



midlands aerospace alliance

# MIDLANDS

# AEROSPACE

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MAGAZINE



2017 PARIS  
AIRSHOW ISSUE

# MIDLANDS FLYING HIGH WITH A350



MIDLANDS SUPPLY CHAIN CELEBRATES FIRST  
FLIGHT OF THE BIGGEST A350 VARIANT – PAGE 4

## DEBUT FOR AERO ENGINE FORUM

Combined conference, B2B  
event rated success – page 2

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Workshop series aimed at  
helping SMEs – page 5



## NATEP INNOVATIONS HEAD FOR MARKET

Project results underscore value  
of SME research – pages 12-13

▶ **3,900** B2B meetings      **400** delegates      **250** companies      **12** countries ◀

## THUMBS UP FOR FIRST FORUM



Keynote speakers at the 2017 MAA Annual Conference included Mike Whitehead of Rolls-Royce and (below) Deniz Lawrence of Boeing Commercial Airplanes.

THE MAA STAGED ITS ANNUAL CONFERENCE BEFORE TWO DAYS OF INTENSIVE B2B MEETINGS SET UP BY GLOBAL EXPERTS BCI AEROSPACE UNDER THE AERO ENGINE FORUM UMBRELLA.

↙ The first Aero Engine Forum Birmingham was an outstanding success and is expected to lead to significant new business for the Midlands aerospace cluster. That was the conclusion of delegates from 250 aerospace companies who took part in the three-day event in April.

The forum kicked off with the annual MAA Conference – an event designed to help companies of all sizes understand the market opportunities and technological challenges in aero-engines and systems over the next 10 years – and continued with two days of B2B meetings to help them identify new collaborative partnerships.

The MAA partnered with recognised world experts BCI Aerospace to set up the B2B meetings. Leading companies including Rolls-Royce in Derby, and UTC Aerospace Systems and Moog Aircraft Group in Wolverhampton, participated in all three days of the forum.

MAA chairman David Danger, managing director of UTC Aerospace Systems – Marston Aerospace, said the event “highlighted the Midlands as a centre of world-class aerospace expertise.”

Birmingham-based manufacturer AE Aerospace – a conference sponsor – used the opportunity of the forum to sign an important





# NEWS ON THE WEB

CLICK THROUGH TO THE MAA WEBSITE FOR CURRENT NEWS ON MEMBERS' ACTIVITIES:

→ The Comac C919 narrowbody airliner flew for the first time on 5 May, thanks in part to technologies from **Wolverhampton** and **Birmingham**.

→ **Aeromet International** has expanded its relationship with Boeing with a record-breaking set of orders.

→ Redditch-based **Mettis Aerospace** is looking to expand overseas to meet customer demand.

→ The **Active Group** of Staffordshire has been acquired by IESA, a specialist in business process outsourcing.

→ **Paul Fabrications** is Rolls-Royce's fabrications supplier of the year.



[www.midlandsaerospace.org.uk/news](http://www.midlandsaerospace.org.uk/news)



MAA member AE Aerospace was among more than 250 companies participating in the two days of B2B meetings.

new contract. Managing director Peter Bruch said: "We had a series of excellent meetings with potential customers from the UK and overseas.

"This was our first foray into having a stand at a show, it proved extremely worthwhile. This experience has shown us the value of attending these events."

For Kevin McCormick, sales director of Summit Engineering (Birmingham), the event was a success. "The quality of meetings was excellent," he said. "There was a good spread of suppliers and customers. My Day 1 was packed solid with people I wanted to see.

"When you're down the supply chain like we are, it's crucial that we hear from Tier 1 and 2 customers as it enables us to maintain an active and responsive strategy. The conference provided the perfect platform."

■ For a full report, visit [www.midlandsaerospace.org.uk/news](http://www.midlandsaerospace.org.uk/news)



Kevin McCormick (right) appreciated having many key contacts under one roof.

**AEROSPACE & DEFENSE MEETINGS TORINO**

TORINO-ITALY November 29-30, 2017

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2015 Industrial supporter:

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In 2015 the initiative was part of the Plan for the Innovation of Regione Piemonte and Unioncamere Piemonte and was co-financed by the Development and Cohesion Fund

2015 initiative in cooperation with:

In 2015 supported by:

Registration & participants list at:  
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# STRETCH FOR THE SKIES



AS THE AIRBUS A350-1000 FLIES THROUGH ITS TESTING PROGRAMME TOWARD CERTIFICATION AND ENTRY INTO SERVICE, THE MIDLANDS SUPPLY CHAIN WATCHES WITH PRIDE.



The Airbus A350-1000, the largest variant of the European airframer's new family of twin-aisle widebodies, is scheduled to enter service later this year with Qatar Airways, the A350's launch customer.

Airbus has more than 210 orders for the -1000 and no doubt is expecting more at the Paris airshow.

Powered by two upgraded Rolls-Royce Trent XWB-97 engines, the A350-1000 has a range of 14,800km and a maximum payload of 20.89 tonnes. In typical three-class configuration, it will seat 366 passengers.

Flight testing with three pre-production aircraft started last November and, at time of writing, was on schedule. An Airbus statement said the tests "confirm the good performance and behaviour of both the aircraft and its Trent XWB-97 engines" and are "a major successful milestone" en route to certification.

The higher-thrust Trent XWB-97 engines – assembled at Rolls-Royce's plant in Derby – contribute to the A350's drive for ever-greater efficiencies in flight. Rolls-Royce describes it as "the world's most efficient large aero

**97,000**

**lb of thrust generated by each Rolls-Royce XWB-97 engine**

**14,800**

**km range of A350-1000**

**20.89**

**tonnes maximum payload**

engine". It generates up to 97,000 lb (432 kN) of thrust on take-off – making it the most powerful engine ever developed for an Airbus aircraft.

Watching the test programme with pride are members of the aircraft and its engines' supply chain, including members of the MAA. Among

them are MJ Sections, G&O Springs and Sigma Precision Components – all exhibitors at Paris (Hall 2b, Stand G171).

Redditch-based G&O supplies springs for the Trent XWB fuel system, as well as a variety of components incorporated into actuation systems. Sigma makes rigid pipe assemblies for the XWB at its Hinckley and Nuneaton plants, while MJ Sections supplies parts from its Dudley site.

Other MAA members on the A350 programme include Bromford Industries of Birmingham, Moog Aircraft Group of Wolverhampton and UTC Actuation Systems of Wolverhampton.

Dr Andrew Mair, MAA chief executive, said: "The Midlands hosts one of the world's major aerospace clusters that does not make aircraft. Our members develop and manufacture complex sub-systems for the world's aircraft and aero-engine makers.

"It's gratifying but entirely natural that Airbus and Rolls-Royce should tap into that expertise for the A350-1000 and its Trent XWB-97 engines."

## ARE YOU READY FOR AS9100-2016?

**Book now for the next MAA workshop on Rev D on 28 June.**

June may be 'the cruellest month' for anyone still unprepared for the new revision of AS9100:2016.

AS9100:2016 Rev D was published on 20 September 2016, and although the transition period extends to 15 September 2018, from 15 June this year, all third-party certifications, re-certifications and surveillance audits will be to the AS9100:2016 revisions.

At this stage, said MAA manufacturing specialist Michael Cunliffe, companies should have given their certification bodies their transition time line. "Better sooner than later," he added.

The event, on 28 June, is the next in a series that the MAA plans to present every quarter over the coming year to help make sure those who need to understand the standard have an opportunity to do so.

Cunliffe said the MAA workshops are designed to give members easy and affordable access to specialists who will be able to explain what will be updated.

*"We try to make sure members understand what 'current' is. People can lose sight of what it's trying to achieve."*

"The majority of points they've introduced or clarified are things that most likely have been cascaded down from primes. In that regard, it's industry best practice.

"We try to make sure members understand what 'current' is, and we feed back to various bodies about how the specifications impact onto the lower tiers. People can lose sight of what it's trying to achieve, especially if they haven't embedded AS into their processes."

Kiwa, an internationally recognised certification body, is supporting fellow MAA members by providing the resources for this training.

**For details of the workshop and to book places, go to [www.midlandsaerospace.org.uk/events](http://www.midlandsaerospace.org.uk/events)**

# A MIDLANDS AEROSPACE CLUSTER STRATEGY?

AS OUR (STRICTLY POLITICALLY NEUTRAL) CONTRIBUTION TO POSSIBLE FUTURE GOVERNMENT THINKING, HERE ARE SOME THOUGHTS ABOUT HOW OUR MIDLANDS AEROSPACE CLUSTER CAN CONTRIBUTE TO A RENEWED UK INDUSTRIAL STRATEGY.

The last government's Industrial Strategy Green Paper consultation closed just before the election was announced in April. One policy it proposed was to set up 'sector deals' between business and government for key industries. The paper's overriding themes were the importance of 'sector' and 'place'.

So could there be a Midlands aerospace cluster deal or strategy?

In recent years, industrial strategy has focused on a limited number of large investments in new technologies. To some observers this approach is unbalanced and supply chains have received only limited attention. Should industrial strategy be more broadly based if we want a wide impact?

A Midlands aerospace cluster deal could be a bottom-up complement to the national strategy of the Aerospace Growth Partnership (AGP). There could be appropriate cluster strategies in different regions – our friends in the South West have proposed an 'iAero' for their region.

The AGP originally had two objectives:

■ *Ensure that the UK remains Europe's largest aerospace manufacturer and globally keeps its position as second only to the US. This is an ambitious and challenging goal, given intensifying international competition and the rapid pace of innovation in the sector.*

■ *Support UK companies at all levels of the supply chain to broaden and diversify their global customer base. This will be critical given the entry into the market of new manufacturers of large civil aircraft.*

The Industrial Strategy Green Paper consultation was a good opportunity for some fresh ideas, especially to help with the second objective, that are relevant whatever the political colour of government.

Will there be the industry and political will to explore the more sophisticated regional business cluster strategies pursued by our European competitors, for example, as supply-chain-focused counterparts to the big national-scale programmes and projects?

An organisation like the MAA could work with other aerospace cluster bodies to ensure the whole UK is covered, as we have done with the National Aerospace Technology Exploitation Programme (NATEP). We could work with other industry cluster bodies in the Midlands as we are doing with the Midlands Engine Cluster Partnership (*see below*).

A holistic industrial strategy could encompass activities like these that are 'bottom-up', working with the supply chain and its extensive regional clusters.

That would be very much in tune with the direction of travel set out in the Industrial Strategy Green Paper.

## MIDLANDS ENGINE A 'USEFUL VEHICLE'

The Midlands Engine is already emerging into a useful vehicle for a Midlands aerospace cluster strategy within a national framework. We could:

→ ensure future technology support activities aimed, in part, at the aerospace supply chain encourage real bottom-up innovation with strong support from aerospace customers;

→ link national-scale activities such as the Aerospace Technology Institute (ATI) and Catapults into the broad aerospace supply chain manufacturing base, in most cases for the first time;

→ ensure activities to improve supply chain productivity focus squarely on delivering real, measurable, changes in companies;

→ pull together, provide appropriate industry leadership for, and help coordinate Local Enterprise Partnership (LEP) and local authority aerospace strategies across the Midlands;

→ coordinate cross-industry cluster support such as the Midlands Engine Innovation Group's Cross-Industry Technology Exploitation in Clusters (CITEC) proposal.

# ENSEMBLE DE PARIS

ASTECH, A SISTER ALLIANCE OF THE MAA, IS THE AEROSPACE CLUSTER COVERING LE BOURGET, WHICH MAKES THE PARIS AIRSHOW ITS HOME EVENT. ASTECH MEMBERS OPERATE THROUGHOUT THE SUPPLY CHAIN AND WILL HAVE A SIZEABLE PRESENCE AT THE SHOW.

 Most visitors know Le Bourget as the site of an international airshow that attracts aerospace contacts from all over the world. Less well-known is the fact that Le Bourget is also the focal point of a major aerospace cluster organisation, ASTech.

ASTech Paris Région, the equivalent of the MAA in France's second-largest aerospace cluster, has ambitions to solidify its position at the heart of the French aerospace industry.

Despite its status as the leading export industry in the broader Ile-de-France region around Paris, aerospace has much less visibility. This is surprising, given that the sector employs more than 100,000 people, more than 25 per cent of them in jobs related to R&D. It has more than 2,000 SMEs active in the industry, particularly in the fields of systems and equipment.



Beyond research and production capacities, the region of Paris brings together most of the decision-making centres or headquarters of major groups, including Dassault

Aviation, Safran, CNES, the European Space Agency, as well as the largest laboratories and universities.

"We treat Le Bourget as a fly-in, fly-out event," said MAA chief executive Dr Andrew Mair. "We might be surprised if we looked closely at the cluster around Paris. It's big and successful despite being less-known."

ASTech gained national 'competitiveness cluster' status in 2007, which enables it to recommend R&D projects to the French interministerial fund (FUI) for financial support. The FUI's focus is on collaborative projects that can be market-ready in about five years.

The association supports and encourages innovation, particularly among SMEs, to

maintain the Paris region's position, mainly in the areas of space, business aviation, propulsion and equipment.

R&D activity recorded in the 2016 project yearbook includes 68 projects covering a very broad spectrum. About half were concluded during the year.

These projects, which reflect the technologies and expertise among ASTech's members, are grouped under five themes:

- System architecture, vehicles and equipment
- On-board power
- Instrumentation and testing
- Materials, processes and structures
- Propulsion.

Every project has an industrial sponsor, an average budget of 3 million euros and a number of partners; upwards of 10 is not unusual.



[www.pole-astech.org](http://www.pole-astech.org)

Le Bourget airport is the home of ASTech's 'local' show and a focal point for a major aerospace cluster.





**KEY FIGURES FROM 2015**

**£100bn**

**in orders announced at Paris 2015**

**2,300**

**exhibitors at Paris 2015 – a record**

**150,000**

**trade visitors**



The 52nd International Paris Air Show opens its gates for seven days on 19 June with high expectations among organisers and participants alike.

Show organiser GIFAS, the French aerospace industries association, expects to break the records set at the last show in 2015.

Exhibitors at this year's show at Le Bourget airport near Paris – including the MAA – support that ambition because of the tremendous business opportunities that come with the headline numbers. Deals announced at the 2015 show totalled more than £100 billion worth of orders.

The Paris air show, like the fine wines for which France has long been famous, is aging well. More than 100 years old, it is the longest-running aerospace trade show in the world, and the largest. Since 1909,

the show has been at the heart of developments in the global aerospace market, and over the years has become one of the global industry's most important meeting places.

For MAA members, whether exhibitors or visitors, the MAA presence in Hall 2B, Stand G171 will be a focal point of activity. Seven of our eight exhibitors are returning to Paris after successful shows in previous years.

Paris is traditionally a big show for the MAA. "We made our own show debut at Paris in 2005," said marketing manager Emma Burgess. "It's proven over the years to be a good showcase for our exhibiting members who are enthusiastic about being back."

■ **MEET OUR EXHIBITORS: OVERLEAF** →

## SEE YOU AT FARNBOROUGH 2018?



**YOUR CUSTOMERS WILL IF YOU EXHIBIT WITH THE MAA AT OUR PRIME POSITION IN HALL 1.**

Start planning your Farnborough 2018 campaign now – speak to one of our team about booking your pod on the MAA stand. It's the simple way to take your marketing message to the heart of international aerospace.

Contact [info@midlandsaerospace.org.uk](mailto:info@midlandsaerospace.org.uk)



# MEET OUR EXHIBITORS ▶



**HALL 2B, STAND G171**

## **COLUMBIA PRECISION**

Columbia Precision will be exhibiting at Paris this year to promote its enhanced capabilities following investment of several million dollars into the latest technological plant and human resources.

The UK firm, based in Birmingham, has recently installed two Matsuura 5-axis prismatic CNC machines, a Mazak Megaturn and Studer twin-spindle CNC grinder, all of which add to Columbia's unmanned state-of-the-art manufacturing capability.

Columbia has been supplying complete precision engineering solutions to demanding markets including aerospace and defence for more than 37 years.

Operations director Ted Yarnall said the firm "is committed to ongoing investment into NPI, new technologies and training to meet engineering and customer requirements. This enables us to cater for existing and new clients' requirements whilst still competing with low cost economies."

The company's specialist skills include the development and production of complex prismatic and turned parts that can be supplied in kit form and as complete tested sub-assemblies.

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## **DYNAMIC METALS**

As one of the UK's largest stockholders of titanium and super alloys, Dynamic Metals services the aerospace industry worldwide.

From our extensive facility in Leighton Buzzard, we are proud to supply aerospace-quality materials on short lead times. We provide a high level of customer service with a personal, yet professional approach and no minimum order charges.

From our conversion facility in Sheffield, we also have the capability to offer semi-finished products for aerospace customers, ranging from bespoke forgings to heat-treated materials and machined products.

