

\$14.95 JUNE 15-28, 2026

# AVIATIONWEEK

## & SPACE TECHNOLOGY

### Rebuilding New Glenn



RICH MEDIA  
EXCLUSIVE

**Wanted**  
340,000 U.S.  
Combat Drones

Franco-German  
Fighter Rupture

FAA Chief Races  
To Fix ATC

# CONNECTING AND PROTECTING OUR WORLD

With three market-leading businesses, world-class operations and investments in research and development, we offer capabilities no one else can. Together, our global team pushes the boundaries of known science—and finds new ways to connect and protect our world.

Learn more at [rtx.com](https://www.rtx.com)



COLLINS AEROSPACE | PRATT & WHITNEY | RAYTHEON





Access **AW&ST** Online  
Go to: [AviationWeek.com/AWST](http://AviationWeek.com/AWST)

June 15-28, 2026 · Volume 188 · Number 12

# AVIATIONWEEK

## & SPACE TECHNOLOGY

**JESSE H. NEAL AWARDS**  
Est. 1955

2026 Winner

72

### DEPARTMENTS

- 5 | Feedback
- 6 | Who's Where
- 8-9 | First Take
- 10 | Up Front
- 11 | Going Concerns
- 12 | Inside Business Aviation
- 13 | The Launchpad
- 55,56 | Tech Take
- 57 | Contact Us
- 57 | Aviation Week Events

42

*Boeing's first 777-9 development aircraft, WH001, has amassed over 2,450 hr. on more than 800 test flights.*



### FEATURES

- 14 | **Deadlock Turns to Divorce**  
Germany and France part ways and look ahead after their future fighter program partnership fizzles
- 24 | **Price Point**  
The Pentagon's strategy to acquire 340,000 drones by the end of next year hinges on a pricing change
- 27 | **Defining Moment**  
 After its launchpad explosion, Blue Origin vows to return the New Glenn to flight in six months
- 36 | **'Another Monster'**  
IATA expects sharp drop in airline profits as fuel prices surge due to fallout from the Iran war

### COMMERCIAL AVIATION

- 38 | Regulatory headwinds temper Brazil's aviation potential
- 39 | Castllake's EasyJet bid could shake up European airline landscape
- 41 |  War, fuel and fares: second-half questions for U.S. airlines
- 42 | Ortberg says ETOPS testing will not delay 777-9 delivery timing
- 46 |  How Airbus is applying new tech and staff to build the A321XLR
- 48 | Daher rethinks business aircraft design strategy and methods
- 50 | Innovators try to break reliance on old airspeed sensing technology
- 52 | The FAA needs funds to take the next step in ATC modernization
- 54 | Power-to-liquids tech developer starts e-SAF commercial production
- 58 | Forging press capacity is aerospace's hidden bottleneck

### DEFENSE

- 16 | Ukraine's deal with Saab could spark new wave of Gripen orders
- 17 | Canada signals new urgency with quick AEW&C selection
- 20 | U.S. Air Force weighs steps to expand its tanker force
- 21 | Budget increase prompts U.S. military VIP fleet refresh
- 22 | Next-Gen Interceptor prepares for production as Golden Dome grows
- 23 | Collaborative combat aircraft surge drives new engine concepts
- 26 | U.S. drone demand moves acquisition to the field

### SPACE

- 29 | New Glenn launchpad explosion yields a silver lining
- 30 | Rising launch cadence spurs calls for air traffic system coordination
- 32 | Landsat's next chapter: NASA pushes commercial follow-on

### BEHIND THE SCENES



**Aviation Week's team** at the inaugural MRO Greater China exhibition and conference included (from left) Patrick Qin, Lu Luo, Charlie Che, Helen Curl, Greg Hamilton, Jennifer Roberts, Lindsay Bjerregaard, Lisa Tan and Jay Ee. The event at the Capital International Exhibition Center in Beijing May 26-28 drew more than 5,000 attendees and nearly 600 airline VIPs.

### ON THE COVER

*Blue Origin was on a speedy path to return to flight following an upper-stage engine issue that felled New Glenn's third mission. But a May 28 prelaunch static-fire test derailed those plans in an instant when the fully fueled booster exploded on the launchpad, destroying the rocket and heavily damaging the company's sole orbital launchpad. The next day, founder and owner Jeff Bezos told employees that how Blue Origin responds to the accident will be its defining moment. Senior Space Editor Irene Klotz's report begins on page 27. Planet Labs PBC image.*

Aviation Week publishes a digital edition every week. Read it at [AviationWeek.com/AWST](http://AviationWeek.com/AWST)



**DIGITAL EXTRAS** Access exclusive online features from articles accompanied by this icon.

# F-Stop Aces

## AVIATIONWEEK 2026 PHOTO CONTEST

- International Recognition
- Win a \$1,499 Tamron 150-500mm lens
- Cash Prizes



Get more information  
and enter your photos at  
[AviationWeek.com/photo-contest](https://AviationWeek.com/photo-contest)

Limited sponsorship  
opportunities available.

### Contact:

Rob Howlett

[rob.howlett@aviationweek.com](mailto:rob.howlett@aviationweek.com)

Andrea Rossi Prudente

[andrea.rossiprudente@aviationweek.co.uk](mailto:andrea.rossiprudente@aviationweek.co.uk)

AVIATION WEEK  
by informa...

MILLER ANDERSON MARIN

## AVIATIONWEEK<sup>7</sup> & SPACE TECHNOLOGY

**Editor-in-Chief** Joseph C. Anselmo [joe.anselmo@aviationweek.com](mailto:joe.anselmo@aviationweek.com)

### Executive Editors

Michael Bruno (Business) [michael.bruno@aviationweek.com](mailto:michael.bruno@aviationweek.com)

Jens Flottau (Commercial Aviation) [jens.flottau@aviationweek.co.uk](mailto:jens.flottau@aviationweek.co.uk)

Lee Ann Shay (MRO and Business Aviation) [leeann.shay@aviationweek.com](mailto:leeann.shay@aviationweek.com)

Robert Wall (Defense and Space) [robert.wall@aviationweek.com](mailto:robert.wall@aviationweek.com)

Graham Warwick (Technology) [warwick@aviationweek.com](mailto:warwick@aviationweek.com)

**Editors** Lindsay Bjerregaard, Christine Boynton, Sean Broderick, Bill Carey, Chen Chuanren, Thierry Dubois, Brian Everstine, Ben Goldstein, Irene Klotz, Vivienne Machi, Helen Massy-Beresford, Molly McMillin, Jefferson Morris, Mark Nensel, Guy Norris, Tony Osborne, James Pozzi, Lori Ranson, Garrett Reim, Adrian Schofield, Steve Trimble

**Managing Editor** Andrea Hollowell

**Art Director** Lisa Caputo

**Artists** Thomas De Pierro, Vicki Hopewell, Rosa Pineda, Colin Throm

**Senior Content Producer** Audra Avizienis

**Copy Editors** Jill Angelini, Jack Freifelder, Cory Hitt, Peri Meyers, Natalia Pelayo, Andy Savoie

**Production Editors** Andrea Copley-Smith, Theresa Petruso

**Podcast Editor** Guy Ferneyhough

**Contributing Photographer** Joseph Pries

**Content Marketing Operations** Wes Charnock, Elena Baxendale, Barbara Nichols

### Data & Analytics

**Senior Director, Forecasts and Aerospace Insights** Brian Kough

**Senior Director, Data Operations and Solutions** Terra Deskins

**Head, Defense Markets and Data** Craig Caffrey

### Editorial Offices

2121 K Street, NW, Suite 210, