Between 2021 and 2030, just over a third of all MRO expenses will be generated by Asia-Pacific alone, while world demand continues to increase at a healthy 3.6% CAGR globally over the decade, post-pandemic.

Demand is expected to experience significant expansion in Asia-Pacific and Middle East, with growths of 61% and 59% respectively.



Note: Regions at large, i.e. Asia = India, Asia and China

Source: 2021 Commercial Fleet & MRO Forecast, Aviation Week Network, Copyright 2020

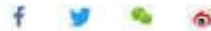
Current & Future Headwinds affecting the Industry



Single-aisle jets get more popular, as wide-body planes phased out amid COVID-19

By GT staff reporters

Published: May 13, 2021 07:13 PM



A staffer conducts cabin inspection at Qingdao, East China's Shandong Province on March 3, 2021. Photo: VCG

Pandemic Causes Historic Decline in Air Passenger Traffic

Global air passenger traffic (revenue passenger kilometers) as a percentage of 2019 traffic



Source: IATA



statista

The IATA predicts air travel demand to reach just 50% of 2019 levels in 2021

Image: Statista

Current & Future Headwinds affecting the Industry



Risk Mitigation Opportunities - Defense



- The Pentagon is asking for \$52.4 billion to invest in the military's air domain.
- 85 F-35 Joint Strike Fighters: \$12 billion
- 14 [Boeing](#) KC-46 tanker aircraft: \$2.5 billion
- 9 Lockheed Martin CH-53K King Stallion helicopters: \$1.7 billion
- 12 Boeing F-15EX fighter jets: \$1.5 billion
- 30 Boeing AH-64E Apache attack helicopters: \$825 million



Ministry of Defence

- In November 2020, the British government approved the largest rise in its defense budget since the end of the Cold War, with £16.5 billion in additional funding made available for spending on shipbuilding, space, cyber, research and other sectors over the next four years.
- The government said military modernization will be underpinned by a record investment of at least £1.5 billion extra and £5.8 billion in total on military research and development, including a commitment to further invest in the future combat air system.

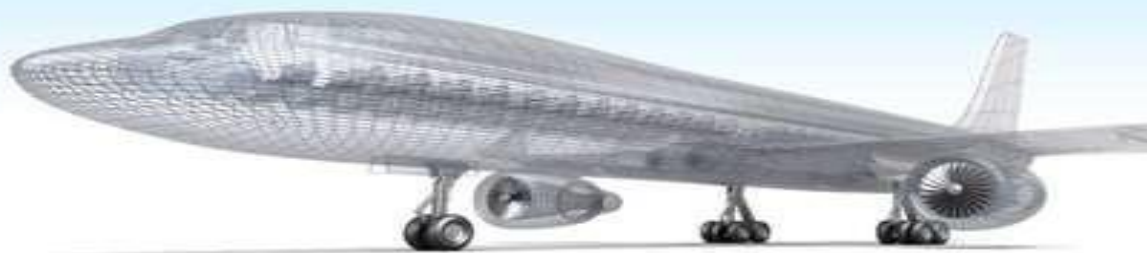


Back to the future? Airline sector
poised for change post-COVID-19

Future Trends – Innovations To Drive Sustainability



Lightweighting for Aerospace Applications



AVIATION COMPOSITES

New-generation GE jetliner engine parts made of SiC fibers



Source: GE Aviation



Aeroengine Composites, Part 1: The CMC invasion

Light Weight Alloys

Honeywell Green Jet Fuel™

Meet renewable energy regulations through low emission jet fuels made from sustainable feedstocks



CAAFI
COMMERCIAL AVIATION
ALTERNATIVE FUELS INITIATIVE

Future Trends – Innovations To Drive Sustainability



E-Fan X

A 2MW hybrid-electric aircraft demonstrator

ELECTRICAL SUPPLY
3000V DC electrical distribution

GENERATOR
Power generation system

ENGINE
One of four jet engines is replaced with an electric motor.

ENERGY STORAGE
High-power battery pack

DATA TRANSMISSION
Flight Test Instrumentation with telemetry

AIRBUS



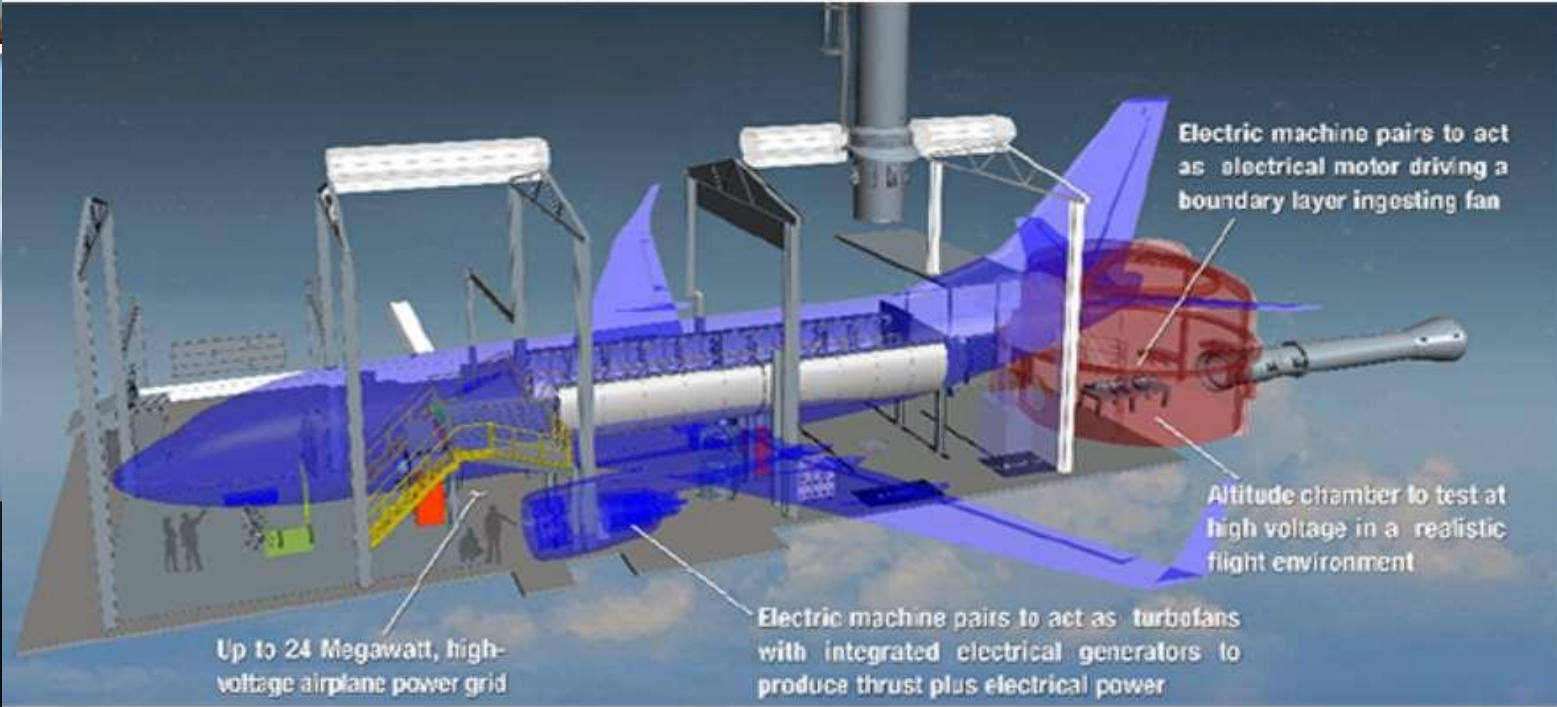
Allied Market Research

Global MORE ELECTRIC AIRCRAFT Market

Opportunities and Forecast, 2020-2027

Global More Electric Aircraft Market is expected to reach **\$4,512.69 Million** by 2027.

Growing at a **CAGR of 15.5%** (2020-2027)



NEAT configured to test a lightly distributed turboelectric aircraft. Credits: NASA

Future Trends – EVTOL \ UAV's \ Flying Cars



City of Hilliard, LIFT Aircraft, GhostWave Inc. and Parallax Advanced Research propose new, life-saving technology on Ohio's first flying car

By Press 10 March 2021



Future Trends – Commercial Space Travel



Future Trends – Hyperloop





The next era of human mobility



Hyperloop Video

<https://www.youtube.com/watch?v=uwm3qvFWVRU>



Thank You



Stephen Kyle-Henney, Managing Director & Founder, TISICS

Stephen Kyle- Henney is Managing director and the founder of TISICS Ltd. Stephen has been working on Lightweight metal composites for over 30 years and TISICS has a unique position as the only integrated continuous fibre metal composite supplier world wide. TISICS develops ultra ;lightweight titanium and aluminium composites reinforced with silicon carbide fibre to save 305 to 70% compared to conventional parts.

Stephen is leading the development for this in space systems and aviation where the renewed focus on net-zero carbon will require increased emphasis on weight reduction.

TISICS

"LIGHTEN UP"

FAC – Ohio Aerospace Institute
Webinar

25th August 2021

TISICS is pioneering **lighter** and **greener, aircraft** and **spacecraft components** with world leading **metal composite** and **net-shape manufacture** technologies.



January
2020

Most significant advancement in forms of **transport** which result in **significantly improved environmental footprint**.



Pitch@Palace
11.0

2019 Finalist

The following presentation will aim to provide an overview of TISICS limited and our activities in Aviation and space sectors as well as a broader view of technology development opportunities in the UK from the viewpoint of a small company.

- 1) TISICS company overview- who we are and where we came from.
- 2) TISICS materials technology- A unique vertically integrated capability
- 3) Aviation Light weighting- 40% to 70% mass reduction
- 4) Space systems - Net shape and high-performance metal structures
- 5) TISICS growth plans- How to exploit advanced materials.

UK Space and Aviation developments – Will be discussed in context of the TISICS activity

- 1) UK Aerospace priorities- Some of the collaborative activities which are underway
- 2) UK Space technology development- Priority areas for UK R&D

TISICS has a unique composite technology

30% - 70% component system weight savings with TISICS
composites



TISICS TITANIUM
COMPOSITE TUBE
(36g)



WEIGHT OF A
CRISP PACKET



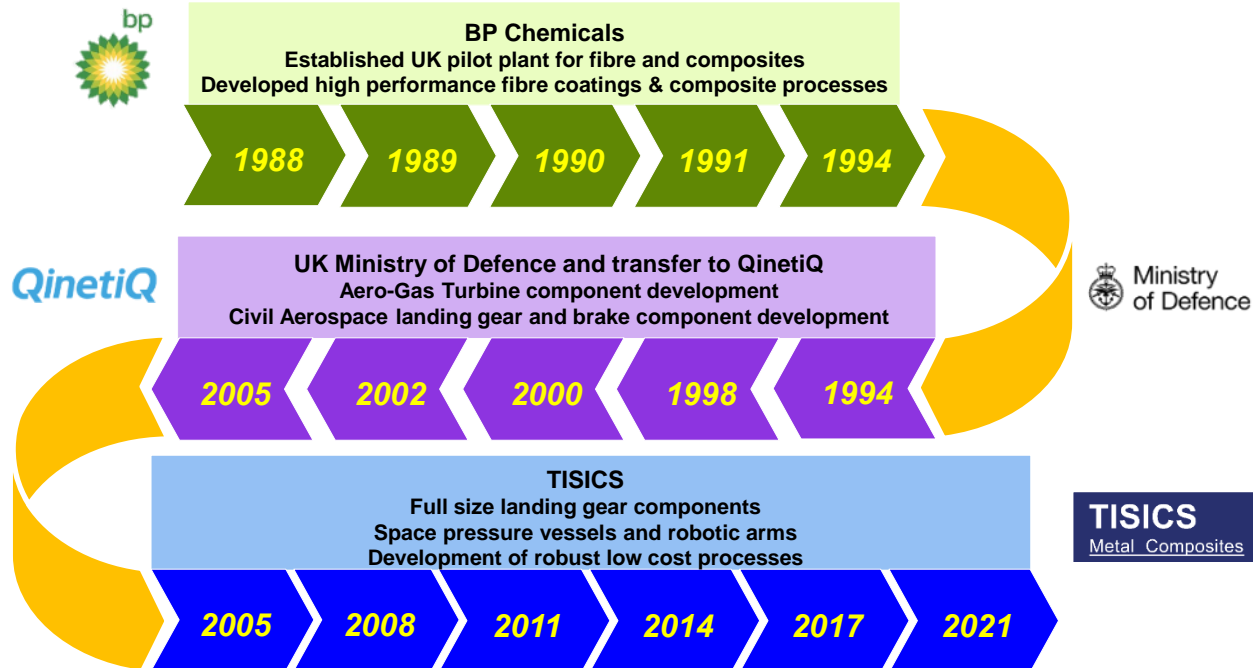
WILL CARRY 5,000Kg

TISICS mission: *Transform metals for a greener, brighter
future*



Technology Heritage

TISICS and its predecessors have maintained UK independent access to silicon carbide fibre since the 1980s ensuring European access advanced light weight components without ITAR restrictions.