"This is generally outside the parameters of most mills," said director Steve Ambrose, "but this capability allows us to offer our customers quicker service and lower minimum order quantities than a mill order."

"As a valuable additional service, we can also offer technical support."

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## HALL 2B, STAND G171

### G&O SPRINGS

G&O Springs is once again extending an invitation to all Paris visitors and exhibitors to bring them any spring design or technical problems they may have.

It's an extension of the company's free design and technical advice service that has helped make G&O the 'go-to' name for anything to do with springs.

"We have our technical team on hand to solve any issues you may have," said managing director Steve Boyd. "If you bring along a problem they cannot solve on site, we'll give you a free bottle of champagne."

G&O has a slightly different approach to the manufacture of springs. Boyd said: "All the springs we produce are mandrel coiled by skilled operators to the tightest of tolerances." When you visit the stand, he'll explain the benefits of this approach.

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### THE UNIVERSITY OF NOTTINGHAM'S INSTITUTE FOR AEROSPACE TECHNOLOGY (IAT)

IAT is at Paris to talk about its contributions to European aerospace research programmes, particularly the Clean Sky (CS) initiative. It is the only university to be a CS associate member in its own right and to sit on the CS governing board.

Safran singled out the university's work on a Green Taxi Motor as a highlight of CS1, while groundbreaking work in more electric aircraft earned Dr Fei Gao Clean Sky's best PhD award in 2017, a second for the university in two years.

Prof Hervé Morvan, Director of the IAT, said: "Paris is the ideal venue to showcase our work on CS1 and CS2, and to build relationships around our research and innovation capabilities."

The IAT is a major centre for aerospace research at the University of Nottingham with more than 70 projects valued at over £75 million; projects in aerospace materials and structures, manufacturing, electrical systems, engines and propulsion, and operations supported by a range of capabilities including technology demonstration.

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### MAYCAST-NOKES PRECISION ENGINEERING

Maycast-Nokes is a leading supplier of fully finished, machined precision aluminium castings, including high-temperature alloys such as AU5NKZR. The company is one of the only UK foundries capable of offering precision sand and investment/lost wax castings from a single location.

Using rapid prototyping techniques, it can supply castings on short lead times for initial trials or fit, form and function tests. "We can then supply production quantities, from hard tooling, of machined, finished and assembled castings," said sales director Dave Blower.

Maycast-Nokes complements its extensive on-site casting, machining and testing facilities with comprehensive finishing and assembly capabilities. "We are well-versed in most surface treatments associated with aluminium components," said Blower. "We also offer mechanical assembly work."

"This means from a single purchase order, clients can source fully machined, finished and sub-assembled castings, which are ready to go straight to production."

Maycast-Nokes recently became the first foundry to be recognised by the UK government as a Top 100 Apprenticeship Employer for training and skills development.

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### MJ SECTIONS

MJ Sections returns to Paris promoting a further improvement to its latest engineering innovation in sheet metal rings.

The company, a specialist in precision-formed sheet metal fabrications and machined components to the UK and global aerospace markets, is now able to replace traditionally expensive machined forgings with sheet metal rings – and hold tight tolerances where needed.

"The driving forces behind this are the significant lead time and cost reductions that are possible," said commercial manager Steve Cresswell. "The finished product could actually cost less than the forged starting ring."

The innovation in sheet metal rings adds to MJ Sections' diverse range of special processes – all NADCAP approved – including welding, NDT, vacuum heat treatment and, new for 2017, high temperature vacuum brazing.

"Our brazing approval is significant, now meaning that we can join several different rings together (including honeycomb) with the end result being that the rings can be a very exotic shape," added Cresswell.

"We look forward to showing visitors samples on our stand."

The company's current portfolio of parts includes rolled rings, rolled stringers for airframes, precision sealing rings/wires/honeycomb rings, pressed brackets and fabrications, machined parts made from turning and milling (3 and 5-axis).

"We're proud to include leading airframers and engine makers among our customers, providing a fast and proactive response to their needs," said Cresswell.

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Mark Johnson compares composite and traditionally manufactured aero engine pipes. (Photo: Leicester Mercury)

**SIGMA PRECISION COMPONENTS**

Sigma Precision Components is showcasing the latest products from its Sigma Lite range of lightweight aerospace components, alongside traditionally-manufactured components for aero-engine and airframe applications at Paris.

The company, which has manufacturing facilities across the UK and low-cost operations in China, will also mark the 10th anniversary of its Chinese operations at the show, and update customers on increased capacity and expanded capabilities across its businesses.

Mark Johnson, Sigma founder and chief executive, said: "While Sigma started out as a make-to-print manufacturer, we've invested heavily to develop our R&D and new product introduction capabilities over the last few years, creating centres of excellence in Farnborough, Hinckley, Nuneaton and China.

"This capability, combined with our manufacturing and after-market expertise, means we can offer customers complete product lifecycle management, delivering lowest-cost and lowest-risk solutions at every stage.

"Our vision is to support customers by combining the agility, speed and cost structures of a local source with access to a truly global capability, while innovating to keep them at the forefront of their market. It's an approach that is proving popular with both aerospace OEMs and Tier 1 customers around the world."

Sigma manufactures ducting, fabrications, sheet details, airframe sub-assemblies, rigid pipe assemblies, composite components, machined items, specialist fasteners, assembly and build fixtures for aerospace OEMs and Tier 1s. It also provides finishing and polishing services. Its flagship Sigma Lite range includes ground-breaking COMPipe technology – a braided composite pipe for aero-engines and airframes that offers weight savings of up to 50 per cent over traditional components; redesigned end fittings using additive manufacturing techniques; and composite drive shaft technologies.

