

SEPTEMBER 2026 AEROSPACE MANUFACTURING AND DESIGN.COM

AEROSPACE

MANUFACTURING and DESIGN

Dedicated to the Design, Manufacturing, and MRO of Aircraft and Aerospace Components

FARNBOROUGH

INTERNATIONAL AIRSHOW 2026

➤ **DEFENSE PRODUCTS MULTIPLY,**
electric aircraft fly; commercial aircraft
and engines dominate sales.



ALSO INSIDE:

GRINDING AEROSPACE
TURBINE BLADES
PG. 8

QUANTUM COMPUTING
TRANSFORMING
AEROSPACE
PG. 16

DISCOVERING
NEW ALLOYS
PG. 26



SUMITOMO RECONDITIONING



OUR SERVICES DELIVER 5 ADVANTAGES!



10 Business Day
Lead Time

Back in Business in 10 days!
PO receipt $\longleftrightarrow$ Shipping from facility
Standard products only



2 Day Air
Special Flat Rate

Rate applies roundtrip!
Shipments up to 10 lbs.



Sumitomo **Q**uality

Original manufacturing quality is
applied to each reconditioned tool



USA Process & Service
in Wisconsin

We take pride in our craftsmanship!



DLC Coating
Available

We also provide services for
Diamond-Like Carbon Coating



www.sumicarbide.com/reconditioning

10

COVER STORY

FARNBOROUGH

INTERNATIONAL AIRSHOW 2026

► Defense products multiply, electric aircraft fly; commercial aircraft and engines dominate sales.



► FEATURES

- 16 3 ways quantum computing is transforming aerospace**
Accelerating aircraft design, optimizing logistics and air traffic management, and discovering next-generation aerospace materials show the potential.

► DEPARTMENTS

- | | |
|---|-----------------------------|
| 4 FROM THE FLIGHT DECK | 22 3D/AM |
| 6 CHECKING IN | 23 NAME THAT PLANE |
| 8 CNC INSIGHTS | 24 ON THE RADAR |
| 9 GAINING ALTITUDE | 25 AD INDEX |
| 14 UP AND SOARING | 26 1 LAST LOOK |
| 20 MAINTENANCE, REPAIR, & OVERHAUL | |

AEROSPACE MANUFACTURING AND DESIGN (USPS #025-557) is published semi-monthly: January/February, March, April, May, June, July, August, September, October, November/December. Copyright 2026 GIE Media Inc., 5811 Canal Road, Valley View, OH 44125. All rights reserved. No part of this publication may be reproduced or transmitted by any means without permission from the publisher. For quality article reprints of 100 or more, call GIE Media, Inc. at 800/456-0707 and ask for the Reprint Department. Subscriptions and classified advertising should be addressed to the Valley View office. Periodicals postage paid at Cleveland, Ohio, and additional mailing offices. Postmaster: Send address changes to AEROSPACE MANUFACTURING AND DESIGN 5811 Canal Road, Valley View, OH 44125. Canada Post: Publications Mail Agreement #40612608 Canada Returns to be sent to The Mail Group, P.O. Box 25542, London, ON N6C 6B2

> **ERIC BROTHERS**

Editor • EBrothers@gie.net



Progress comes from applying AI on the shop floor

THE COMPANIES making progress with artificial intelligence (AI) are the ones applying it to factory operational data to stabilize output, improve first-pass yield, and reduce rework. That's the finding of a recent Accenture survey.

Our team at the Farnborough International Airshow had the opportunity to discuss the findings with Accenture's senior managing director – aerospace and defense, global lead, John Schmidt, and Jeff Wheless, Accenture's growth & strategy research leader.

Schmidt gave a little background to the study. "Supply chain is always a thing. Getting parts is the problem. We see companies who've been pointing a finger at suppliers as the problem starting to recognize operations inside their own four walls are also a problem, and 42% of them said, 'AI is what we need to use to get us out of it.'"

Wheless adds, "It's a big deal when you're saying, 'Oh, it's inside my walls,' because it's always been a supplier problem – you never admit it's *your* problem. Manufacturers are now admitting it's a production problem, and *then* a problem with the supplier."

Schmidt says applying AI in the back office – for finance, human resources, engineering, supply chain management – isn't going to show immediate, measurable results. It's different for physical AI, the automation going into facilities, including robotics or automated material handling. He sees the companies making progress are the ones

looking at problem areas in machining, in the factory, on the assembly floor, and having a triage team formulate the business case to automate. "What are the options to do that? When they see the business case, it will be focused and very specific; you don't need to automate the entire factory."

Schmidt gives an example: "If I have 70% first-time quality, is there a way to make that 100% by automating? That business case is easier to get through the chief financial officer who says, 'I can see the money that goes out to do this, but I'm having trouble seeing where it comes back.' But with the physical AI and what you can do on the shop floor, you can say, 'Okay, if we do this, we're going to take our quality defects down to zero and here's the return on investment from reduced scrap.'"

Wheless says the use of physical AI has reached a tipping point, "We asked what are you doing to resolve your supply chain issue and parts? And this is the first time AI was top of the list. We had 42% applying physical AI."

"That may or may not sound impressive," Schmidt says, "but it was the number one thing they're doing." He underscores the purpose of using AI, saying, "We're not trying to replace humans. We're trying to deal with the fact that we have fewer people available to do these jobs."

And the jobs benefiting the most from AI aren't administrative tasks but production. – *Eric*

AEROSPACE
MANUFACTURING and DESIGN

PUBLISHER

Elizabeth Engler Modic, Group Publisher
EModic@gie.net • 216.393.0264

EDITORIAL

Eric Brothers, Editor

EBrothers@gie.net • 216.393.0228

Jake Kauffman, Senior Editor

JKauffman@gie.net • 216.393.0217

Clare Scott, Managing Editor

CScott@gie.net • 216.393.0314

Eric Schwarzenbach, Contributing Columnist

ESchwarzenbach@mygrinding.com

Justin McCombs, Editorial Intern

JMcCombs@gie.net • 216.393.0324

GRAPHICS

Katelyn Mullen, Art Director

KMullen@gie.net

COORDINATOR/SUBSCRIPTIONS

Amanda Scolaro, Market Coordinator

AScolaro@gie.net • 216.393.0249

Abigail Patton, Audience Development Associate

Subscriptions@aerospacemanufacturinganddesign.com

SALES/ADVERTISING

Russ Warner, Sales Director

RWarner@gie.net • 216.393.0293

Patrick Roberts, Regional Sales Manager

PROberts@gie.net • 216.393.0265

Andrew Nicholas, Regional Sales Manager

ANicholas@gie.net • 216.393.0316

Patrick Roberts, Classified Ad Manager

PROberts@gie.net • 216.393.0265

Simone Ciolek, Europe (excluding Italy)

SCiolek@gie.net • 49.9771.1779.007

Diego Casiraghi, Italy

diego@casiraghi-adv.com • 39.031.261407

Octavia Yeung, Hong Kong Regional Sales Manager

Octavia@ringier.com.hk • 85.2.236.98788 ext. 21

Sandra Su, Taiwan Regional Sales Manager

SandraSu@rignier.com.hk • 886.4.2329.7318

Maggie Liu, China Regional Sales Manager

MaggieLiu@ringiertrade.com • 86.2885.5121

CORPORATE

Richard Foster, Chairman

Chris Foster, President and CEO

Dan Mooreland, Publisher Emeritus

James R. Keefe, Executive Vice President

Kelly Antal, Chief Financial Officer

Christina Warner, Director of Data Acquisition

Maria Miller, Director, Conferences & Events

Irene Sweeney, Marketing Director

Jim Blayney, Graphics Director

Michelle Wisniewski, Production Manager

**CORPORATE/EDITORIAL/
PRODUCTION/SALES**

5811 Canal Road • Valley View, OH 44125

ph: 800.456.0707 / fax: 216.525.0515

INDUSTRY PARTNERS





THE MIXING BEHIND THE MISSION

Built for mission-critical environments, ROSS Mixers deliver precise, repeatable mixing of propellants, adhesives, composites, and specialty materials used across aerospace and defense manufacturing.