Technology & Capability Investment

£ 3.5m

Total capital investment since 2005

£ 7.99m

Total technology & process R&D

£ 14.m

Revenue to date

£ 1.5m

Management equity

Vertically Integrated Capabilities

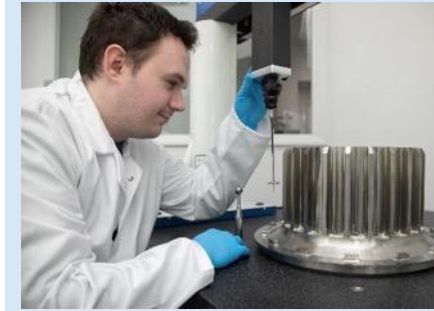
TISICS
Metal Composites

World unique integrated composite

manufacture

- One of two commercial silicon carbide fibre suppliers worldwide
- Fibre competitor based in USA and subject to ITAR/EAR controls
- Only commercial supplier worldwide with integrated fibre and composite capability

Certifications



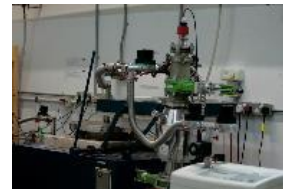
MANUFACTURE



SiC Production



Cleanrooms

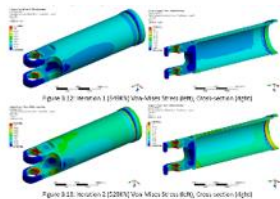


Furnaces & Vacuum Processing



CNC: Lathes, Mills, Wire Eroder

DESIGN

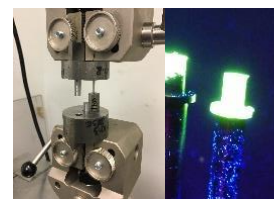


CAD, FEA

TEST

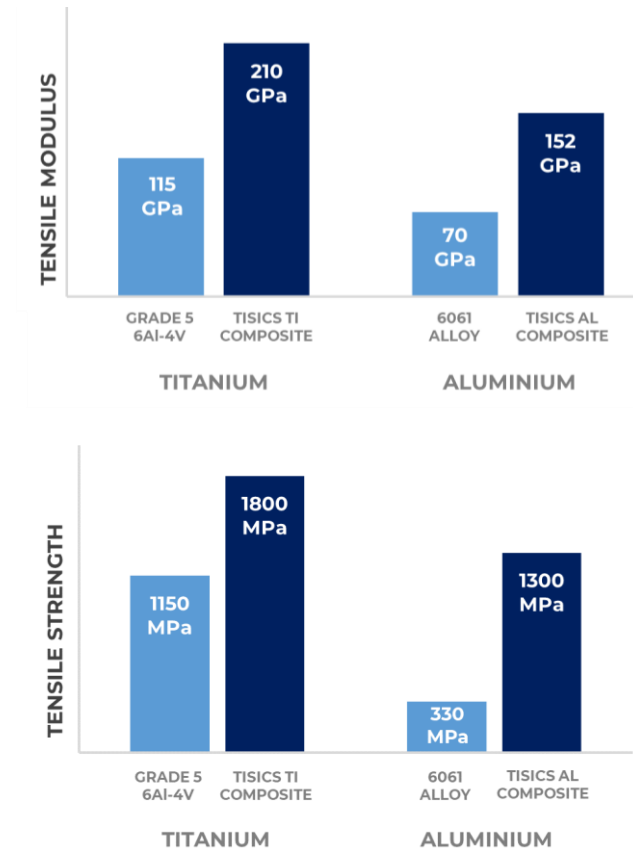
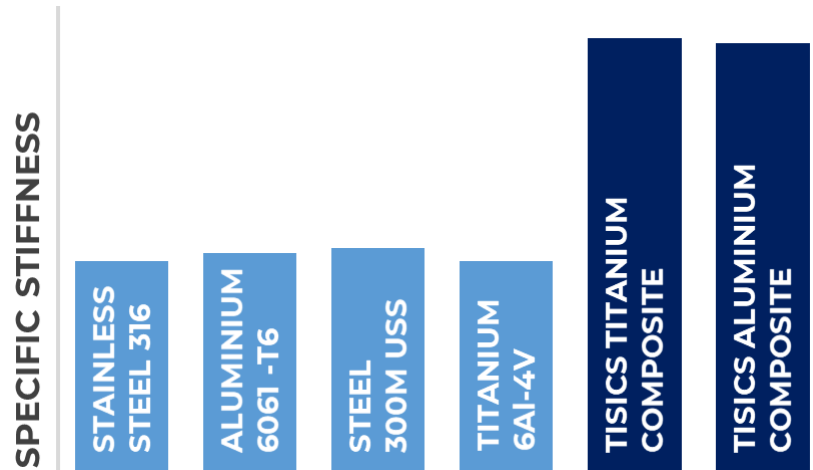


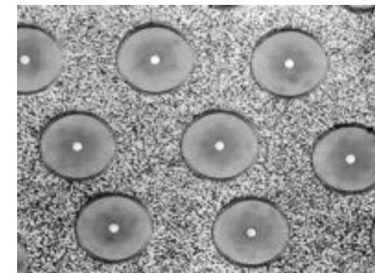
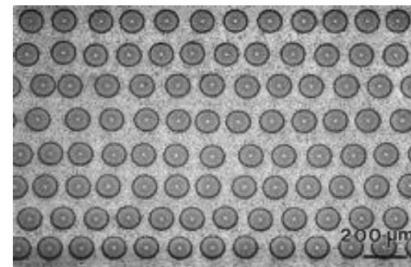
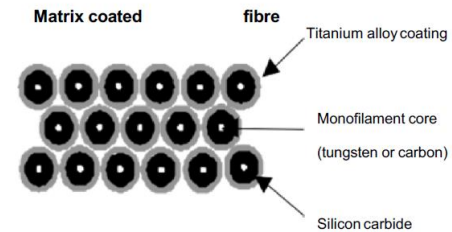
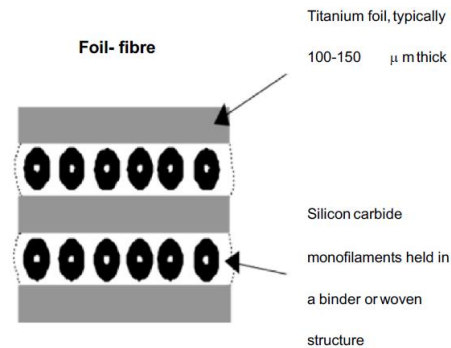
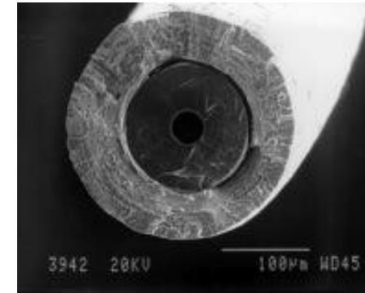
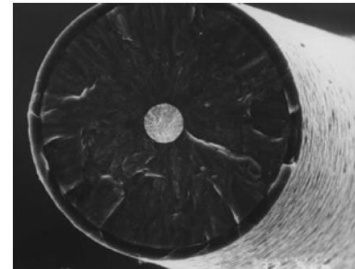
Inspection, Analysis