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**SPINCRRAFT / ENGINETICS AEROSPACE**

Spincraft and Enginetics have chosen Paris to showcase manufacturing processes and hardware components integral to their expanding roles in the aviation market.

Spincraft's Airbus contract includes single-piece spun and machined lipskins for A320neo nacelles. This complements earlier A320neo awards of the PW1100 Series engine, and five-piece exhaust system.

Enginetics' extensive metal-forming and precision-machining capabilities support a broad range of next-generation engines.

To support increased volume, a second Spincraft facility in Wisconsin, USA, was built and opened in 2016. The Spincraft Aviation Aluminum Center of Excellence features 7,154 sq m of new manufacturing floor space, and specialises in thin-gauge forming and close-tolerance components. This factory features 100 per cent flow-line manufacturing, multiple CNC spinning and high-speed 5-axis milling

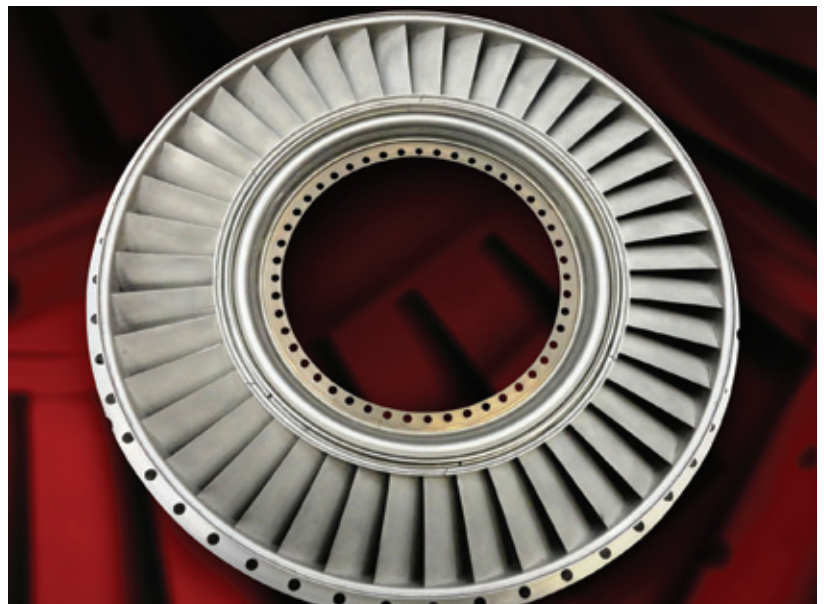


centres, NADCAP-certified aluminum heat treat, and robotic polishing.

Together, Spincraft and Enginetics make up Standex International's Engineering Technology Group (ETG). With six facilities throughout the UK and US, the group provides global manufacturing solutions via collaborative engineering efforts.

Within ETG, the specialised Advanced Engineering Technology team supports US and UK facilities, working directly with customers to develop unique manufacturing solutions. Precision metal-forming technologies are supplemented with vertically integrated manufacturing processes to support aviation, defence and space system markets.

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## AN INDUSTRY VIEW ON BREXIT



*Prof Hervé Morvan, member of the MAA board and director for the Midlands-based Institute of Aerospace Technology (IAT), suggests how the UK aerospace industry can navigate the post-Brexit global landscape.*

Connectivity to the rest of the world is central to a modern and vibrant economy. In the context of the UK, the connections afforded by its aviation sector are particularly important.

It is clear that, with Brexit, the UK is looking beyond its European horizons to forge and grow new commercial and collaboration agreements.

In March, the Aviation Minister, Lord Ahmad, said in a speech to the Airport Operators Association (AOA) that the government is aware of concerns in the aerospace and aviation sectors and is working to deliver on new deals effectively.

He pointed to new horizons in China and India. The government, he said, will do all it can to support growth and/or offer alternative accesses to markets.

In the Midlands, the University of Nottingham has long noted the potential for collaboration in Asia, having actively engaged in the region for more than 10 years.

In aerospace, we have important collaborations with the Aviation Industry Corporation of China (AVIC), the republic's state-owned aerospace and defence company, and the Commercial Aircraft Corporation of China (COMAC), the state-owned aerospace manufacturer.

China is set to play a greater role in key activities such as electric propulsion as it aims to take on environmental challenges. The IAT will be working with colleagues at the University of Nottingham Ningbo China (UNNC) on this grand challenge, at a time when a revolution in aerospace is looming.

While the increase in air travel and flight numbers represents a manufacturing and commercial opportunity, it

*“It is clear that, with Brexit, the UK is looking beyond its European horizons to forge and grow new commercial and collaboration agreements.”*

also places serious stress on the infrastructure that supports the exploitation of the airspace.

In the drive to deliver greener aviation, we are developing more environmentally friendly aircraft, but these developments will only deliver their potential if we can reduce CO<sub>2</sub> production due to network inefficiencies.

This presents a great opportunity for the UK's research and innovation ecosystem, e.g. in satellite, navigation and positioning technologies and the routing of aircraft on the ground and in the air. This includes the Nottingham Geospatial Institute (NGI) and in the area of scheduling and optimisation, it involves the Automated Scheduling, Optimisation and Planning Group (ASAP), both of which are affiliated to the IAT.

Here, it will be important to retain our participation in essential programmes and networks such as the Single European Sky ATM Research (SESAR) programme, as well as our ability to influence the debate and direction of travel to benefit the UK. These are all significant – airspaces are obviously connected.

Beyond the airspace, we also need to look at the airport of the future. The UK has a lot to offer on this front.

Cranfield University is the only university in Europe with its own airfield, which could contribute to such research by offering a unique test platform, while the University of Nottingham has played a crucial role in delivering key technologies in electrification to make airport operations greener. Our green taxi electrical wheel system, for example, grew from a collaboration with the French Safran group, the supplier of systems and equipment for aerospace, defence and security.