Because in aerospace, **every batch counts.**



Made in the **U.S.A.** Trusted **Worldwide.**

Kratos expands Oklahoma City manufacturing facility

Kratos Defense & Security Solutions Inc. is expanding its Oklahoma City, Oklahoma campus with the addition of 106,000ft² of manufacturing and production space. The expansion supports increasing demand for the company's family of high-performance jet-powered drone systems, including the Valkyrie collaborative combat aircraft, the Firejet/Mighty Hornet IV, and others.

Kratos currently produces approximately 165 high-performance jet drones annually, and the expansion will enable the company to further increase production to meet growing demand from the U.S. Department of War and allied customers.

"The future fight demands the ability to rapidly produce affordable, high-per-

formance systems at scale," says Steve Fendley, president of Kratos Unmanned Systems Division. "This expansion in Oklahoma City reflects our long-term commitment to investing ahead of customer demand and building the industrial capacity needed to support the Department of War's modernization priorities. As autonomous systems become increasingly central to the future force, manufacturing readiness and production at scale will be just as important as technology readiness, maybe more."

The expanded facility will provide additional manufacturing, assembly, integration, and test capacity for multiple Kratos tactical jet aircraft programs, including Valkyrie, the collaborative combat aircraft (CCA) selected by the U.S. Marine Corps



as the foundation of its CCA program of record. The expanded facility will also manufacture the Mighty Hornet IV, a tactical unmanned system, and support increased production capacity for Kratos' family of high-performance aerial target systems such as the Firejet system for realistic operational test, evaluation, and weapons training across the U.S. military and allied nations.

Kratos drones were featured in GIE Media's Manufacturing Group IMTS 2026 booth.

➤ kratosdefense.com

PHOTOS COURTESY OF RESPECTIVE COMPANIES



Greenleaf®
Sustainable Productivity

**TIRED OF RISING TUNGSTEN
CARBIDE COSTS?**



Greenleaf Ceramics:
Made in America, Sold Around the World!

Appointments

CNC grinding technology, automation, and software company **ANCA** appointed **Edmund Boland** as group CEO.

He first worked within the business during school holidays across a range of departments, including the factory floor, stores, and the Grinding Centre. During the past two decades he built a career across finance, global supply chain, international leadership, and operations, holding senior roles including GM of ANCA Europe and GM of ANCA CNC Machines.

ANCA Co-Founder Pat Boland welcomed the appointment, highlighting



▲ Boland

Edmund's long-standing commitment to the business and its customers. "I've watched Edmund earn the respect of our people, suppliers, and customers over many years. He's done it through hard work, integrity, and a genuine commitment to helping manufacturers succeed."

> machines.anca.com

Michael (Mike) Marucci joined **AMETEK Specialty Metal Products** as division vice president & business unit manager. In this leadership role, he leads the production and delivery



▲ Marucci

of the company's differentiated tube, strip, and powder metal solutions, supporting customers across aerospace and defense.

The company also appointed **Dr. Rahul Bhattacharya** director of quality and technical at Fine Tubes, a UK-based AMETEK Specialty Metal Products facility for precision tubing. In this role, he's responsible for ensuring Fine Tubes' products consistently meet customer expectations, engineering specifications, industry standards, and regulatory requirements.

> ametekmetals.com



▲ Bhattacharya

MAKE THE SWITCH to GREENLEAF CERAMICS!

Greater metal removal rate

Higher cutting speed

Chemical stability

Superior heat resistance and hot hardness

INCREASED PRODUCTIVITY!

vs carbide in similar tooling applications



18695 Greenleaf Drive | Saegertown, PA 16433 | 814-763-2915
©2026 Greenleaf Corporation

Greenleaf Corporation is ISO 9001 Certified

➤ **ERIC SCHWARZENBACH,**
founder of MyGrinding Inc., retired as
president from Rollomatic Inc. – global builder
of CNC grinding and laser cutting machines.



The role of grinding

in producing aerospace turbine blades

Manufacturing turbine blades involves several CNC grinding operations. This column outlines some of the areas where precision CNC grinding is essential.

On the tooling side, fir-tree milling cutters are commonly used to machine the root sections of turbine blades and rotor discs for jet engines. Most of these cutters are manufactured from tungsten carbide, while some are still available in high-speed steel (HSS). Their distinctive profile consists of a series of interlocking serrated shoulders resembling the shape of a fir tree. This geometry produces a robust mechanical interface between the blade and the rotor disc, capable of absorbing severe mechanical stress and distributing high centrifugal and rotational loads.

High-quality fir-tree milling cutters are invariably designed with helical flutes to improve chip evacuation. However, designing the profile of a helically fluted cutter requires special consideration. A direct 1:1 replication of the grinding wheel path accurately produces the desired profile only on straight-fluted tools. Once a

helical flute is introduced, the helix geometry distorts the form, making compensation for the grinding wheel path essential to achieve the correct final profile. Many CNC tool design software packages include built-in compensation features, or separate programs can be used to perform these calculations.

These cutters are used for roughing and/or finish milling the fir-tree root sections of turbine blades, as well as the corresponding attachment slots in rotor discs. On most commercial turbine engines, the final geometry is produced by a process known as CNC creep feed grinding where the machine feeds the grinding wheel very slowly across the workpiece while taking a deep cut, ensuring the precise serrated profile is formed accurately

Manufacturing turbine blades involves several CNC grinding operations. Here are the areas where precision CNC grinding is essential.

in just a few passes. This combination of low feed rate and high depth of cut enables the complex serrated fir-tree profile to be ground with exceptional accuracy and surface finish.

Grinding wheel selection typically includes electroplated cubic boron nitride (CBN) wheels, in which the finished profile is incorporated into a single layer of CBN abrasive crystals, as well as vitrified CBN wheels, which support automatic in-process or continuous dressing to maintain profile accuracy.

Although some smaller blades are machined from solid stock, most high-performance turbine blades are produced by

investment casting using the lost-wax process. Following casting, turbine blades typically undergo precision grinding to improve surface finish, remove casting imperfections, and prepare the surface for the application of protective coatings. In addition, the blade tips need to be finish-ground. As the outermost section of the rotating assembly, the blade tips operate at the highest peripheral speeds and have a significant influence on aerodynamic efficiency.

These operations are typically performed using 5-axis creep-feed grinding, in which a CBN grinding wheel is fed slowly into the superalloy workpiece while removing material in one pass. Grinding aerospace alloys generates intense heat. If not properly cooled, the blade's crystalline structure can suffer thermal damage, potentially causing a catastrophic engine failure. High-pressure and high-volume coolant oil is applied directly to the grinding zone to dissipate heat and flush away grinding sludge.

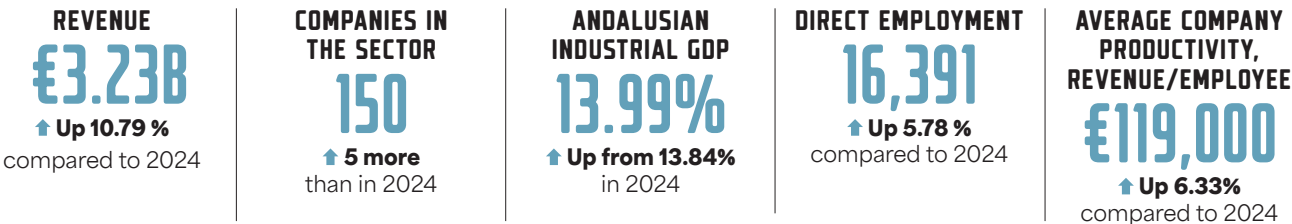
Do you have any manufacturing challenges?

Email me so I can address them in a future column:
eschwarzenbach@live.com.

ANDALUCÍA AEROSPACE

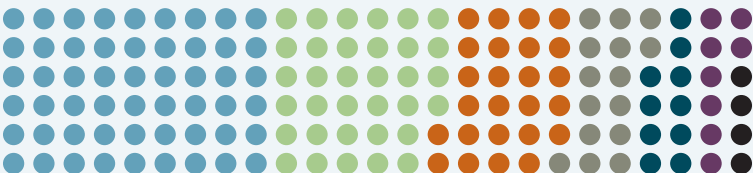
The Andalusian aerospace and defense business cluster in southern Spain reports noteworthy gains in 2025.

2025



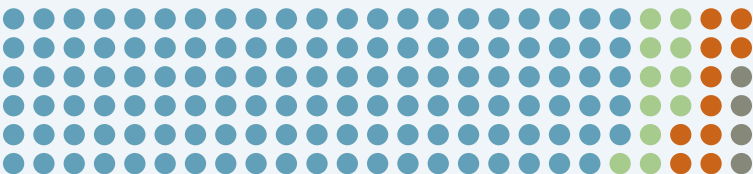
SECTOR DETAILS

NUMBER OF COMPANIES BY MAIN ACTIVITY

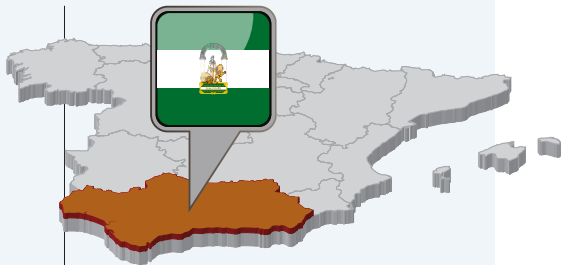


54	Aerostructures, assemblies, mechanical activities, composites, plastics
34	Engineering and consultancy
25	Services: logistics, industrial maintenance, training
15	Equipment, systems
10	Technical testing, analysis
8	Integrator (aircraft, spacecraft, UAS)
4	Maintenance, repair, and overhaul (MRO)

NUMBER OF COMPANIES BY MAIN SEGMENT AND REVENUE SHARE



125 Aeronautic industry 76%	11 Aviation and General Aviation (MRO, aircrew training, aerial work) 15%	10 Space activities 7%	4 Uncrewed aerial systems (UAS) and advanced air mobility (eVTOL) 2%
-----------------------------------	---	------------------------------	--



ANDALUSIA FAST FACTS

- ↓ Civil aerospace programs account for **64%** of revenue, compared to 58% in 2024
- ↓ Accounts for **38.4%** of Spain's aerospace exports
- ↓ **2nd largest** exporting region in Spain

Source: andaluciaaerospace.com/wp-content/uploads/2026/07/Andalusian-Aerospace-report-2025-Compressed.pdf

FARNBOROUGH

INTERNATIONAL AIRSHOW 2026

Defense products multiply, electric aircraft fly; commercial aircraft and engines dominate sales.

➤ BY ERIC BROTHERS

The 2026 edition of the Farnborough International Airshow (FIA 2026) witnessed commercial deals worth more than \$84.7 billion from 353 firm commercial aircraft orders and 904 firm engine orders. Boeing, Airbus, Embraer, CFM, and Pratt & Whitney led the commercial announcements.

During its five-day run, FIA 2026 welcomed 141,580 trade and public visitors, a show-on-show increase of 41%, and nearly double 2022's attendance, representing 136 countries.

The aerial displays were noteworthy: United Arab Emirates' Fursan Al Emarat – the UAE National Air Display Team – made a colorful Farnborough debut with their seven-jet aerial display (the customary display team, the Royal Air Force Red Arrows, was touring North America as part of the America 250 celebrations.)

Electric flight soars

Vertical Aerospace completed the first public electric vertical take-off and landing (eVTOL) flight at FIA 2026, switching to and from helicopter to airplane mode.

▼ Vertical Aerospace's eVTOL makes its first Farnborough flight.



GE Aerospace flew its Electrified Powertrain Flight Demonstration (**EPFD**) aircraft, a modified Saab 340B, every day of the air show. In May, the EPFD made a high-altitude hybrid electric flight above 30,000ft, the altitude of a passenger commercial aircraft, with the help of NASA, BETA Technologies, and Boeing subsidiary Aurora Flight Sciences, at Plattsburgh, New York. The EPFD aircraft then made the first hybrid electric flight across the Atlantic Ocean (with numerous stops), landing in Farnborough before FIA 2026 opened.

Inside

More than 270 U.S. aerospace companies filled the USA Partnership Pavilion, the largest international group at the airshow. **Kallman Worldwide** celebrated its 30th year supporting U.S. exporters abroad showcasing 25 state pavilions and 79 new companies.

Defense present and growing

Across from the exhibit halls, major defense contractors' display buildings featured mock-ups or demonstrators of collaborative combat aircraft (CCA), drones, and autonomous cargo-hauling air vehicles based on existing helicopter or eVTOL aircraft. Leonardo's PROTEUS VTOL and **BETA's MV250** hybrid power VTOL multi-mission utility aircraft are examples of the latter category. A company that didn't exist a decade ago, Anduril Industries, had a building to rival those of legacy aerospace and defense companies.

Commercial aircraft sales

SMBC Aviation Capital, a global aviation finance platform servicing a fleet of 1,700 aircraft for more

▲ United Arab Emirates' Fursan Al Emarat – the UAE National Air Display Team – make a colorful Farnborough debut.

than 170 airlines, placed orders for 100 **Boeing** 737 MAX Jets and 100 **Airbus** A320neo family aircraft. The 100 Boeing 737 MAX airplanes include 40 737-8 and 60 737-10 jets. It's the lessor's first 737-10 order and the largest lessor order for the largest of the 737 series.

SMBC Aviation Capital CEO Peter Barrett says, "This order reflects market dynamics as our airline and investor customers look to upgauge to the 737-10. This order will support their growth ambitions well into the next decade."

The Airbus firm order, finalized at FIA 2026, is for an additional 65 A321neo and 35 A320neo aircraft.

"This significant new order will give our airline customers access to a continuous delivery pipeline of the latest technology A320neo family aircraft into the mid-2030s," Barrett says.

Embraer's largest sale was with aircraft

lessor **Azorra**, for 20 passenger-to-freighter conversion firm orders and 10 purchase rights. The order follows the successful entry into service of the E190F in March and marks Azorra's entry into the freighter leasing market, making the company among the first lessors to commit to the Embraer E-Freighter.

Fort Lauderdale, Florida-based Azorra's current fleet consists of 338 aviation assets, including 186 owned and managed aircraft, 103 owned engines and airframes, and a committed pipeline of 49 aircraft including Airbus A220 and Embraer E/E2 aircraft.

Record engine agreements

FIA 2026 set a benchmark for engine deals, with **GE Aerospace** and the 50-50 joint company of GE Aerospace and Safran Aircraft Engines, **CFM International**, obtaining orders for nearly 1,800 engines. Topping

the list was the sale to **IndiGo**, India's largest airline, for more than 1,000 LEAP-1A engines to power 510 Airbus A320neo aircraft. The deal marks the largest single order for LEAP engines and a record for CFM. The deal includes CFM support for IndiGo's new engine maintenance, repair, and overhaul (MRO) facility and a long-term material services and spare parts agreement.



▲ GE Aerospace's Electrified Powertrain Flight Demonstration (EPFD) aircraft is a modified Saab 340B.

PHOTOS THIS SPREAD: FARNBOROUGH INTERNATIONAL AIRSHOW





apply innovation™

Manufacturing confidence at every level

Over 50 years of aerospace innovations

Born out of aerospace, Renishaw developed the first touch-trigger probe for use on Concorde jet engines. By creating consistent, stable processes, our innovative technologies empower repeatable, traceable, and efficient manufacturing to the finest tolerances. We do this throughout the supply chain so every component, not just safety critical ones, meets their design intent.

For MRO, we supply the precision required to repair components that demand high quality maintenance in service. We are also accelerating additive manufacturing (AM) solutions for lightweighting and topological optimization.

Explore how Renishaw can increase your confidence in aerospace manufacturing, whatever the elevation.

www.renishaw.com/aerospace






Renishaw, Inc., West Dundee, IL 60118
 © 2025 Renishaw, Inc. All rights reserved.

usa@renishaw.com

➤ **Right:** Megawatt-class and multi-kilovolt hybrid electric propulsion system developed for the EPFD aircraft, for which GE Aerospace or its companies developed motor/generators, power converters and inverters, controllers, gearboxes, propeller, heat exchangers, torque sensing, engine harnesses, and a CT7 engine. The hybrid electric turbogenerator combines an electric powertrain with a traditional gas turbine to optimize power management during different operational phases.

➤ **Far Right:** Eve Air Mobility is advancing certification for its Eve 100 electric vertical take-off and landing (eVTOL) aircraft in Brazil, Europe, and the U.S.



GE Aerospace also announced wide-body deals, including Philippine Airlines' order of GEnx-1B engines to power 15 Boeing 787-10 aircraft, and AerCap's selection of GEnx-1B engines for 15 Boeing 787 Dreamliners.

RTX business Pratt & Whitney received more than 800 geared turbofan (GTF) engine orders and commitments from the start of 2026. Airlines and lessors announcing orders this year include Abra Group, AirAsia, Azorra, Binter, British Airways, Finnair, Jackson Square Aviation, Luxair, Scoot, Tigerair Taiwan, and VietJet. In total, more than 14,000 GTF engine orders and commitments have been placed by more than 90 customers worldwide, bringing the GTF order backlog to more than 8,000 engines.

Advanced air mobility

The most noteworthy announcement in advanced air mobility (AAM) was **Electra.aero's** plans to establish its first production facility in Springfield, Ohio to manufacture the EL9 Ultra Short nine-passenger hybrid-electric aircraft. Ohio Gov. Mike DeWine revealed an \$850 million investment will create 1,975 new jobs and anchor initial production for up to 400 aircraft per year, able to expand up to 800 aircraft per year.

Market trends

Ahead of FIA 2026's opening, Boeing released its 2026 Commercial Market Outlook (CMO), forecasting operators will need nearly 44,000 new airplanes to support air travel demand and air cargo expansion during the next 20 years. This

PHOTOS THIS SPREAD: ERIC BROTHERS

DRIVE RESULTS WITH INNOVATION

Secure the competitive edge with the industry's most advanced manufacturing solutions built for performance and growth. Visit Mazak at IMTS in booth #338300 to explore the latest Mazak machine tool technology, scalable automation solutions, secure digital connectivity and world-class customer support.



Drive High-Volume Production with
EXCEPTIONAL OUTPUT AND PRECISION



Achieve Unmatched
ACCURACY AND CONSISTENCY



Reduce Setups and Increase Productivity with
DONE IN ONE® MACHINING



Gain the Unbeatable Combination of
VALUE AND PERFORMANCE



Visit us at
IMTS2026
September 14-19, 2026
Booth #338300

Mazak



number is consistent with CMOs of the post-pandemic years, growing slightly with each edition. Half of deliveries will replace previous-generation airplanes with more fuel-efficient models.

The company projects near-term disruptions won't meaningfully affect long-term aviation industry growth, foreseeing the global commercial airplane fleet growing to more than 50,000 airplanes by 2045 as airlines and cargo operators add capacity.

North America, Eurasia, Oceania, and North-east Asia will account for 45% of new deliveries, while China, the Middle East, Latin America, South and Southeast Asia, and Africa, will take the rest. Single-aisle jets will account for more than 75% of new deliveries with widebodies claiming 20%. Regional jets and freighters will make up the total.

Airbus' Global Market Forecast (GMF) for 2026-2045 also forecasts consistent passenger traffic growth around 3.9%, requiring more than 42,000 new jets – 81% single-aisle and 19% widebody.

For MRO, Boeing projects the aviation services market to reach \$4.9 trillion during the next 20 years. The company also forecasts a global need for 728,000 maintenance technicians through 2045, with Eurasia, China, North America, and Southeast Asia leading demand. **A**



**> Farnborough
International Airshow**

farnboroughinternational.org



Beyond Machining. We Build Reliability.

**The Heart of Every Journey,
The Precision Behind Every Flight.**

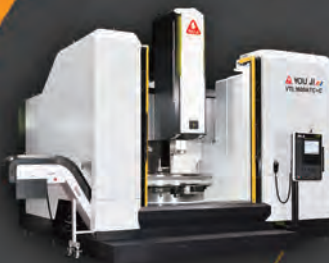
IMTS September 14-19, 2026
South Building, Level 3-339476

VHL1200ATC+C
Vertical Turning Center



The best solution for
Aerospace and
Bearing industry

VTL1600ATC+C
Vertical Turning Center



TEL: 886-7-6953061
FAX: 886-7-6953198
E-mail : youji@ms15.hinet.net

www.youji.com

VIDEO



Nine⁹

**Radius
0.5 ~ 10.0 mm**
Corner Rounding Cutter



CT Insert
For spotting, chamfering

**Smooth
Every Edge**

- ▶ One holder supports various inserts.
- ▶ Produces smooth and excellent surface finish on workpiece.
- ▶ Long tool life.

IMTS
#431308

AMB
HALL 3
#3E13



JIMMORE
International Corp.



E-mail: trade@jimmore.com.tw
<https://nine9.jic-tools.com.tw>

MQ-28 Ghost Bat flies with US Air Force in Indo Pacific

Boeing's MQ-28 Ghost Bat participated in Exercise Valiant Shield alongside F-35A, F-35B, F-15EX, HC-130, E-3, E-2D, EA-18G, RC-135, and various other joint and coalition aircraft becoming the first and only collaborative combat aircraft (CCA) deployed to a multinational, joint operational exercise.

During Valiant Shield 2026 in June, the Australian-developed MQ-28 Ghost Bat integrated with forces from the U.S. Pacific Command to support the U.S. Air Force's Experimental Operations Unit's CCA integration objectives.

The aircraft participated alongside crewed platforms as they refined tactics, techniques, and procedures around the Marianas Island Range Complex in the Western Pacific region, proving the ability to deploy and integrate into a joint force.

"Having MQ-28 participate in such a significant military training exercise is a first, and this is just the start of demonstrating how advanced human-machine teaming extends the reach and awareness of



▼ MQ-28 Ghost Bat and U.S. Air Force F-15EX Eagle II during Exercise Valiant Shield 2026 over the Philippine Sea.

crewed platforms and enhances joint force operations," says Steve Parker, president and CEO of Boeing Defense, Space & Security.

The MQ-28 has been developed using open mission systems and government reference architectures allowing defense

forces to rapidly integrate sovereign payloads for their specific mission requirements. It's designed to team with 4th, 5th, and 6th-generation aircraft to enhance the capabilities of the entire fleet.

> boeing.com/defense

DoorDash Air launches its own drone delivery program

DoorDash Labs has earned the Federal Aviation Administration (FAA) Part 135 air carrier certification to operate its own drone delivery service for local commerce.

To earn FAA Part 135 certification, operators must pass a robust five-stage

evaluation process verifying aircraft airworthiness, maintenance programs, and safety procedures. DoorDash is only the eighth drone operator to have earned this certificate.

"We want drone delivery to work for any merchant, anywhere. We're building the full stack to make that possible from the ground infrastructure to the drone itself, and the handoff systems that make it work together seamlessly," says Harrison Shih, head of DoorDash Air. "Advances in hardware, compute, and AI are creating extraordinary new capabilities for local commerce, and becoming a certified air carrier accelerates everything we're building."

The company is designing and building

its drone program inside DoorDash Labs, its in-house robotics and autonomy team. The aircraft will be purpose-built to complement the short- and long-range designs its partners are scaling. The drone is American-designed and built, with most components made in the U.S.

DoorDash is working with leading autonomous technology providers while building the infrastructure so any partner can integrate with them as they extend into the air.

"For us it's not just about building the drone, it's just as much about running the airline: the routing, the safety systems, the operational layer that makes everything fly smoothly," a company communication concludes.

> labs.doordash.com



< DoorDash teases its drone design.



 **FABTECH**

Innovation Without Limits

OCTOBER 21-23, 2026 | LAS VEGAS, NV

Push beyond boundaries at FABTECH 2026, North America's largest metal forming, fabricating, welding, and finishing event. Explore breakthrough technologies, connect with industry leaders, and discover solutions that redefine what's possible.



**REGISTER TODAY AT
FABTECHEXPO.COM**

Event Partners



FMA

sme

PMA

IFCA



Platinum Sponsors



MITSUBISHI LASER





▲ Aerospace quantum CFD representation.

3

WAYS QUANTUM COMPUTING IS TRANSFORMING AEROSPACE

Accelerating aircraft design, optimizing logistics and air traffic management, and discovering next-generation aerospace materials show the potential. > BY SIMON FRIED

The aerospace industry faces numerous unprecedented challenges. Rising demand for air travel, geopolitical disruptions accelerating defense needs, and a new global space race are all contributing to increased tensions.

New problems, however, demand fresh solutions, and traditional computing methods are struggling to keep up with the complexity of modern aerospace demands.

Yet, a game changer is helping to shape

the way aerospace companies operate. Quantum computing offers breakthroughs in simulation, logistics, and materials science set to redefine the future of flight. Many companies in the industry are beginning to experiment with quantum technology. In the coming years, those innovators, whether they're aircraft manufacturers, airlines, or airport owners, will begin to reap the benefits of that innovation. Here is a longer look at three ways quantum will change the aerospace industry.

Accelerating aircraft design with quantum-powered simulation

Aircraft development can be a slow and expensive process. Wind tunnel testing and computational fluid dynamics (CFD) simulations can consume years of R&D time. Quantum computing has the potential to dramatically speed up these processes by enabling highly accurate digital simulations that reduce reliance on physical testing.

These innovations aren't far off in the future. Companies including Boeing and

Rolls-Royce are already exploring quantum algorithms, specifically to optimize jet engine performance and wing aerodynamics. Rolls-Royce is using quantum computing to improve fuel efficiency, which is becoming a critical factor as airlines face stricter emissions regulations. By simulating airflow and combustion at a quantum level, engineers can refine designs more quickly and with greater precision. Potentially, development cycles could be sliced in half.

The shift from classical computing to hybrid quantum-classical approaches is enabling aerospace firms to run more complex simulations without prohibitive costs. As quantum hardware matures, modeling entire aircraft systems in a digital twin environment could become a reality, reducing time-to-market and R&D expenses. Tomorrow's aircraft could ultimately be significantly cheaper to develop and manufacture than the new models we have today.

Optimizing logistics and air traffic management

Managing airlines and airports is a hugely complex process. Scheduling thousands of flights, administering gate assignments, and minimizing delays to keep costs low push existing classic computing technologies to their limits.

Quantum computing is well-suited for solving optimization problems, making it an ideal solution for advancing aviation logistics to new levels of efficiency.

The most obvious example is route optimization, a task in which quantum computing can solve complex variables in real time far faster than classical systems. Airlines can use quantum algorithms to dynamically adjust flight paths based on weather patterns, fuel efficiency targets, and air traffic congestion.

A recent experiment by NASA suggested quantum-powered routing could reduce flight times by up to 10%. If this were to become commercially viable it could potentially cut fuel consumption by millions of tons annually. This would make quantum a key enabler of cost savings and a key tool for enabling airlines to meet their sustainability targets.

Quantum can also have a transformative impact on airport operations by enabling enhanced scheduling to synchronize arrivals, departures, and gate assignments in real time. Another beneficiary could be logistics companies that, by implementing quantum optimized package routing, cut delivery times and reduce fuel consumption.

Discovering next-generation aerospace materials

The search for lighter, stronger, and more heat-resistant materials is a key battleground in aerospace innovation. Quantum computing can speed up this process by simulating molecular interactions at an unprecedented scale and accelerate the discovery of ad-

FIVE WAYS TO IMPROVE MACHINING EFFICIENCY

1

REDUCE SET-UP TIME AND INCREASE MACHINE CAPACITY

Solution: Zero Point Clamping System

- A modern alternative to T-slot tables, modular work holding has the flexibility and diversity to hold any workpiece while maintaining high accuracy.



2

ACHIEVE HIGH PRECISION WITH QUICK-CHANGE COUPLINGS

Solution: PSC Polygonal Toolholders

- Per ISO 26623, provides extreme stability and increased rigidity in machining. Modular tapers allow for quick and easy interchangeability of tools for both milling and turning.



3

PERFORM MULTIPLE OPS WITHOUT CHANGING MACHINES OR REPOSITIONING THE WORKPIECE

Solution: Live Tools

- Machine high-quality parts efficiently and effectively with the SK collet system and run-dry features.



4

MAXIMIZE MACHINE UPTIME BY STREAMLINING TOOL SETUPS OFFLINE

Solution: Presetters

- Optimize your workflow and maintain high levels of accuracy with rock solid precision.



5

IMPROVE MACHINE THROUGHPUT EFFICIENCY

Solution: Machine Tending

- Ideal for high mix, low volume production, machine tending significantly boosts spindle time and enhances overall machine efficiency - NO advanced robotics skills needed.



847.367.4800 | sales@lyndexnikken.com | lyndexnikken.com

**LYNDEX
NIKKEN**



vanced alloys, coatings, and composites.

Leading aircraft manufacturers are now exploring how quantum simulations can accelerate the development of next-generation materials. These include high-entropy alloys capable of enduring the intense heat of hypersonic flight and advanced corrosion-resistant coatings dramatically extending airframe lifespans. One promising application

is lightweight composite materials, where quantum modelling could help engineers perfectly balance reduced weight and uncompromised durability. Again, this is a critical factor in improving fuel efficiency.

By simulating materials at the atomic level, researchers can predict mechanical, thermal, and chemical properties with unprecedented accuracy, potentially eliminat-

ing years of costly trial-and-error testing. This shift could save hundreds of millions in R&D expenditures while speeding up innovation cycles.

Looking further ahead, there's enormous potential in the concept of quantum-powered digital twins of materials. These may allow engineers to virtually test performance under real-world stresses before a single physical prototype is ever built.

This capability could redefine how future aircraft are designed, making materials development faster and more precise than ever before. It could also save companies huge sums in development costs.

Quantum's future in aerospace

These three innovations are only the start. Quantum could potentially transform other aspects of the aerospace industry.

Optimizing the position of satellites is another area well suited to being explored in quantum. It could also enhance radar systems, including signal detection problems caused by false positives. As radar develops and companies deploy more sensors, they can access more data. In theory this makes the issue of detection more accurate and easier. Yet it has the side effect of making data analysis more complex, because there's much more of it. Quantum can help decipher all that information.

Leading aerospace companies are already investing in quantum computing to gain a competitive edge. As quantum hardware improves and algorithms mature, the industry will see faster aircraft development cycles, more efficient air traffic management, and breakthrough materials enabling hypersonic travel and space exploration.

For aerospace companies the question is no longer *if* quantum computing will make an impact, but *how soon* they can integrate it into their operations. Those who harness quantum's potential first will lead the next era of aerospace innovation. **A**



> **Classiq**
classiq.io

About the author: Simon Fried is VP Marketing and Corporate Business Development at Classiq.

SMW Autoblok is the stop for the workholding and automation your new (or old) machine deserves.



ACCESSORY TO KILLER PRODUCTION

We've been in the game for a long time, and we're well aware: that big machine tool purchase is what shops are most excited about.

But if you're the type of person who geeks out over the efficiencies that are possible when you really, truly nail workholding and automation, the SMW Autoblok booth is the can't-miss destination.