Tensile, compression testing & NDE

Double the specific stiffness of engineering metals



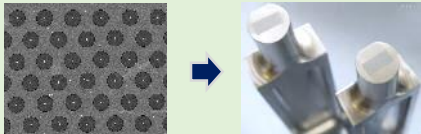


TECHNOLOGY

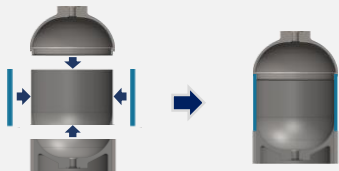
CERAMIC FIBRE



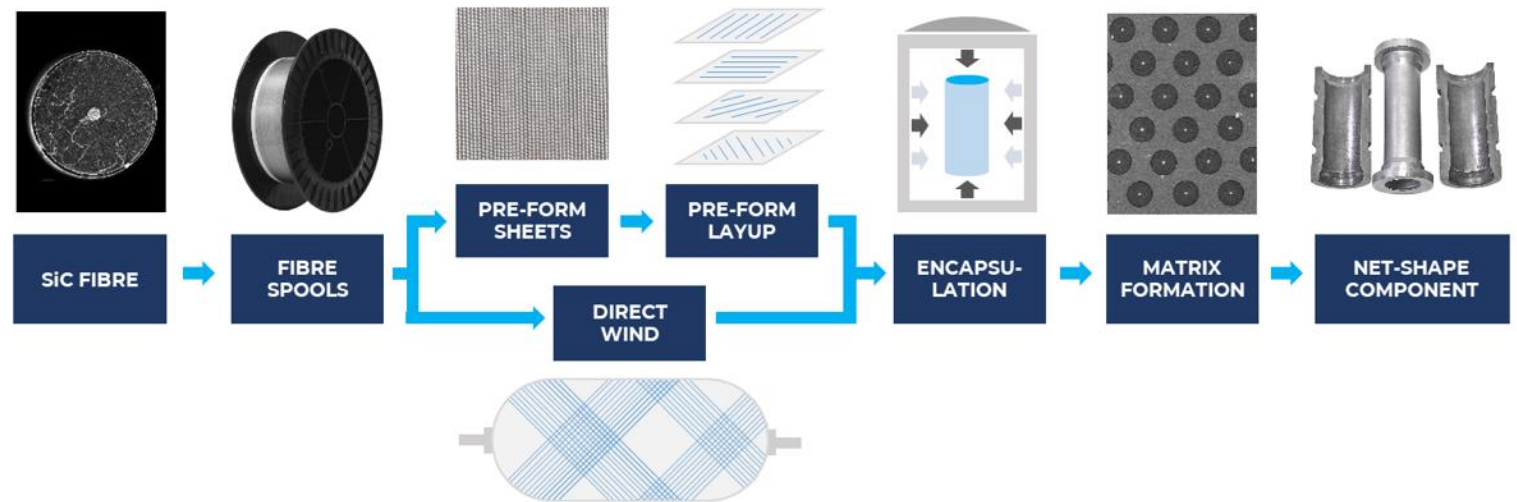
TITANIUM, ALUMINIUM COMPOSITES



NET SHAPE FABRICATION



COMPOSITE MANUFACTURE



Near net-shape process minimises welding, joining and final machining

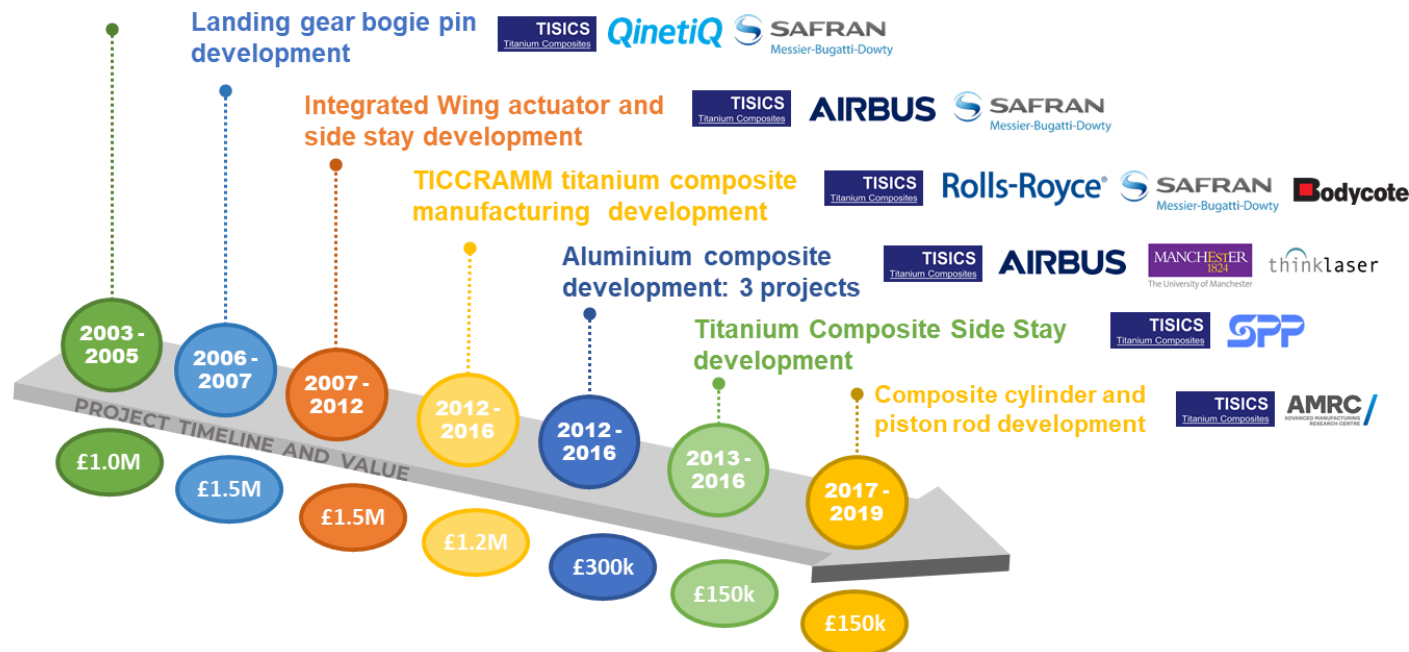
**STRONG
BARRIERS
TO ENTRY**

Research and Development (public programmes)
Co-funded by TISICS

Titanium composite Landing gear material technology study.



TISICS Established 2005 (from QinetiQ)



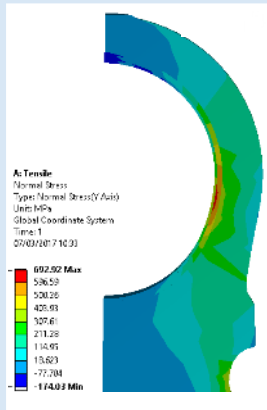
Existing customer relationships and TRL6 component development in place

Defensibility

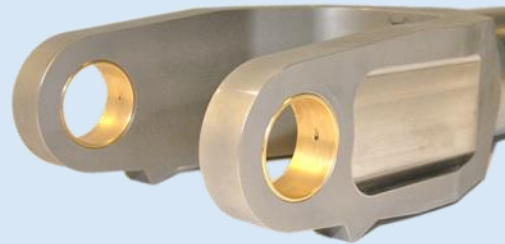
- Safety-critical aero components and materials require **extensive development**
- Full **process IP ownership**
- **30yr+** tech investment by BP, MoD, QinetiQ
- 1 of 2 raw material suppliers worldwide (**only European supplier**)
- **ONLY integrated fibre reinforced metal composite supplier worldwide**



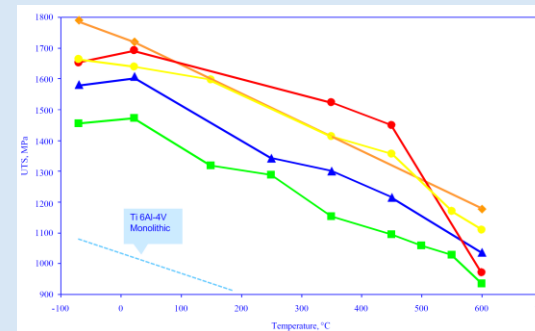
Selective Reinforcement



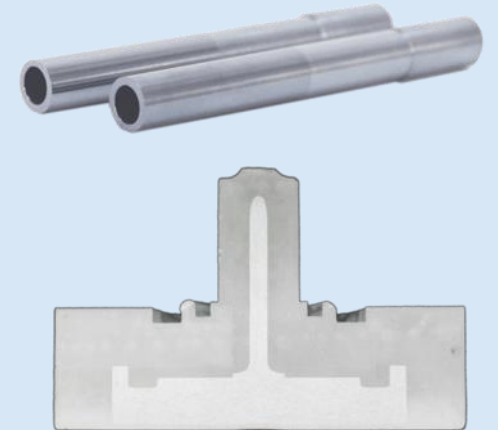
Net Shape Components



Thermo-mechanical Stability



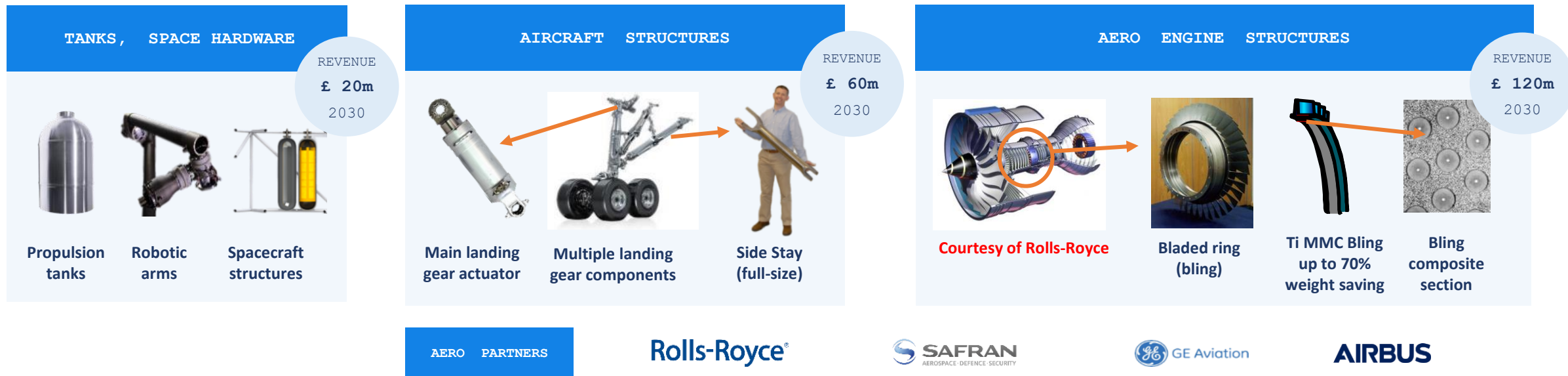
Mixed Material Complex Shapes



Multi-Sector Commercialisation

TISICS
Metal Composites

TISICS activities are a stepping stone to a larger £200m market for which TISICS has extensive existing relationships.



Builds on £20m pre-TISICS investment by BP and QinetiQ

£200m space, aero, defence business by 2030



>80% UK exports
High quality jobs



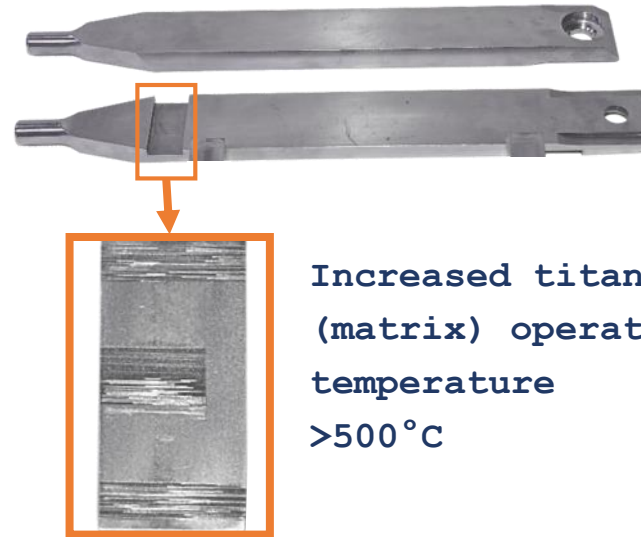


Brake Drive Bars

Original Steel Component

- Heavy
- High operating temperature
- Exposed to harsh runway environments
- Heavier high strength steel with coatings or nickle alloys typically

CHALLENGE



Increased titanium
(matrix) operating
temperature
>500°C

SOLUTION

TISICS Titanium Composite

- Tested, survived 3 lifetime cycles
- Passed simulated rejected take-off (997 °C)
- Corrosion resistant

30% LIGHTER

INCREASED THERMAL
STABILITY

OUTCOME



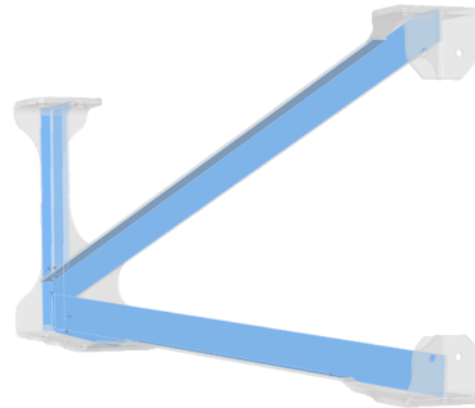
Aluminium Wing Riblet

Original Aluminium I-Beams

- Minimise mass
- Retain material compatibility with Al system
- Fixed attachment points
- High tension and compression loads
- Extensive machining required

CHALLENGE

- Selectively reinforced
- Simple 0° lay-up for maximum load



- Net-shape minimises machining
- Ease of system integration (Al bolt holes)

SOLUTION

TISICS Aluminium Composite



30% LIGHTER

OUTCOME

Major UK Development for landing Gear

TISICS
Metal Composites



SIDE STAY

↓ 42% MASS SAVING

↓ 47,400 Tonnes CO₂ saving across world fleet

MLG upgrades
(30% weight saving)