The aerospace and aviation sectors are keen to play their part in delivering greater connectivity and green solutions to the UK, and new economic opportunities for the country.



[www.nottingham.ac.uk/aerospace](http://www.nottingham.ac.uk/aerospace)

# OUTSIDE THE BOX

*Four NATEP projects led by members of the Midlands Aerospace Alliance underline the big long-term benefits of the programme.*

## Updating old abrasion process

In this two-year NATEP project, Leicester-based ITP Engines UK and partners Extrude Hone and Brunel University are getting to grips with the science behind a 50-year-old process used extensively to improve the surface finish on metallic parts after machining.

ITP uses abrasive flow machining (AFM) to finish integrally-bladed rotors for aero engines, often referred to as bladed disks, or blisks. These high-value blisks are manufactured from aerospace alloy forgings using expensive 5-axis milling machines on which time is always at a premium.

During AFM, a viscous abrasive paste is forced under pressure across the surfaces of parts to smooth out surface irregularities such as machining marks.

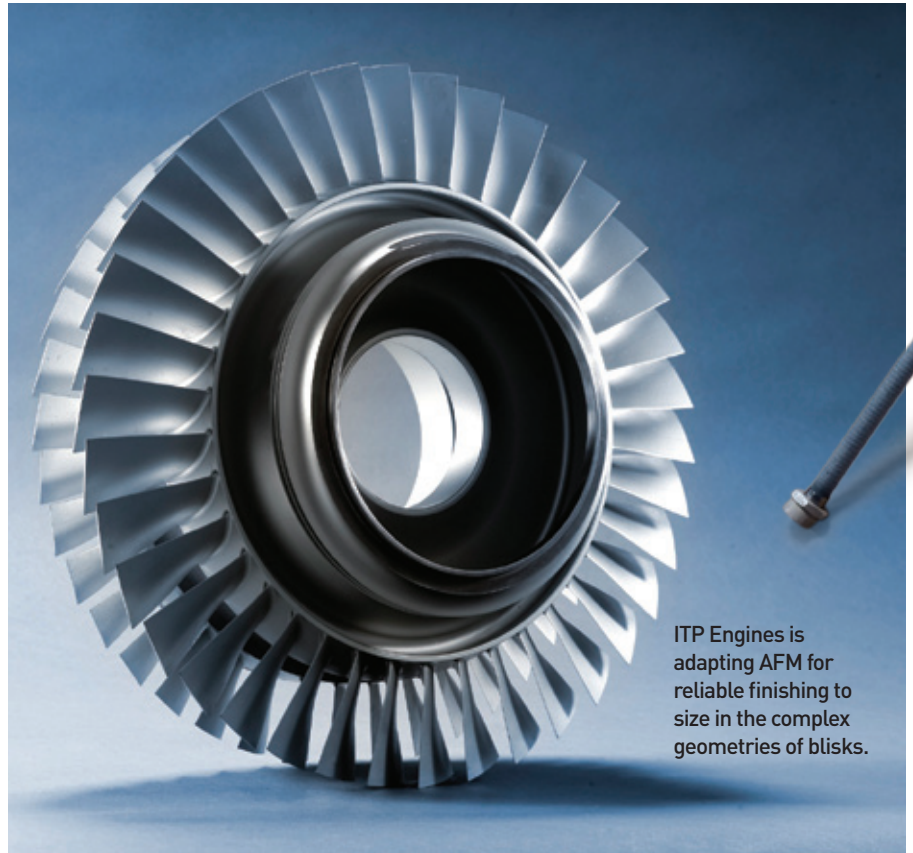
Despite being deceptively simple in concept, the process has always been largely empirical because the underlying physics and chemistry are not fully understood.

As airfoil shapes become more sophisticated, the inability to accurately predict and control the AFM process means that it is becoming increasingly difficult to preserve key features. Caution dictates that some parts need to be subjected to interim measurement on CMM machines, thereby significantly increasing the manufacturing time.

During this project, Brunel University has been constructing a mathematical model of the AFM process and validating it through a series of tests on material coupons and blisk segments carried out by Extrude Hone and ITP.

Although this project still has a little way to go, the results to date are extremely encouraging.

ITP hopes it will be possible to fully integrate AFM into the manufacturing cycle as a controlled process, and that it may even be possible to reduce milling time, safe in the



ITP Engines is adapting AFM for reliable finishing to size in the complex geometries of blisks.

knowledge that reliable finishing to size can be achieved using AFM.

## Adapting pipe-bending technology

Carbon fibre reinforced thermoplastic pipes offer potential weight reductions for aircraft because they are durable, strong and light. The problem with airframe and aero-engine pipes, however, is that they are seldom if ever straight and more usually have bends in complicated 3D geometries.

Traditional manufacture of thermoset composite parts, which involves laying the fibres in a mould replicating the final shape required, is problematic for pipes which can have many different shapes.

Warwickshire-based Sigma Precision Components, a leading supplier of metallic pipes, considered the traditional thermoset

method neither a sensible nor cost-effective approach for composite pipes. Sigma proposed a novel alternative which NATEP has been able to help turn into a reality.

In this 12-month project, Sigma and partner e-Mould UK have developed a process to bend pre-made Sigma composite pipe into the desired form under computer control.