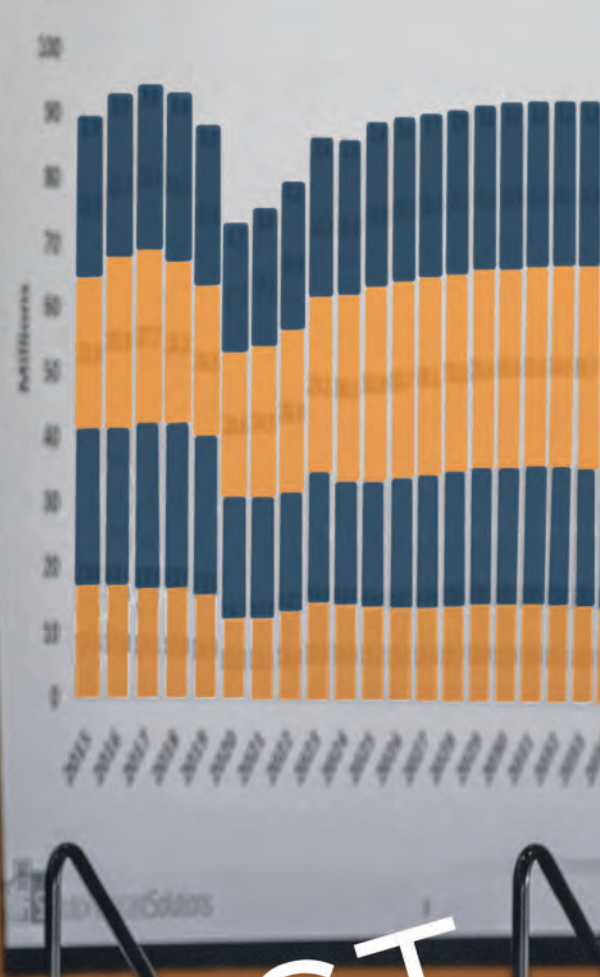
Rotating workholding, stationary workholding, automation—all done at a better, smarter level.



Check it all out at **IMTS booth #431617.**

**A LITTLE BETTER.
A LITTLE SMARTER.**

**MORE THAN
JUST INSIGHTS.
REAL SOLUTIONS.**



MTFORECAST

SALES FORECASTS FOR MANUFACTURERS

Market cycles can fuel volatility — and reveal new opportunities in manufacturing. Get the tools, sector outlooks, and market data insights to build the right solutions to prepare your business to succeed.



Oct. 14–16, 2026
SCHAUMBURG, IL

POWERED BY &AMT

REGISTER TODAY
MTFORECAST.COM

GKN Aerospace secures long-term Pratt & Whitney GTF repairs

GKN Aerospace has secured a series of contract awards as a key maintenance, repair, and overhaul (MRO) provider for RTX business Pratt & Whitney GTF engines. Spanning the next 5 to 10 years, these agreements cover more than 20 different component types, including critical engine cases, structures, and rotating parts across the global Pratt & Whitney GTF family.



▲ GKN Aerospace DED repair

The awards include multiple complex PW1500G/PW1900G part repairs. In Trollhättan, Sweden, directed energy deposition (DED) additive repairs will be used to repair PW1500G/PW1900G exit guide vane (EGV) stators. DED replaces worn features in components otherwise unfixable using legacy methods.

GKN's Johor, Malaysia site will support stators and stator assembly component repairs. The site in San Diego, California is introducing state-of-the-art thermal coatings alongside new shot peen methods using advanced ultrasonic technology.

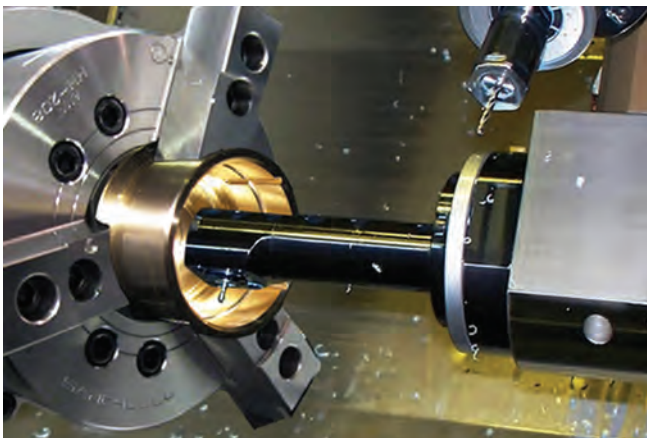
> gknaerospace.com;
rtx.com/en/prattwhitney



Embraer, SkyWest Airlines extend long-term heavy maintenance for E-Jets fleet

Embraer and SkyWest Airlines have agreed to a long-term extension for heavy maintenance services covering the airline's fleet of 271 E175 aircraft in the United States. Under the agreement, maintenance activities will be performed at Embraer's Services & Support facilities in Nashville, Tennessee; Macon,

PHOTOS COURTESY OF RESPECTIVE COMPANIES



INTEGRATE SECONDARY OPERATIONS

Designed to fit popular live lathe models, Eltool's Titespot® angle heads machine in bores down to 5/8" in diameter. Now, oil grooving, keyway cutting, and other secondary operations can be integrated into your turning operations.

- REDUCE HANDLING
- INCREASE THROUGHPUT
- IMPROVE ACCURACY

ELTOOL
WWW.ELTOOL.COM



SCAN ME
SCAN FOR VIDEO



UNIFY
MACH & TOOLS
SINCE 1972

Unify thread rolling machine series:

- 2 roll CNC, NC type
- 2 roll Hydraulic type
- Serration gear rolling type
- 3 roll type

Unify thread rolling dies

- ISO standard, UNC, UNF series
- Trapezoidal profile series
- Ball screws profile series
- Serration Spline series
- ***grinding profile***

VIDEO



Taiwan UNIFY thread rolling (KIM UNION)

www.kimunion.com Email: kimunion@kimunion.com

Georgia; and Fort Worth, Texas. The extension expands the scope of the existing program and increases available capacity, supporting SkyWest's long-term fleet planning and operational requirements.

SkyWest is the world's largest owner-operator of the E175.

Embraer continues to expand its maintenance, repair, and overhaul (MRO) footprint in the country. In Fort Worth, the company is investing approximately \$70 million in a new commercial aviation MRO facility at Perot Field Alliance Airport, expected to be operational by 2027. Once completed, the expansion will increase Embraer's service capacity for E-Jets customers in the U.S. by more than 50%.

> embraer.com; skywest.com

Willis Lease Finance, P&W sign five-year agreement for engine storage, lease return services

Willis Lease Finance Corp. (WLFC), a lessor of commercial aircraft engines and global provider of aviation services, obtained a long-term storage agreement with RTX business Pratt & Whitney to provide storage and lease return services for PW1100G-JM, PW1500G, PW1900G, PW4000, and IAE AG V2500 engines. WLFC will support Pratt & Whitney's growing after-market storage requirements from its Coconut Creek, Florida and Bridgend, Wales facilities.

The five-year agreement builds on WLFC's decades-long relationship with Pratt & Whitney, strengthened through quality reviews of Willis Engine Repair Center (WERC), a subsidiary of WLFC, as well as WERC's technical capabilities and maintenance & storage training (MTA) initiatives.

The company's service offerings include Part

145 engine maintenance, aircraft line and base maintenance, aircraft disassembly, parking and storage, and airport fixed-base operator (FBO) and ground and cargo handling services.