A330

0.7mT

A350 / B787

2.9mT

A320 / B737

>4.5mT



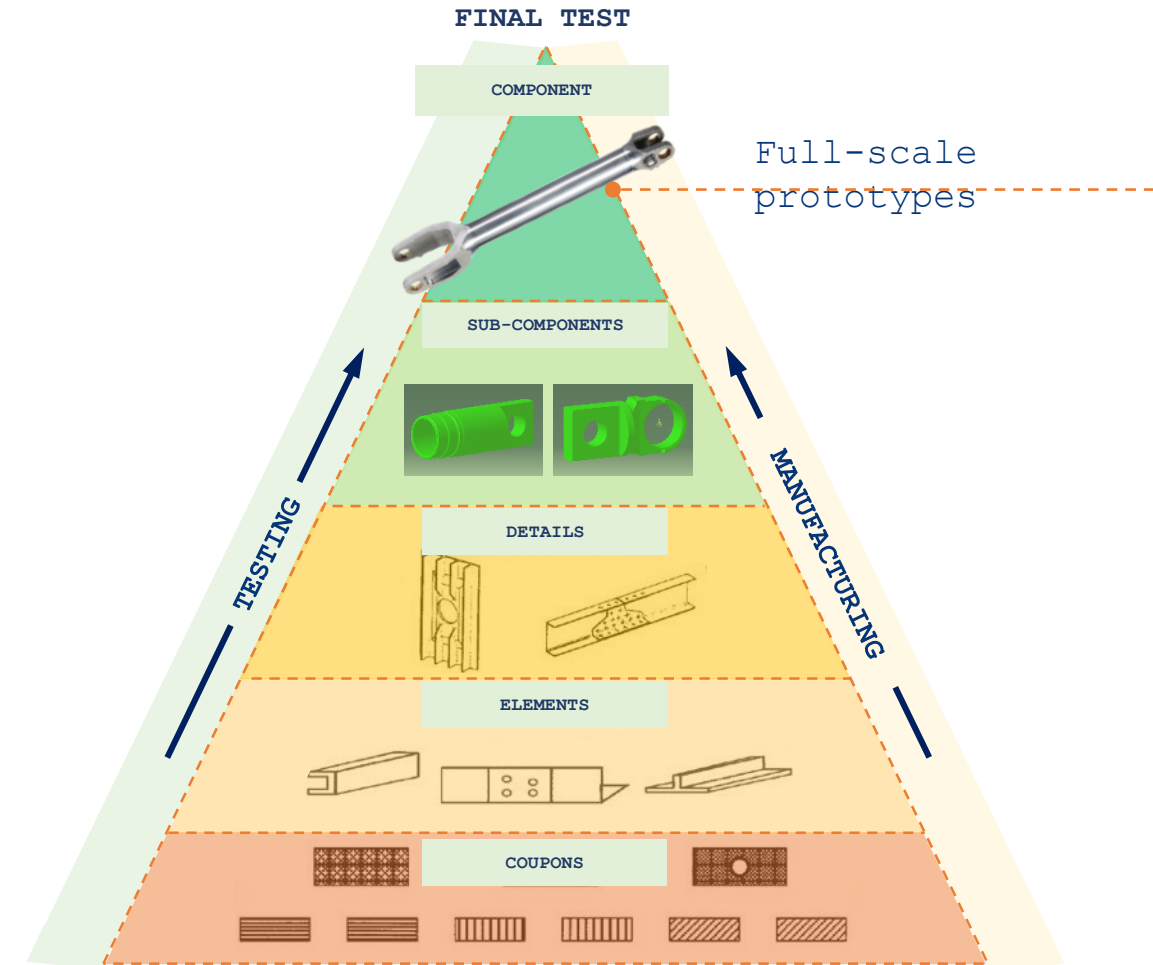
LIGHTLAND OUTCOMES

- ✓ COP26 full-scale demonstrator
- ✓ Fully functional prototype tested by Safran
- ✓ Materials characterisation
- ✓ LCA, LCC and environmental analysis

TISICS Landing Gear Project 10

months

- define design to sub-scale and full-scale demonstrator components
- optimise for component loading conditions
- evaluate optimal manufacturing methodologies
- Further develop modelling capability
- materials characterisation to demonstrate manufacturing repeatability
- LCA and LCC analysis to address economic performance
- validate environmental benefits



TISICS Landing Gear & Brake Development Parts

TISICS
Metal Composites

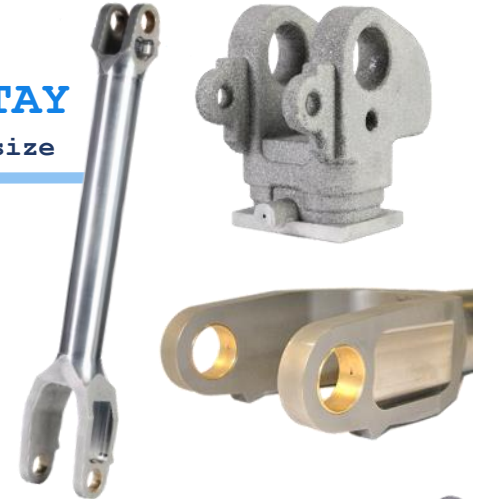
ACTUATORS

A320 full-size



SIDE STAY

A320 full-size



BRAKES

A340 full-size



Multiple platforms



WHEEL BOLTS



TORQUE PIN

A340 full-size



BOGIE PIN

BRAKE ROD

A350 full-size

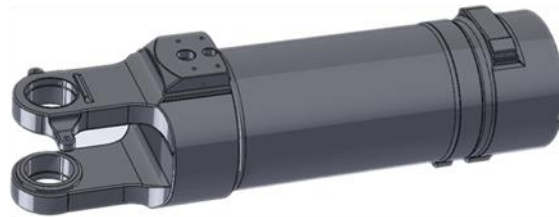


LINKAGES

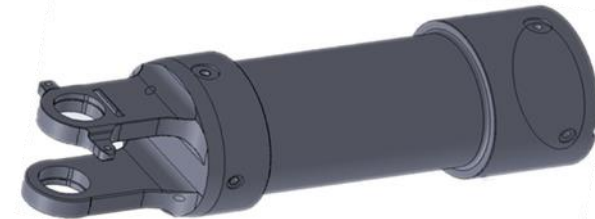


Significant cost-savings

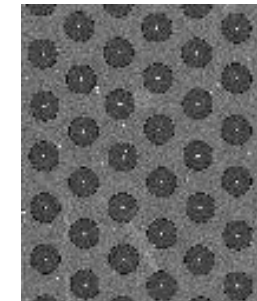
**Original Steel
Component (22.34kg)**



**TISICS Aluminium Composite
Component (10.46kg)**



11.88kg saved



Lightweight components significantly
**reduce airline operating costs over the
life of an aircraft.**

Spacecraft Tanks: Supply Challenge

TISICS
Metal Composites

Current tank supply: machined forgings

40
kilograms

HEAVY TANKS

Thickened weld regions for strength, increase mass around closures, mounts and attachment points

18
months

LONG LEAD TIME

Tanks take 18 to 24 months to manufacture, impacting development timeframes

>£100k

EXPENSIVE

Hand-built by highly skilled engineers, with no production capability. Large tanks can cost £250,000 each.

90%
waste

WASTEFUL

Expensive 1000kg titanium forgings machined to very thin-wall tanks, ultimately weighing 40kg.

6
satellites/yr

LOW SATELLITE NUMBERS

Automation uneconomical

TISICS solution: lightweight tanks

35%
lighter

LIGHTWEIGHT TANKS

Single-piece design minimises wall-thickness across entire cross-section, resulting in lower mass

70%
faster

SHORT LEAD TIME

6 months to delivery, down from industry standard 18 - 24 months

40%
cheaper

LOW COST

Single-piece tank liner eliminates the need for weld, minimises machining and need for expensive inspection

<15%
waste

MINIMISES WASTE

Additive manufacture minimises waste of expensive raw material

>20
satellites/mo

HIGH THROUGHPUT

Robotic assembly into satellite



TISICS
lightweight &
short lead
time
spacecraft
tank



Template for R&D Transition to

Products

- Identified niche product opportunity with high barriers to entry
- Recruited customer-recommended industry experts in tank design, manufacture and system deployment
- Developed product technology in collaboration with customers to ensure development fits current and future product needs
- Broad customer base with wide product and platform compatibility
- TISICS-driven product development for early market entry

Tank Development

Thin wall, high performance tanks developed to scale across multiple satellite platforms.



Test Sheets



Burst Tubes

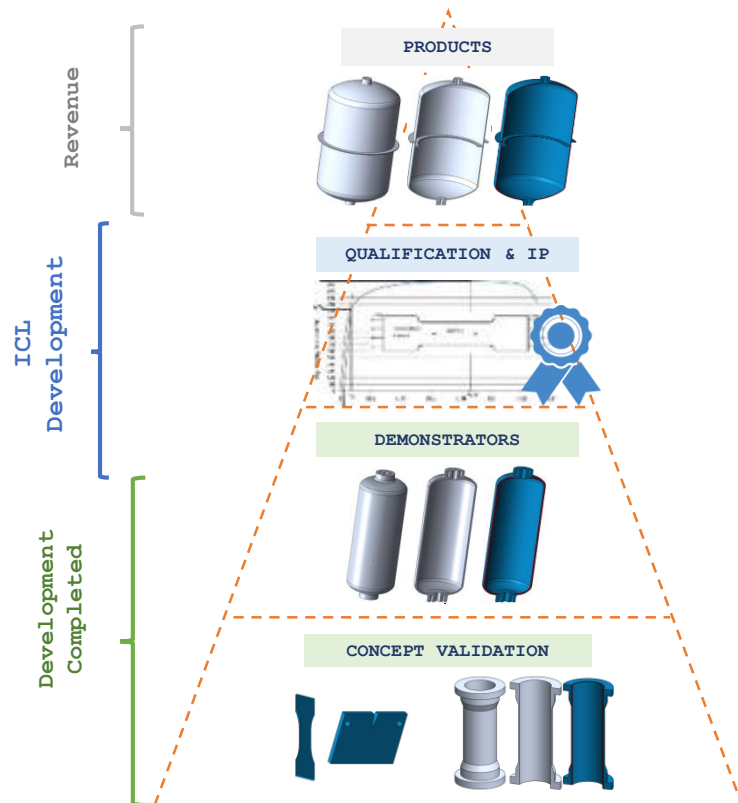


Sub-scale
Shell
manufacture

Bread Board Model
incl.
Attachment feature



Technology and Manufacturing Readiness Timeframe



Research and Development
funded by TISICS non-dilutive grants and customers

High pressure tank
2010



SURREY
Innovate UK

ITI Spherical tank
2012



SURREY
esa

NEO Sat tank
2012-2015



AIRBUS
DEFENCE & SPACE
Innovate UK

Hydrogen peroxide tank
2016-2018



SURREY
Innovate UK

Twin tank
2016-2018



ThalesAlenia Space
UK SPACE AGENCY

Robotic fabrication development
2016-2020



thinklaser
AIRBUS
DEFENCE & SPACE
ThalesAlenia Space
UK SPACE AGENCY
esa

Development supported by customers



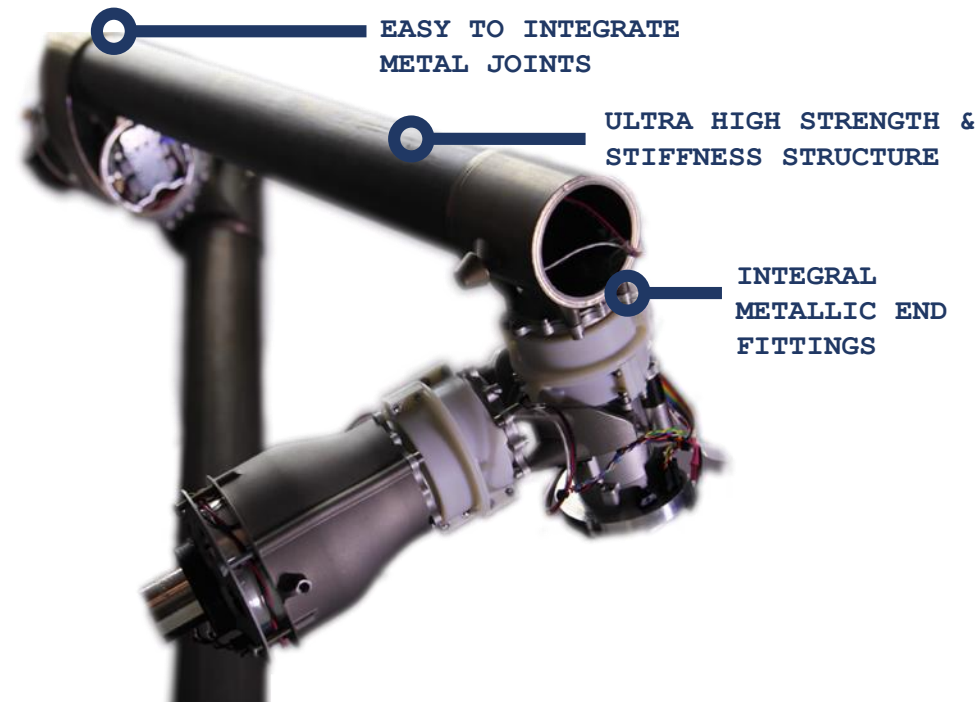
Robotic Arms

Original CFRP Structure

Need for:

- high strength, high stiffness solution
- thermal conductivity
- durability

CHALLENGE



SOLUTION

Lightweight Metal Composite Structure

- incorporated 3-D printed end fittings (diffusion bonded)
- eliminated welded joints