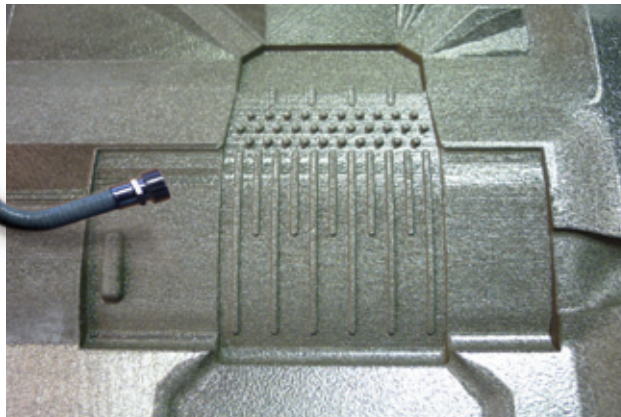
To achieve this, it was necessary to design and manufacture special tools which are heated and cooled during a precisely controlled, automated forming cycle. The bent pipes have been subjected to a range of tests and have been shown to meet performance requirements.

Composite pipe is a disruptive technology which offers up to 50 per cent weight reduction compared to stainless steel and 15 per cent reduction compared to titanium. Owing to temperature constraints of the thermoplastic material, only a proportion of aerospace



New materials developed by SHD Composites are designed to replace 1990-era materials used by AIM Altitude for a Door 2 bar complex installed in Virgin Australia Boeing 777-300 aircraft.

Thermoplastic pipe shape created by Sigma using its novel bending technique.



One-half of a new ceramic core die block, produced using AM.

applications would be eligible for a composite pipe solution, but this is still a very large potential global market.

With its experience in metallic pipes, Sigma is in a good position to exploit the market potential. Aside from aerospace, there is also interest from other sectors such as automotive for lightweight composite tube in applications other than conveying fluids.

**New approach to ceramic cores**

An 18-month NATEP project led by Gardner BTC features the use of additive manufacturing (AM) to help improve the yield from one of the many complex manufacturing steps in making modern gas turbine blades.

Turbine blades for aero engines are usually manufactured by investment casting (or lost-wax processing). This process involves making

a precise negative die of the blade shape and filling it with wax to form a wax blade. If the blade has internal cooling channels, a ceramic core in the shape of these channels is inserted in the wax blade before it is coated with a heat-resistant material to make a metal casting shell. The core remains embedded in the blade alloy that replaces the wax until it is dissolved, leaving the blade channels hollow.

These cooling channels within the blade can be extremely narrow and convoluted, and for the ceramic cores which will eventually form these channels, this can pose a real problem for their manufacturer, Gardner. The thin 'fingers' of these ceramic blade cores are extremely fragile and prone to breakage as a result of thermal stresses during cooling.

Gardner, with 3D printing partner Material Solutions, has redesigned the ceramic core manufacturing dies to introduce optimised thermal control within the die block during

injection. Cooling channels are designed and positioned with the aid of computer thermal analyses to give greater control over the injection process and minimise residual stresses in the injected core.

By using AM, it has been possible to make far more complicated internal pathways than have previously been achieved through conventional machining. In addition to improving the quality of ceramic cores, Gardner predicts that core manufacturing yield improvements will be realised, allowing more difficult core geometry to be more easily made.

**Sugar cane to composite material**

For Lincolnshire-based prepreg manufacturer SHD Composites, a new material set to revolutionise aircraft interiors has been developed using an unlikely biomass waste product.

Under this 18-month NATEP project, SHD – with its partner, AIM Aviation – has developed a new composite material in which the phenolic resin that is traditionally used has been replaced by a furfuryl alcohol resin derived from the inedible part of sugar cane after it is processed. This new material has demonstrated great fire-resistance properties compliant with aerospace standards (CS 25.853) and mechanical properties which are as good as or better than current materials.

However, project leader Nick Smith emphasises that there are other benefits likely to be at least as interesting to the aerospace industry, concerning the health and safety of production workers and the environment. The material is much safer to handle as manufacture does not involve any hazardous volatile organic compounds (VOCs) and the hot melt manufacturing is less energy-intensive and solvent-free, leading to reduced emissions.

Equally important, the material's raw organic matter cannot be used to feed people and its production is sustainable.

SHD has acquired a new factory which will be used to manufacture the new prepreg material after it is certified. Samples are currently being produced for evaluation in uses such as galleys, storage and partitions in cabin interiors – anywhere phenolic material is currently used.

## PROFILE

VIEW FROM THE MAA BOARDROOM

“The UK in many areas can be competitive, given the opportunity”

*The right training, an interest in engineering and a little good luck helped Neil Holmes establish Columbia Precision. Making it successful over nearly four decades has taken dedication and hard work.*

### HOW DID YOU GET WHERE YOU ARE TODAY?

Making things has always been my passion. I was fortunate to get on an early course in CNC machining – which turned me into a ‘data tape’ anorak – and completed a five-year apprenticeship as a machinist in three years. I took time out for international sporting duties with the Great Britain ski squad and then, back in Birmingham, I met my former employer. He offered me a job, but in a split second I decided to ask if he would give me work if I started on my own. To my surprise, he said ‘yes’.

That’s where it started. I had no premises or plant. Another old boss became my original business partner. We bought some old machines and gradually built it up with continual reinvestment in the company.

From the start, I loved the maths side of engineering and problem-solving. We’re going into our 37th year and I still have the same enjoyment and passion for it.

### WHAT’S THE BEST ADVICE YOU’VE RECEIVED?

Listen to what people have to say. There might be something in it that will stand you

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*“A good engineer will always look to make something better, quicker and with better materials. Innovation is what brought a contract back to us from the Far East when the company out there struggled to maintain the quality.”*

in good stead down the road. And don’t be afraid to ask questions – that’s the hardest thing to overcome. There’s no such thing as a stupid question.

### WHAT HAVE YOU LEARNED THAT YOU CAN’T GET FROM A BOOK OR LECTURE?

Experience as much as you can; it teaches you in all sorts of ways. Whether it’s learning directly from experienced people and their skill sets, hands-on experience, anything at all – expanding your knowledge is vital.