> rtx.com/en/prattwhitney; wlfc.global



▲ Charles F. Willis IV, Founder & Executive Chairman, WLFC; Rick Deurloo, President, Commercial Engines, Pratt & Whitney; Austin C. Willis, CEO, WLFC and Charles F. Willis V, Analyst, Trading & Valuations, WLFC

2026 MANUFACTURING GROUP VIRTUAL EVENTS

SEPTEMBER		NOVEMBER	
September 2	Archetype Medical	November 4	AI/Digital Technologies Roundtable
September 10	Lunch & Learn	November 12	Lunch + Learn
September 24	Machine Tool Builders Roundtable	November 18	Grinding Roundtable
September 30	Cybersecurity: Bridging the Gap Between Prime Contractors & SMBs		
OCTOBER		DECEMBER	
October 14	Aerospace Industry Outlook	December 2	Supply Chain
October 22	Lunch + Learn	December 10	Lunch + Learn
October 28	Leaders in Manufacturing Roundtable	December 16	Shopfloor Connectivity Roundtable

2026 WEBINAR SERIES SPONSORS



TODAY'S
MEDICAL DEVELOPMENTS
TodaysMedicalDevelopments.com

AEROSPACE
MANUFACTURING and DESIGN
AerospaceManufacturingAndDesign.com

DEFENSE AND MUNITIONS
DefenseAndMunitions.com

Renishaw unveils LIBERTAS technology for AM

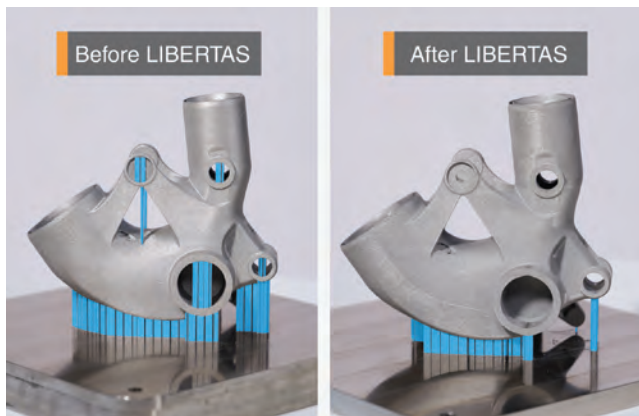
LIBERTAS technology from Renishaw addresses two challenges in metal additive manufacturing (AM): poor downskin (bottom) surface finish and the need for support structures. Traditional supports manage heat and distortion, but they also increase material usage, extend build times, and require costly post-processing. LIBERTAS technology dynamically adjusts laser scan parameters across part geometries for printing complex components with smoother downskin surfaces, less material use, and reduced or eliminated supports.

LIBERTAS technology can manufacture complex geometries previously requiring extensive supports, often in inaccessible locations, reducing post-processing time and material waste.

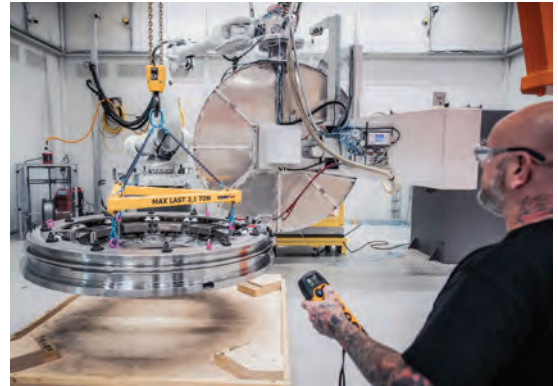
LIBERTAS is for Renishaw's RenAM 500 metal additive systems using laser powder bed fusion (LPBF). An upgrade module within Renishaw's QuantAM build preparation software requires no costly hardware upgrades and allows one license to work across multiple RenAM 500 systems.

Applications include complex aerospace components such as nozzle guide vanes and blisks.

> [renishaw.com](https://www.renishaw.com)



▲ Renishaw's LIBERTAS software dynamically adjusts scan parameters across different sections of a part to print smoother downskin surfaces, and reduce or eliminate supports.



GKN Aerospace, RTX's Pratt & Whitney expand AM collaboration on military engine

RTX's Pratt & Whitney and GKN Aerospace signed a Technology Development Agreement to jointly explore using additive manufacturing (AM) for large structural components for the F135 engine powering the Lockheed Martin F-35 Lightning II.

The agreement, supported by the Forsvarsmateriell – Norwegian Defence Materiel Agency (NDMA) – is to demonstrate producing a large-scale engine case using AM.

GKN Aerospace's facility in Kongsberg, Norway will lead the work using its laser-directed energy deposition with wire (L-DED-w) technology. The goal is to produce a full-scale component while maintaining compatibility and interchangeability with the current engine design. The component is expected to be among the first of this size for military engine applications.

A demonstrator component is expected to be ready by 2027 and the product certified by the end of 2028.

> fma.no/en; gknaerospace.com

Elmet Technologies to produce hypersonic vehicle parts with 3D Systems

Elmet Technologies, a subsidiary of The Elmet Group, is deploying 3D Systems' direct metal printing DMP Flex 350 Triple metal additive manufacturing machine (laser powder bed fusion) to rapidly produce large heat exchangers for hypersonic vehicles. Using high-performance C103 alloy, the Elmet team expects to qualify and certify the system to begin production in 2026.

Elmet Technologies has worked the last eight years with 3D Systems' Application Innovation Group (AIG) of expert engineers who consult, guide, and assist customers with advanced development of processes and materials. The team developed processing parameters for C103 – a niobium-based alloy made with hafnium and titanium for use in extreme high-temperature and aerospace applications – specifically for this deployment.

The DMP Flex 350 Triple's low oxygen environment allows for tight control of metal chemistry and superior surface finishes.

Mike Shepard, VP of Aerospace & Defense, 3D Systems, says, "The low oxygen architecture of our DMP series metal additive machines is ideal for manufacture of complex components from highly reactive metals such as C103 and other refractory alloys."

> 3dsystems.com; elmettechnologies.com

Aerospace Manufacturing and Design welcomes all aircraft enthusiasts to join the fun and **NAME THAT PLANE!**

Each issue, a new aircraft will be featured. Given a photo and a clue box, readers are encouraged to guess what plane is being described and submit their answers to AerospaceManufacturingAndDesign.com/Form/NameThatPlane.

NAME THAT PLANE



RAPID-FIRE FACTS

- **Role:** Electronic warfare/ Attack aircraft
- **First flight:** May 25, 1968
- **Number built:** 170
- **Primary users:** United States Navy, United States Marine Corps

SPECIFICATIONS

- **Wingspan:** 53ft (16m)
- **Length:** 59ft 10" (18.24m)
- **Height:** 16ft 8" (5.08m)
- **Max. speed:** 651mph (1,048km/h)
- **Engines:** Pratt & Whitney J52-P-408A turbojet

**JULY 2026
ANSWER:**
Boeing B-47
Stratojet

**JULY
2026
WINNER:**

TOM STEINBRUNNER,

Electronics Engineer,
National Air and Space Intelligence Center (NASIC),
Wright-Patterson Air Force Base, Ohio

**How long have you
been involved in
aerospace?**
27 years.

**How did you become
interested in aircraft?**
My dad was always
interested, and I was
always fascinated by
helicopters.

**What is your favorite
aircraft and why?**
The Fairchild Republic A-10
Thunderbolt II (Warthog).
As an Army veteran,
I always saw it as the
ultimate support for troops
on the ground.

< LOOK WHAT TOM WON!

Enter today to win your own
high-quality desktop aircraft replica!



RUNNERS-UP:

Runners-up:
Jared Brown, *Operations Manager,* CMFS/Miraclean, Ashville, New York
Sean Hamilton, *Director of Operations,* Putnam Precision, Brewster, New York

SUBMISSION PROCEDURE:

To enter the contest, visit AerospaceManufacturingAndDesign.com/Form/NameThatPlane and fill out the provided entry form. Only completed forms will qualify. A full set of rules is provided.

The entry deadline for this issue's contest is October 6, 2026. Winners will be announced in the Nov/Dec 2026 issue.



HAVE FUN, AND GOOD LUCK!

CREDIT: U.S. MARINE CORPS

BROUGHT TO YOU BY:

AEROSPACE
MANUFACTURING and DESIGN

Ethernet metrology

Coordinate measuring machine (CMM) manufacturer LK Metrology launched a new range of laser scanners and complementary technologies designed to raise the efficiency of data-intensive metrology tasks on CMMs, enhance digital production, and optimize metrology across the manufacturing sector using high-speed, industry-standard Ethernet communication.

Engineered for automated dimensional inspection and 3D surface digitization, the non-contact sensors enable manufacturers to inspect complex freeform surfaces, intricate features, and delicate components more efficiently and rapidly than is possible with traditional touch-probe measurement techniques. The newly-introduced, Ethernet-ready lineup incorporates the LC15DX, L100NX, and SLK25 line scanners as well as the XC65DX and XC65DXLS cross scanners.