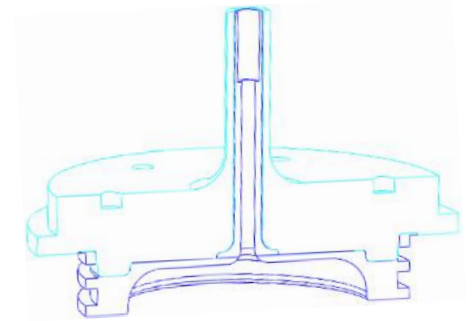
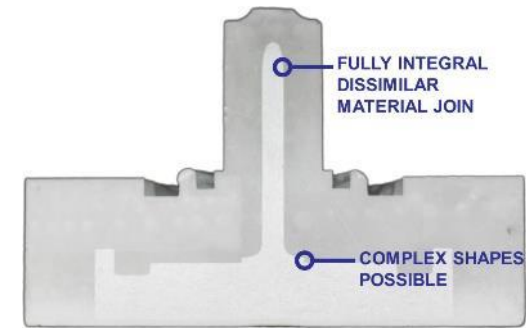
LIGHTER SOLUTION

OUTCOME

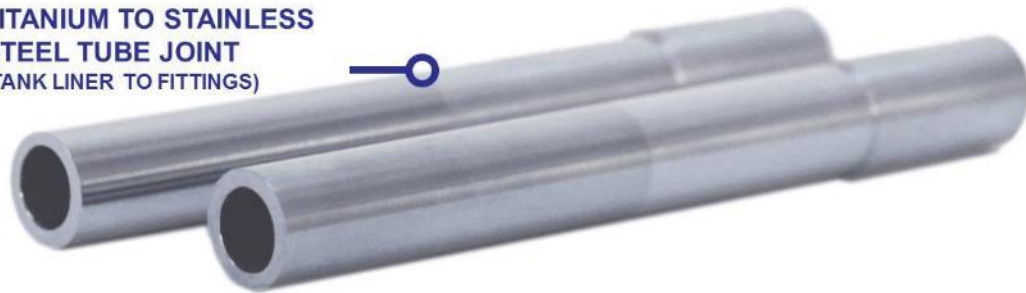
Joining Dissimilar Metals

Mixed metal technology development

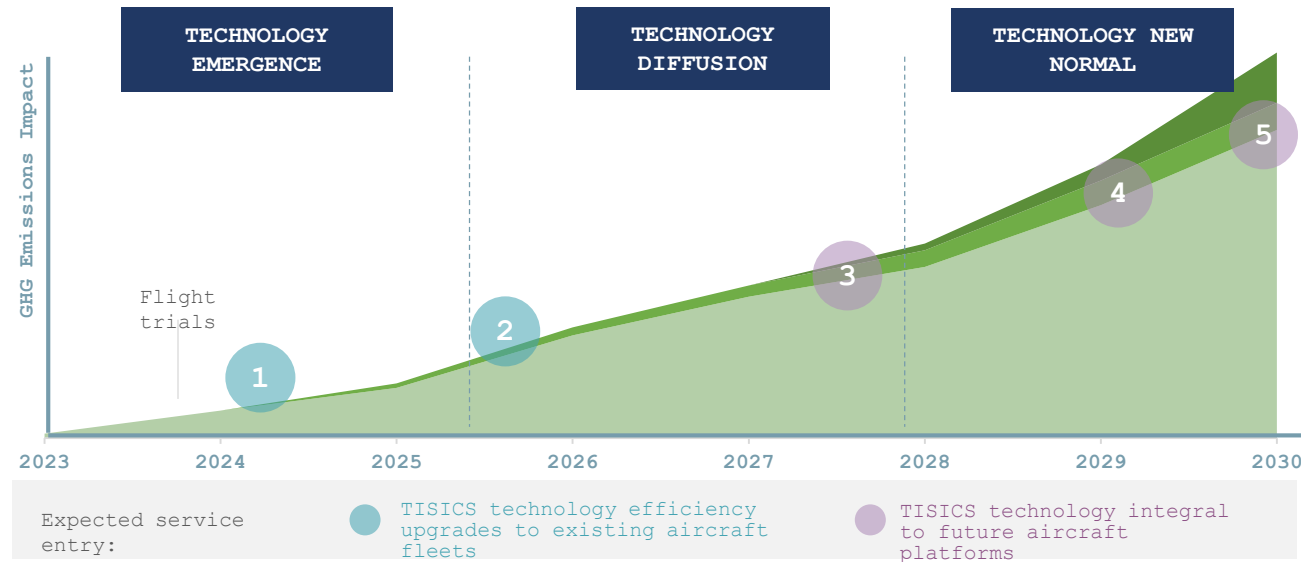
- Propellant and gas transition tubes e.g. titanium to stainless-steel
Other material combinations (e.g. aluminium to titanium) are under development in current development programmes
- Cladding of internal surface
Addresses compatibility issue for e. g. titanium clad with aluminium for hydrogen peroxide



**TITANIUM TO STAINLESS
STEEL TUBE JOINT**
(TANK LINER TO FITTINGS)



Decarbonising Aviation through MMCs



30% mass reduction would **save 3.7m Tonnes CO₂ emissions/yr** across A330 & A350 fleets (ATI Fixed Trade calculator)



Al-MMC wing ribs and brackets, Ti-MMC actuators and gear beams: **20%-30% mass saving** (GE-IUK and Airbus ATI projects)



Bling engine parts alone could **save 3% fuel on commercial airlines** (IATA Roadmap for delivery 2030)



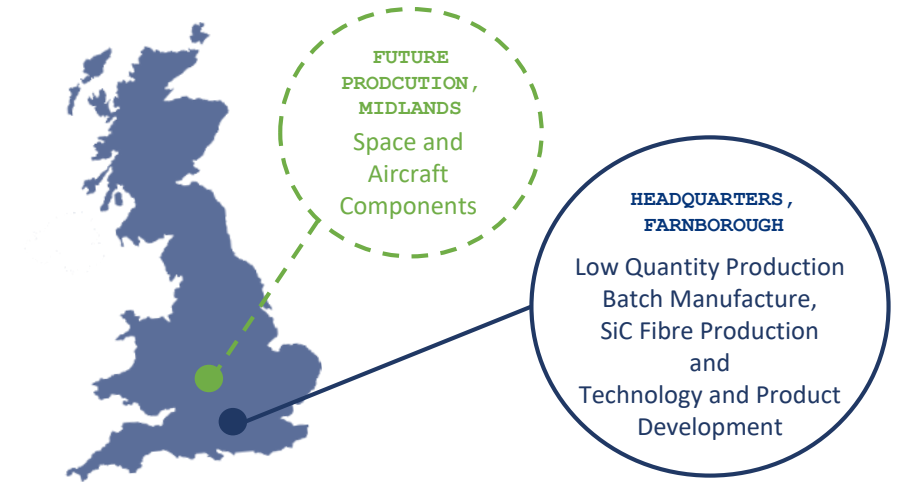
Ultra-lightweight liquid hydrogen tanks under development based on TISICS Space capability. **>30% gravimetric index** targeted to meet aviation needs.



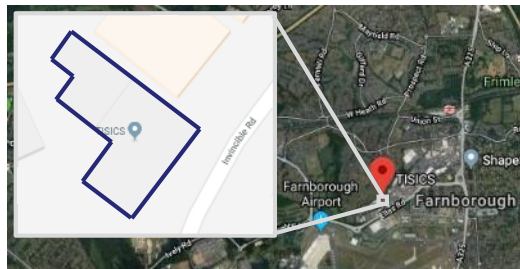
MMCs provide mass, performance & assembly automation potential for blended wing truss structures. Development work with Reaction Engines demonstrated technology viability.

Manufacturing capacity

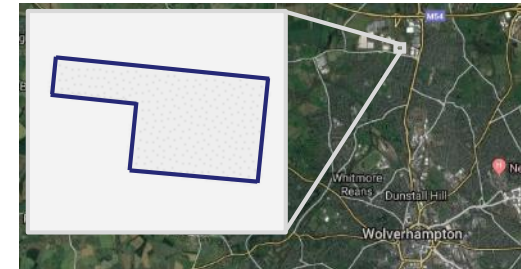
- TISICS operates a 15,500 sqft (1435 sqm) manufacturing facility in Farnborough, UK.
- This includes fibre and composite manufacturing and is the only site of its kind worldwide.
- Farnborough site has the capacity for development Including increased Fibre Capacity to 450kg.
- Future expanded production plant planning in progress to meet increasing space and aerospace demand.



CURRENT FACILITIES



FUTURE EXPANSION



TISICS

www.tisics.co.uk

TISICS intends to be the world
leading industrial supplier of
metal composites.

Come talk to us.



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Managing Director

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Ms. Ayantika Mitra

Business Strategy Director

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ayantikamitra@tisics.co.uk



Mr. Mick Iles

Aerospace Systems Director

+44(0) 7854 748 198

miles@tisics.co.uk



John Sankovic, Ph.D., CEO & President, Ohio Aerospace Institute

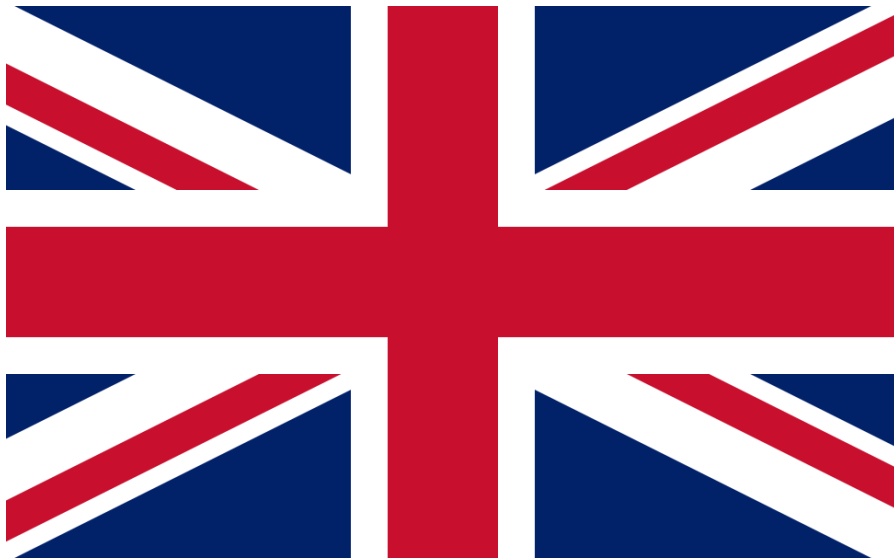
John Sankovic prioritizes developing multi-university partnerships, driving research from university laboratories to Ohio's industrial aerospace manufacturers and fostering novel collaborations between governments, industries and private organizations.

Sankovic had a distinguished 31-year career at NASA, where he served as center chief technologist and director of the Office of Technology Incubation and Innovation. There, he received numerous awards, including the NASA Outstanding Leadership Medal, six Agency Honor Group Achievement Awards and an R&D100 technology innovation award.

An industrious academic, Sankovic earned his bachelor's and master's degrees in mechanical engineering from The University of Akron, his MBA degree from Cleveland State University and his master's and doctorate degrees in biomedical engineering from Case Western Reserve University. He is a registered professional engineer in the State of Ohio with distinction by the Ohio Society of Professional Engineers for highest achievement on both licensure examinations. He holds three U.S. patents.

UK-Ohio Aerospace Joint Growth Opportunities

Dr. John M. Sankovic
President and CEO
Ohio Aerospace Institute





Geography lesson

We're proud Ohio has easy access to
US and Canadian population centers.
Many see location this way:





National position

- Third for manufacturing output
- Second for aerospace infrastructure
- Third for aerospace industry size
- Second overall most attractive state for aerospace manufacturing (PricewaterhouseCoopers, 2020)
- Largest supplier state to Airbus and Boeing (combined spending of more than \$17 billion annually in Ohio)



National position

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Ohio jobs supported by UK companies

- 49,100 Ohioans employed by UK subsidiaries in 2018
- 20,640 jobs are supported by exports from Ohio to the UK worth \$3.8 billion in 2019.

Value of exports to the UK from Ohio

- The UK was the 4th largest export market for Ohio in 2019
- Total value of Ohio goods exports to the UK \$1.9 billion
- Total value of Ohio services exports to the UK \$1.9 billion



Top Ohio goods exports to the UK

Aerospace products and parts	\$663 million
------------------------------	---------------

Motor vehicle parts	\$222 million
---------------------	---------------

Nonferrous metal products	\$108 million
---------------------------	---------------

Miscellaneous general purpose machinery	\$78 million
---	--------------

Miscellaneous fabricated metal products	\$78 million
---	--------------

Source: www.uk.gov



NEWER

Flying cars and cargo
eVTOL and autonomy enabled

FARTHER

Commercial cislunar activities
ARTEMIS ACCORDS



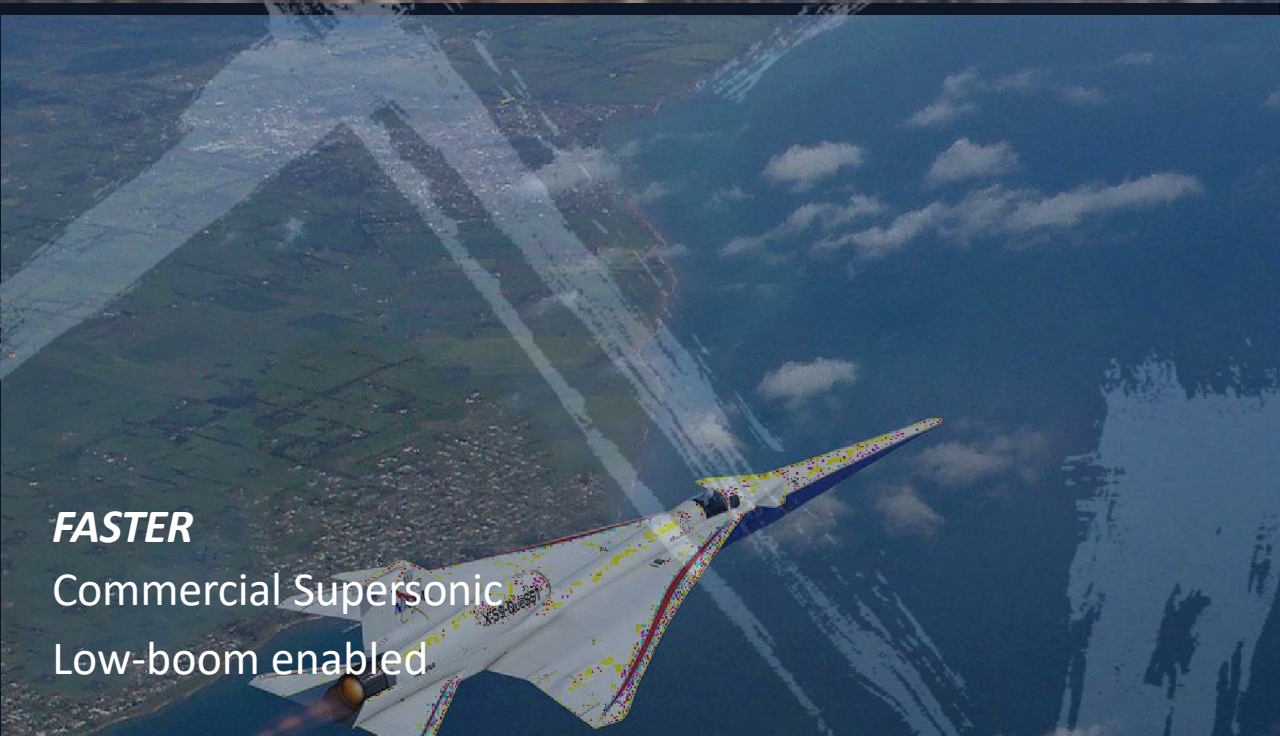
Future trends in Aerospace

FASTER

Commercial Supersonic
Low-boom enabled

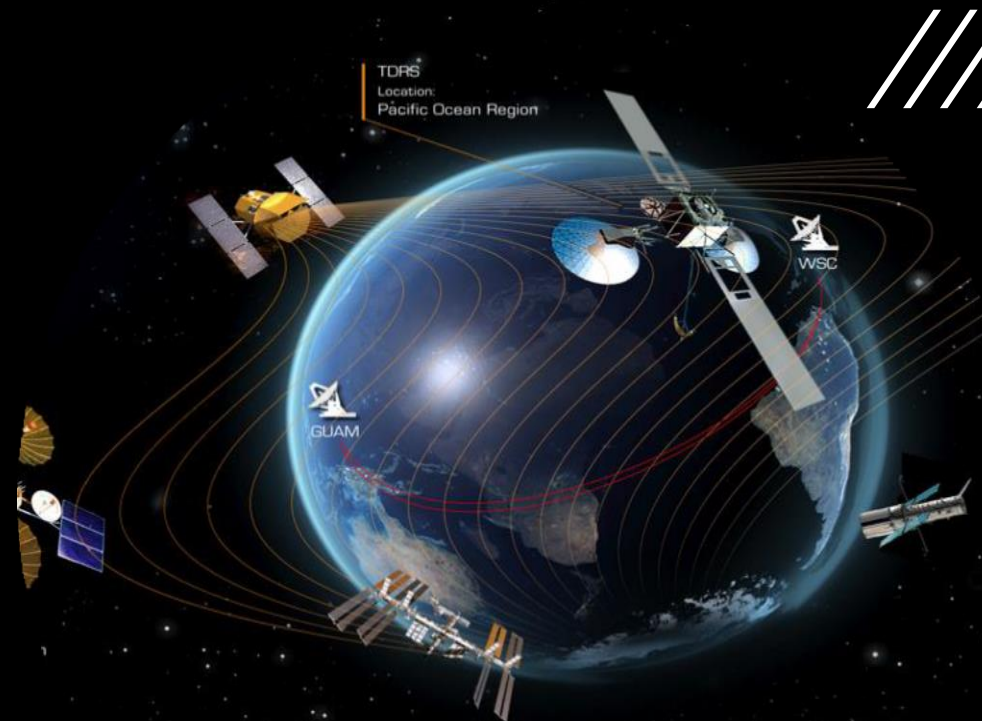
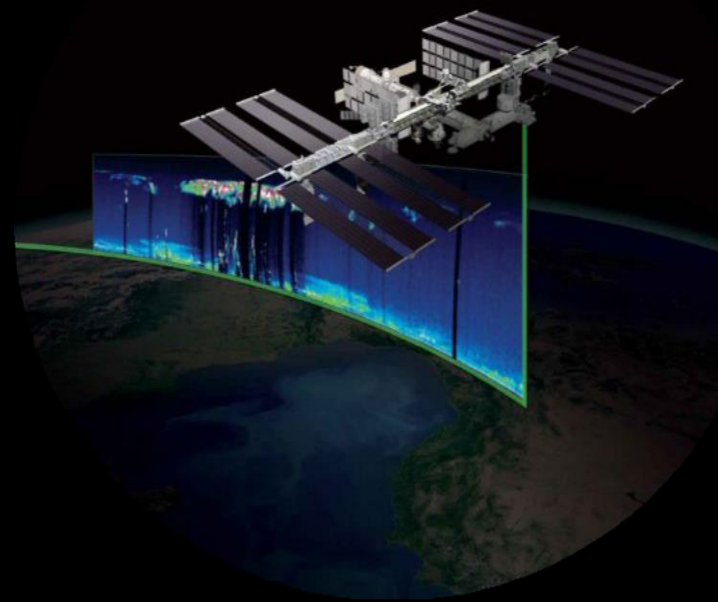
CLEANER

Rethinking the fleet
Electrification enabled



Space Economics

Rockets, Remote Sensing,
Telecommunications



- Government supports infrastructure development
- Private Companies Provide Services
- Private Commerce Flourishes

Moving Space Operations beyond 400 km.



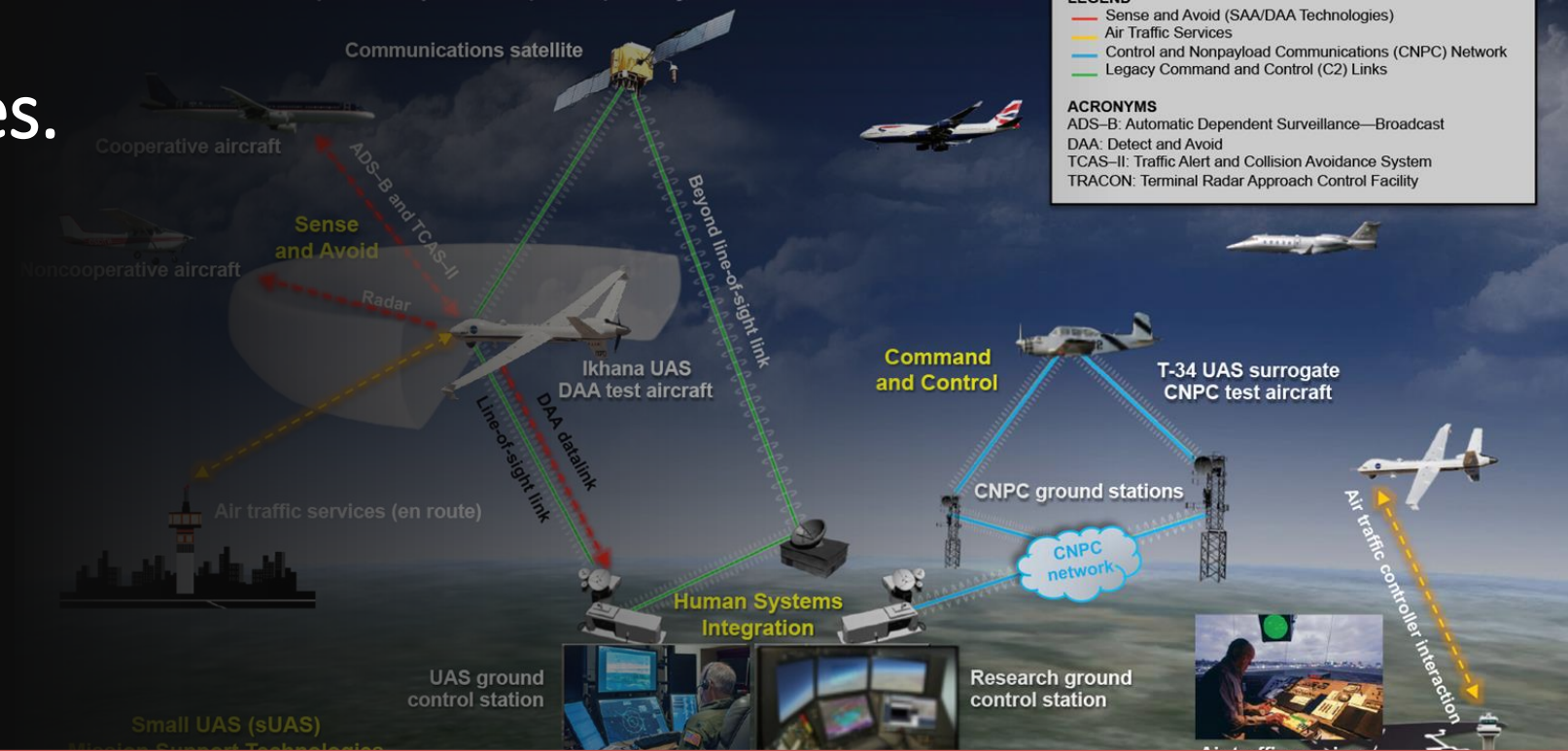


FASTER. (again)

Aerion and Ohio-based Netjets partner for
Commercial Supersonic Transport



New transportation modes. Integrated into existing infrastructure.



Beta Technologies plans eVTOL work in Dayton, Ohio, charging station at Akron-Canton Airport, Ohio



Thank You!