### ARE THE DAYS OF TRADITIONAL PRECISION ENGINEERING SHOPS NUMBERED?

Generally, yes they are: you have to move with the technology and today’s engineer needs a broader skill set. However, someone running that technology still needs to understand speed, feeds, materials and cutting tool technology.

### HOW SHOULD A BUSY SME APPROACH INNOVATION/R&D?

Years ago, I’d have seen R&D only in cost terms but now I see the benefits. A good engineer will always look to make something better, quicker and with better materials. Innovation is what brought a contract back to us from the Far East when the company out there struggled to maintain the quality. We were aggressive in taking cost out of the job and ultimately the job came back to the UK.

### HOW CAN MORE COMPANIES ‘RESHORE’ WORK?

There’s been a trend with many buyers thinking they must go to a ‘low-cost economy’, but I feel the UK in many areas can be equally, if not more, competitive given the opportunity.



### WHAT DO YOU BRING TO YOUR ROLE AS AN MAA DIRECTOR?

It offers a way to open dialogue and engage with all companies and sectors and bring representation and a voice from an SME perspective, highlighting our needs compared to that of a larger organisation.

### WHAT KEEPS YOU AWAKE AT NIGHT?

My brain doesn’t switch off. I’m always thinking how we can improve the business through efficiencies, expansion and new opportunities. People put you under pressure; how you deal with pressure is up to you. That’s what keeps me awake, but in a good way.



[www.columbia.uk.com](http://www.columbia.uk.com)

# FOR YOUR DIARY

ONLINE: [WWW.MIDLANDSAEROSPACE.ORG.UK/EVENTS](http://WWW.MIDLANDSAEROSPACE.ORG.UK/EVENTS)

## CALENDAR

### PARIS INTERNATIONAL AIRSHOW 2017

Le Bourget, Paris, 19-25 June

The largest airshow in the world once again will bring together all the players in this global industry around the latest technological innovations.

### AEROSPACE MARKET DATA: WHERE TO FIND IT, HOW TO USE IT

MAA offices, Coventry  
6 July

A breakfast workshop for MAA members focusing on how to make data work for you in bidding for new work.

### ADVANCED ENGINEERING 2017 NEC, Birmingham 1-2 November

Visit the MAA on stand 06 at the UK's largest annual gathering of advanced engineering professionals.

### AS9100:2016 WORKSHOP

MAA offices, Coventry  
28 June

Learn about implementing AS9100:2016 which continues the trend towards meeting customers' expectations of quality and reliability within the aerospace and defence sector.

### FIRST MAA ANNUAL DINNER

Hyatt Hotel, Birmingham  
11 October

Join the Board of the Midlands Aerospace Alliance to celebrate our 15th birthday at a black-tie business dinner.



For further information and to book your place at an MAA event, please scan the QR code or visit [www.midlandsaerospace.org.uk/events](http://www.midlandsaerospace.org.uk/events)



## ABOUT THE MAA...

The Midlands Aerospace Alliance (MAA) is the voice of companies in the British Midlands supplying global aerospace. Its 300 member organisations range from global aerospace players to SMEs. The MAA board comprises senior managers from Meggitt, Moog Aircraft Group, Rolls-Royce and UTAS Actuation Systems, elected supply chain representatives and key regional partner bodies.



For additional copies of *Midlands Aerospace*, or to add your colleagues to the distribution database, please contact the MAA by any of the means below.

If you have a query or suggestion that you would like to make, please contact the MAA.

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F: +44 (0) 2476 430251  
E: [info@midlandsaerospace.org.uk](mailto:info@midlandsaerospace.org.uk)

## NEW MEMBERS

The MAA welcomes the following new members

### ADDQUAL

Derby  
Qualification, capability and fast make services for aerospace products.

### AIRCRAFT RESEARCH ASSOCIATION

Bedford  
Aerodynamic research, design, development and analysis service.

### BOWERS GROUP

Camberley, Surrey  
Precision measurement.

### ELECTRO OPTICAL SYSTEMS

Warwick  
Technology supplier for industrial 3D printing of metals and polymers.

### LEE PRODUCTS

Gerrards Cross, Buckinghamshire  
Sales and distribution of miniature fluid control components.

### MAJENTA SOLUTIONS

Coventry  
Consultancy, training and software.

### MGS PRECISION

Stone, Staffordshire  
Manufacture of complex precision parts.

### ORBITAL WELDING EQUIPMENT

Sandy, Bedfordshire  
Supply of orbital welding, cutting and bevelling equipment.

### ROMAX TECHNOLOGY

Nottingham  
Software, analysis and services for gearbox, bearings and driveline systems.

### ROZONE

Wednesbury, West Midlands  
Innovative solutions to complex cleaning problems.

Become a member of the MAA and join the 300+ other companies and organisations who are already enjoying the benefits of belonging to one of Europe's largest aerospace industry regional bodies. It costs your company only £520 per year if you are in the Midlands or £725 if not.

### WHAT CAN THE MAA DO FOR YOU?

A three-fold strategy guides the MAA's activities.

- Sharing knowledge and information
- Delivering expert support to members
- Leading coordination of shared strategy

For information about membership in the MAA, go to our website: [midlandsaerospace.org.uk](http://midlandsaerospace.org.uk) or contact the MAA office.



[www.midlandsaerospace.org.uk/join](http://www.midlandsaerospace.org.uk/join)



midlands aerospace alliance



midlands aerospace alliance

One of the world's biggest regional aerospace alliances



Are you a member?



- Over **300 organisations** are members of the **MAA**
- Including Primes and Tier 1 companies like **Rolls-Royce, UTC Aerospace, Moog Aircraft Group** and **Meggitt**
- Expert support for members, like **marketing for new business, technology funding** and **specialist aerospace services**
- Companies from **outside** our region are **welcome** to join!