LK Metrology's FOCUS point cloud inspection software streamlines part-to-CAD inspection by automatically comparing scanned point cloud data with nominal CAD geometry. Deviations are visualized through color maps and graphical reports, enabling easier assessment of part quality.



> **LK Metrology Inc.**
lkmetrology.com



Deburring dust collector

Productive Robotics has made a new fully integrated metal dust collector for its automated deburring and polishing cell. The cell, operated by the company's OB7 from its line of zero-programming collaborative robots (cobots), offers a compact, enclosed workstation preventing abrasive dust and metal fines from contaminating the shop floor environment.

The cell is 4ft x 5ft. The installation package includes OB7 and a force-controlled deburring platform. The cell also supports the use of multiple media for deburring and polishing as well as finishing different areas of a part.

The cell requires zero programming. An operator teaches OB7 by physically guiding the cobot through each motion from speed and number of passes to part rotation. Productive Robotics' drag-and-drop interface allows any operator to set up a job quickly. Unlike 6-axis robots, the 7-axis OB7 can reach complex geometries, gear teeth, and obstructed areas.



> **Productive Robotics LLC**
productiverobotics.com

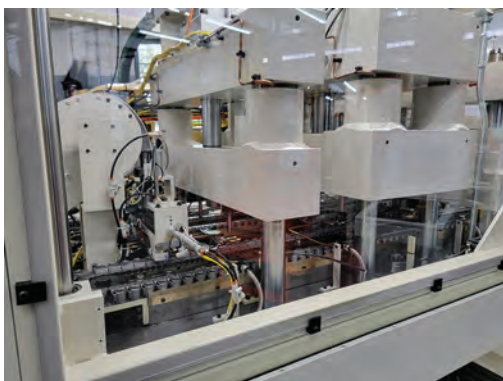


Hydraulic presses

Greenerd Press & Machine Co. will highlight the company's hydraulic press and automation capabilities at FABTECH Booth #S27007. Greenerd designs and builds custom hydraulic presses with automation solutions for a range of industries and applications and invites attendees to see how various challenging press applications were solved through automation, and discuss your application and how it can be automated.

Examples of Greenerd custom hydraulic press automation solutions have been achieved in a range of applications and industries from aerospace and defense to metal-working, forming and fabricating, compression molding, and more.

Greenerd is a Tier 1 Industrial Authorized Robot System Integrator of FANUC America Corp.



> **Greenerd Press & Machine Co.**
greenerd.com

Automating indexable insert handling

ZOLLER's »micBox« automates every step required for indexable insert handling on milling tools. From RFID-supported tool identification to mounting, indexing, rotating, flipping, exchanging inserts, and even automatically replacing fastening screws after a predefined service life, the system ensures every aspect of the insert preparation process is performed with precision and reliability.

An optional AI-supported measuring function, ZOLLER »wearCheck«, automatically inspects and evaluates the condition of every cutting edge before any action is taken. The system can detect wear, classify the condition of individual cutting edges, and intelligently determine whether an insert should remain in use, be indexed to the next cutting edge, rotated, or completely replaced. This ensures only inserts that have reached their wear limit are serviced, maximizing insert utilization, reducing tooling costs, and providing a fully autonomous and optimized tool preparation process.



> **ZOLLER Solutions**
zoller.info

2026 MTForecast Conference.....	19
2026 Virtual Events.....	21
Eltool Corp.....	20
FABTECH.....	15
Greenleaf Corp.....	6-7
Growermetal.....	28
ISCAR USA.....	27
Jimmore Int'l Corp.....	13
Kim Union Industrial Co Ltd.....	20
Lyndex-Nikken Inc.....	17
Mazak Corp.....	12
Renishaw Inc.....	11
ROSS Mixers.....	5
SMW Autoblok.....	18
Sumitomo Electric Carbide.....	2
You Ji Machine Co Ltd.....	13



DON'T BE A STRANGER

In today's fast-paced world, there's a reason industry professionals turn to *Aerospace Manufacturing & Design's* social media channels to keep them informed throughout the day. See what all the fuss is about:



@Aerospace-
Manufacturing-And-Design



@Aerospace.Mfg.Design



@AMDMagazine



@AMDMag

AEROSPACE
MANUFACTURING and DESIGN

Self-driving AI lab helps discover new alloys

A project demonstrates efficacy of autonomous AI research in materials.

► EDITED BY JUSTIN MCCOMBS

Using AI, a team of researchers at the University of Toronto discovered new metal alloys which retain strength under extreme conditions, are well suited to additive manufacturing (AM), and could lead to enhanced parts for aerospace and more.

“There’s enormous demand for materials that can stand up to huge swings of temperature and pressure,” says project leader Professor Yu Zou. “We also need materials printed layer by layer, enabling us to make new components. For example, to make a material that’s both lightweight and strong, you can vary the composition: a hard, tough alloy on the outside and something softer and lighter on the inside.”

Zou says many of the high-performance metal alloys used today are made primarily of a single component – often nickel or cobalt – with small amounts of up to 10 other elements mixed in. But there are many other formulations not yet explored; identifying new 3D-printable alloys out of tens of thousands of possible combinations is difficult, particularly for complex alloys of three or more principal elements.

To overcome this problem and explore new regions of the potential design space, Zou’s team leverages the power of AI.

The technique – active learning – combines computer modeling, machine learning, and robot-assisted manufacturing to create a self-driving lab, capable of following promising leads near-autonomously. The team targeted what they call compositionally complex alloys containing relatively large amounts of just three different elements: nickel, cobalt, and chromium. In just a few weeks, their self-driving lab had zeroed in on six new alloys with promising new properties.

“One of the properties we were targeting was puncture resistance at temperatures up to 600°C, which is what you’d find in the front section of a jet engine,” says Ajay Talbot, a Ph.D. student in Zou’s lab.

“The industry standard in this space is nickel-based alloys such as Inconel 625. But we found one made of 12% nickel, 62% cobalt, and 26% chrome that was great for retaining hardness at extremely high temperatures. Even with just three components, our alloy outperformed Inconel 625 – an alloy of more than 10 different elements – by 4.5%.”

Another alloy is designed for the back of jet engines, where temperatures can get even hotter, up to 1,000°C.

“One of the things that happens in an environment like that is the formation of oxide scale, which essentially means your material is just getting burnt away,” Talbot says.

“We found a material made of 36% nickel, 14% cobalt, and 50% chrome was extremely good for oxidation resistance at these high temperatures: it even outperforms Inconel 625 by 85%.”

“This nickel-cobalt-chrome system has just three elements in it,” Talbot says. “What we want to do next is ramp up the complexity a bit more to make even crazier stuff, with maybe 10 or 12 different elements. There’s a lot more out there just waiting to be discovered.”



► **University of Toronto Faculty of Applied Science & Engineering**

engineering.utoronto.ca



► **Read the paper:**

doi.org/10.1038/s44334-026-00098-5



▲ Ph.D. student Ajay Talbot holds up samples of metal alloys made of nickel, cobalt, and chromium, discovered with their self-driving AI lab.

YOU

MILLING

INTELLIGENTLY?

MAXOUT

MAXVALUE
MINIMUM COST MAXIMUM OUTPUT



QUICKD MILL

The ultimate all-in-one indexable tool, combining milling and drilling to **increase versatility, maximize insert utilization, and improve cost efficiency.**



Member IMC Group
ISCAR
www.iscar.com

ELEVATING SAFETY WHEREVER YOU GO.



NEXT EVENTS

OCT.
28 - 29

AVIATION WEEK
MRO
EUROPE
AMSTERDAM, NL
BOOTH 5-1029

**EXPERIENCE ALLOWS US
TO FACE THE MOST
CHALLENGING AEROSPACE
APPLICATIONS.**

Thanks to our advanced processes, treatments, testing and selection certified in accordance with AS/EN 9100 standard, we are the ideal partner to meet the aerospace industry requirements.

With a broad portfolio of washers and components, our products extend Growermetal's quality and safety in the most challenging applications. This is how we spread innovation and push every limit.

**DISCOVER THE
FULL RANGE**