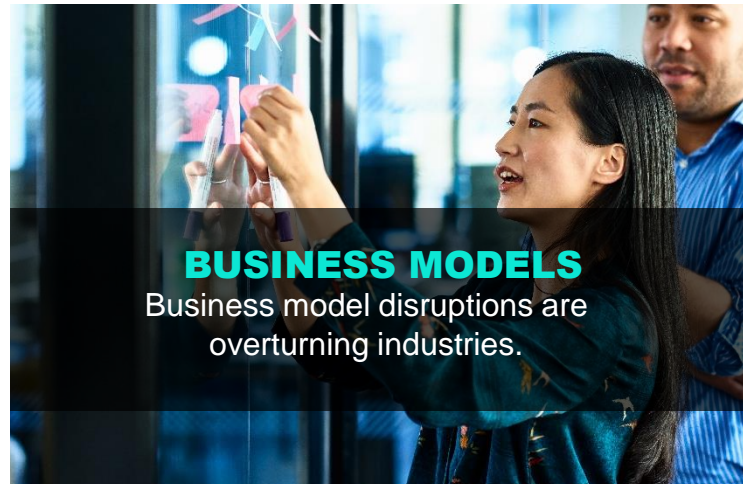
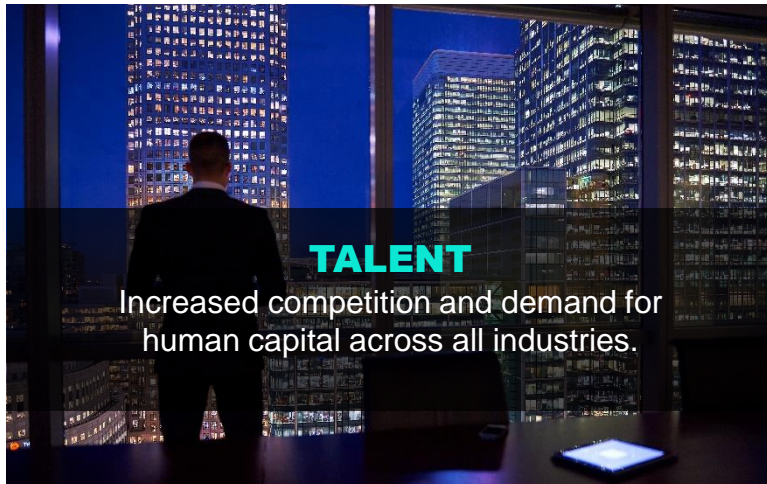
Nicola Bates Global Accelerators and Innovation Programs, Boeing

Nichola joined Boeing over four years ago, following a decade-long career working with early stage and scaling startups, where she championed the role of the SME to government, particularly in the security and resilience sector. Nichola brings extensive experience of international business development and fundraising for growth, from strategy through to execution; with a wide network across governments and industry. Having also gained experience of working inside one of the world's largest corporations she has become even more passionate about the benefits of collaboration between startups and corporates. In her role as Managing Partner for Aerospace Xelerated, Nichola invests in and supports startups that have the potential to disrupt or transform the aerospace sector.

Aerospace
Xelerated



WHY



Convergence of rapidly advancing technical capabilities with shifting market trends & consumer expectations.

FOCUS AREAS

MOBILITY TRANSFORMATION



AUTONOMOUS
SYSTEMS



MOBILITY
PLATFORMS



ALTERNATIVE POWER
SYSTEMS



VEHICLE & AIRSPACE
SERVICES



ADVANCED LOGISTICS

Accelerating the transformation of transportation via new platforms, products and propulsion systems.

SPACE & CONNECTIVITY



SPACE & SATELLITE
SYSTEMS



GROUND SEGMENT &
DATA ANALYTICS



LAUNCH



5G CONNECTIVITY

Launching us into the next generation of space exploration & enhancing connectivity from seabed to space.

INDUSTRY 4.0



WORKPLACE SAFETY,
PRODUCTIVITY &
TRAINING



SMART FACTORIES &
WAREHOUSING



ADVANCED
MANUFACTURING
AND MATERIALS



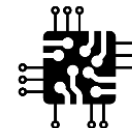
DIGITAL
SUPPLY CHAIN

Disrupting the business environment through innovative approaches, technologies, materials and training.

DIGITAL ACCELERATION



AI & ML



COMPUTING
HARDWARE



CYBERSECURITY &
ENCRYPTION



DATA - ENABLED
BUSINESS MODELS



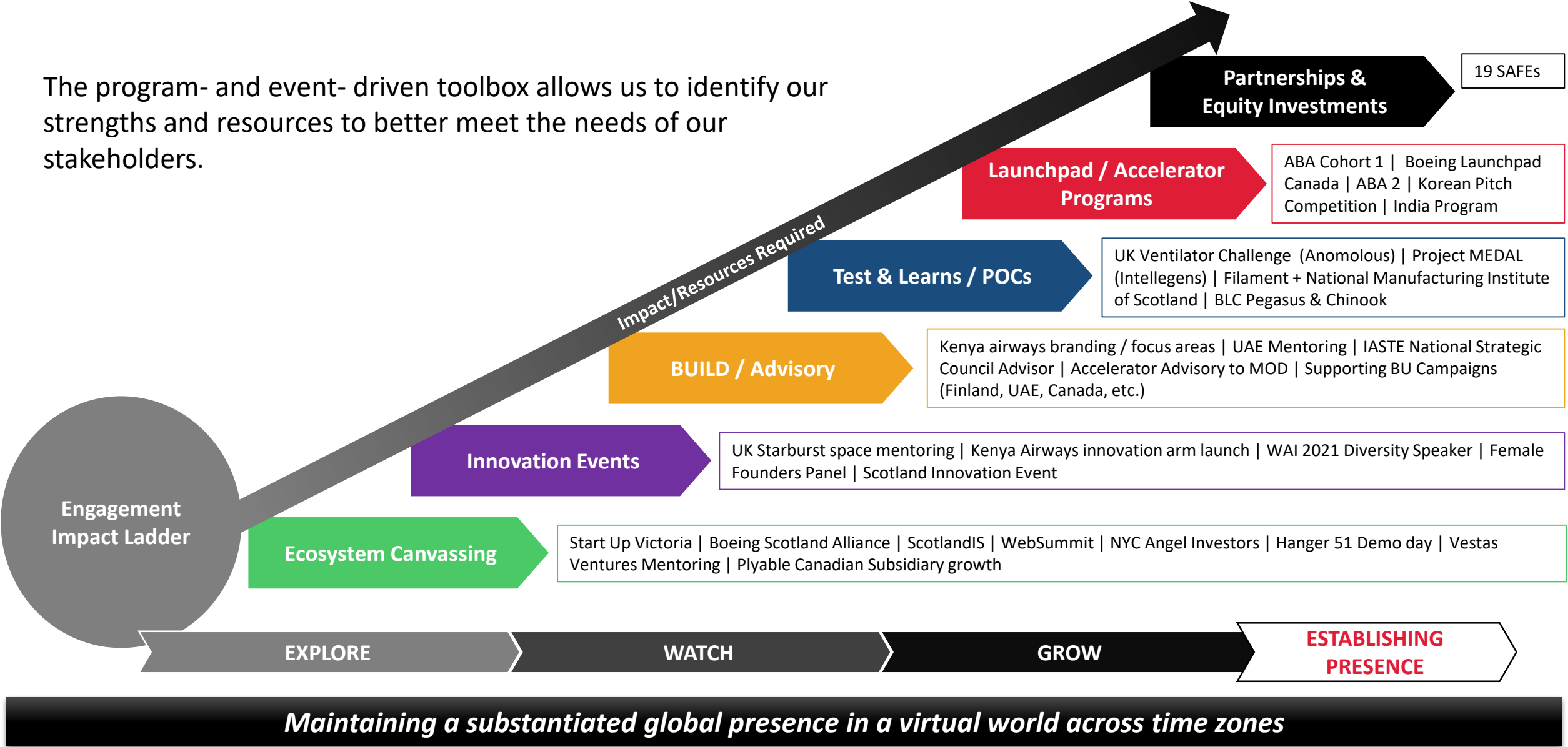
QUANTUM
COMPUTING

Driving differentiation and productivity through computing, usage of data sets and artificial intelligence.

GLOBAL STRATEGY TOOLBOX

Provides a comprehensive view of our capabilities and offerings and allows us a framework to identify the best fit for our stakeholders.

The program- and event- driven toolbox allows us to identify our strengths and resources to better meet the needs of our stakeholders.



Aerospace Xelerated Programs



Aligning autonomy & AI Boeing champions to capability areas to ensure buy in



Thanks

For updates, contact

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Managing Partner

Jacqueline Davidson
Program Director

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[linkedin/nicholabates](https://www.linkedin.com/in/nicholabates)

+1 (314) 327-0083
jd@xelerated.aero
[linkedin/jsnedavidson](https://www.linkedin.com/in/jsnedavidson)

Alan Fisher

With 35 years' experience in the sector, Alan is working to grow the membership of the UK's longest established aerospace and defense trade body.

FAC supports hundreds of companies mainly in the south and south east that work in the aerospace sector and its supply chain.

fac

South East Aerospace

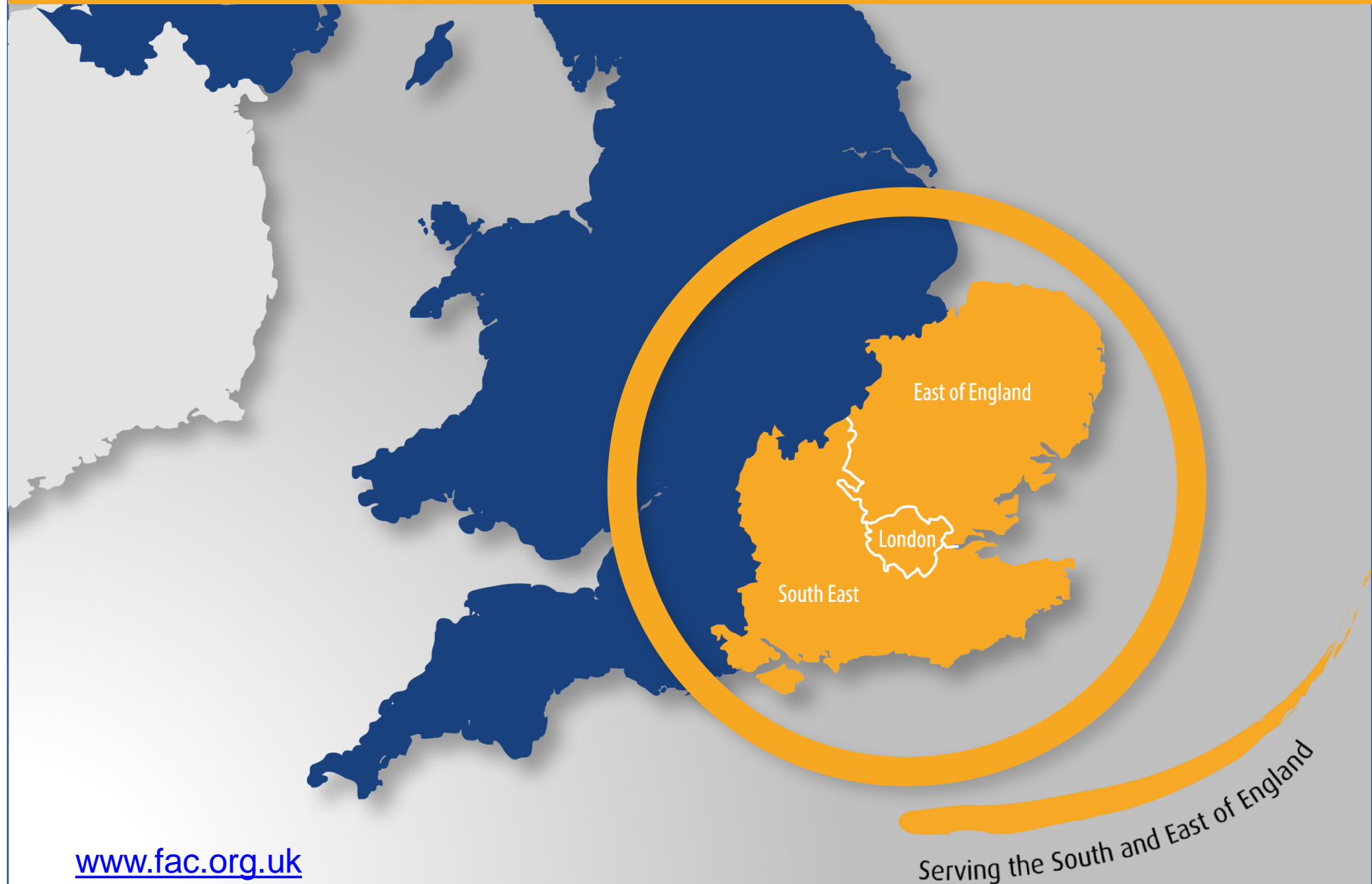
www.fac.org.uk

FAC

- ❑ **FAC** is a not-for-profit trade association acting as a facilitator of business between large global primes and the supply chain in the South East and East of England
- ❑ FAC has 130 fee paying members with a vast array of capabilities
- ❑ FAC is in Farnborough, Hampshire – ‘The Home of UK Aerospace’.



FAC Region



UK Aerospace Major Suppliers



www.fac.org.uk

Serving the South and East of England

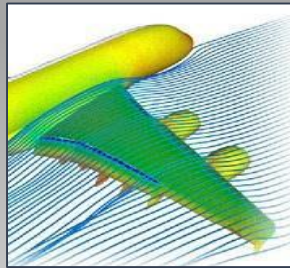
Recent Mergers and Acquisitions



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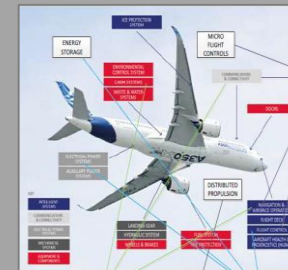
Aircraft Major Systems & Segments



Structures



Helicopters



Systems



Propulsion



Landing
Gear



Aftermarket

Coherent Industry Strategy

The Aerospace Growth Partnership (AGP) brings together the UK Government and industry to tackle barriers to growth, boost exports and grow high value jobs. The AGP industrial strategy for UK aerospace includes a range of measures to make the UK a world-leading environment for investment, including long term certainty around the availability and levels of funding for R&D. It is being implemented across the breadth of the UK: England, Northern Ireland, Scotland & Wales.

The structure of the AGP, comprising around 100 reps from companies of all sizes, and Government is below:



Future Flight Challenge

The Future Flight Challenge



Demonstrates aviation systems incorporating low environmental impact, electrified, increasingly autonomous air vehicles and airspace management by 2025

Pioneers an accessible airborne mass transit and service delivery system

Unlocks new aviation markets worth over \$2Tr and enhances UK prospects in the \$17Tr conventional aviation markets to 2050

Airborne transformation of UK connectivity, exports, productivity and mobility

UK Research
and Innovation

www.fac.org.uk

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Future Flight Challenge Work Streams

Addressing the Future Flight Challenge



Future Air Transport & Services as a System of Systems

- System of systems architecture
- Synthetic modelling environment
 - Assess safety, environmental and economic impact
- Public engagement and survey

New models of airspace management and anticipatory regulation

- Synthetic environment for airspace management system
- Airspace management demonstration – drones in cities

Novel Air Vehicle Demonstrators

- Drones with scalable autonomy
- All Electric/ Hybrid VTOL
- All Electric/ Hybrid CTOL

Ground Infrastructure Systems Demonstrators – city & sub-regional airport

- Drone services
- Electrified air vehicles

New operating models for users and commercial operators of air services

- Future market synthetic environment
- Drone system services demos
- Business models for electrified urban and sub-regional air vehicles

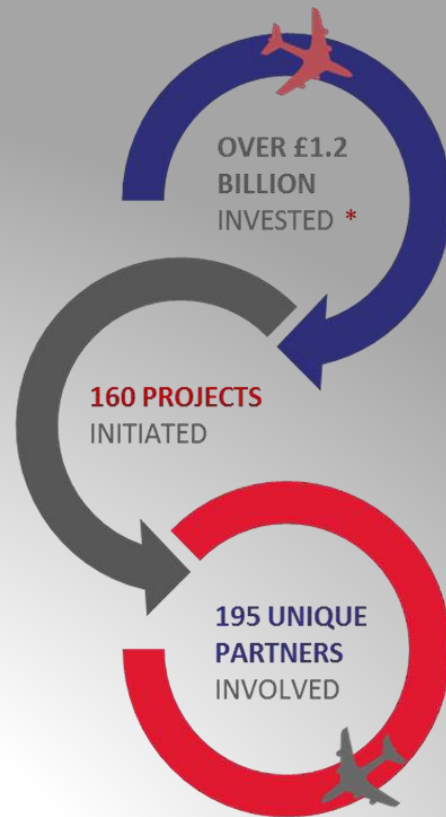
Engagement of authorities is critical (including DfT, BEIS, Local and City Authorities, TfL, CAA, OFGEM)

UK Research
and Innovation

www.fac.org.uk

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Aerospace Technology Institute



1st published
technology strategy



Technology strategy
and Portfolio Update

- An independent institute, funded by the UK Government and industry
- Established to help oversee a £3.9bn R&T investment programme out 2026 to grow the UK's aerospace industry
- Works with Innovate UK and BEIS to stimulate collaborative projects
- Leads initial industry engagement on the development of projects

Four Major Themes





To realise
zero-carbon
emission
commercial flight
by the end of the decade

Aviation's Carbon Challenge

885 million

tonnes of global
CO2 emissions
from aviation each
year

David S Lee, 2018

38.3 million

commercial flights
in 2019

ICAO, 2020

4.5 billion

Total global
passengers in 2019

ICAO, 2020

22 million

litres of kerosene
used from Heathrow
every day in 2019

Rix, 2021

1.5%

potential impact
of contrails on
warming effect

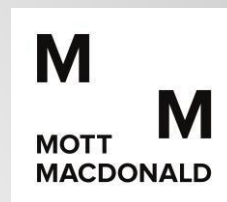
David Lee et al, 2020

0

Target carbon
emissions for
FlyZero Aircraft

Team FlyZero

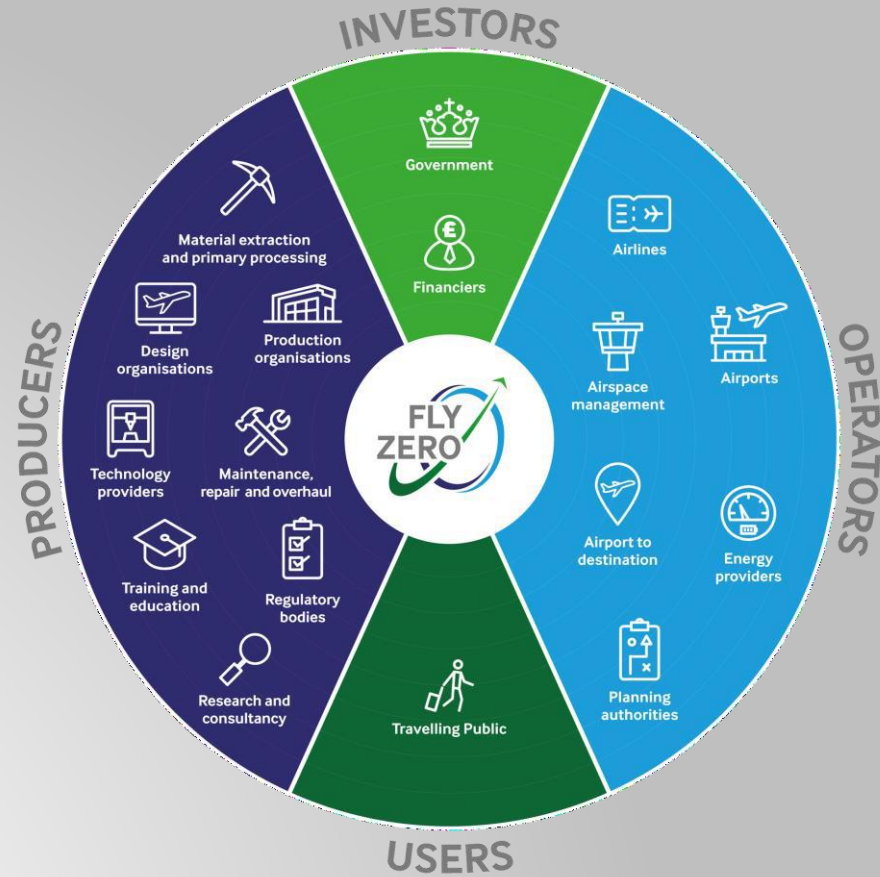
The FlyZero Team is made up of experts on secondment from the organisations shown here as well as independent applicants.

The Airbus logo, consisting of the word "AIRBUS" in a bold, blue, sans-serif font.The Belcan logo, featuring the word "Belcan" in white bold sans-serif font on a dark blue rectangular background.The NATS logo, featuring the word "NATS" in a stylized blue font.

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Working with the whole ecosystem



NATEP

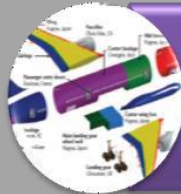
- Focussed on driving innovation at lower levels of the supply chain
- Encourage supply chain partnerships with customer participation
- Support R&D management in the supply chain
- Focus on middle TRLs



£40M invested so far
(including £23M from
Government)



1,200 jobs through
100 projects

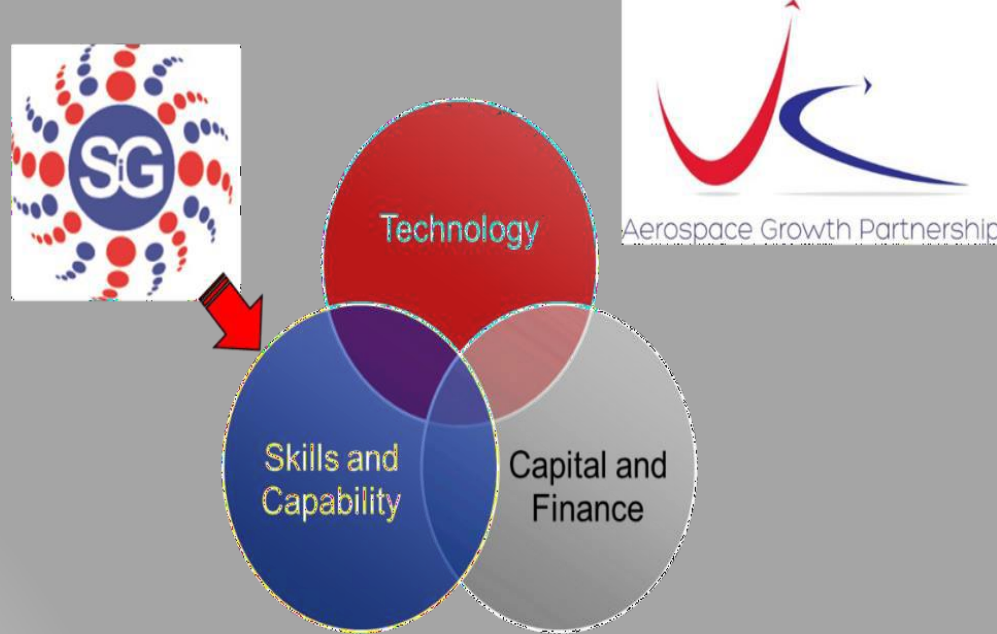


To support technology
development throughout
the supply chain

National Aerospace Technology Exploitation Programme (NATEP)

Sharing in Growth

£250 million Sharing in Growth performance improvement programme, backed with £80m public funding, to get up to 64 companies up to world class levels of competitiveness. It has now delivered over 1 million training hours, and the lead 43 have already confirmed winning in excess of £1.6 billion of contracts as a result of participating.



SC21 - Supply Chains for the 21st Century

- SC21 is an improvement programme designed to increase the performance of UK suppliers and ultimately their supply chains
- Endorsed by all major UK aerospace and defence companies
- Over 750 companies within UK supply chain are SC21 signatories with >100 award winners
- Defines performance goals and standardizes the approach and tools for continuous sustainable improvement
- A collaborative effort with ADS leading the programme at a national level, working with signatory companies, primes, regional trade associations (RTAs), strategic partners and accredited training providers.
- Overseen by the Aerospace Growth Partnership (AGP)
- Plans for SC21 to be enhanced via Supply Chain Competitiveness Charter and cross sector National Manufacturing Competitive Level (NMCL) SC21 Competitiveness+Growth (C+G) programme.



Going Forward

- UK Mission 20221/22



- Farnborough 2022



For more information

Want to know more.....

For more information or to discuss how we can help you achieve your requirements please contact Alan Fisher on:

e: alan.fisher@fac.org.uk

t: 01252 375600

m. 07827 309727

w: www.fac.org.uk



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Conclusion, Question and Answer Session

Submitted questions will now be answered by panelists.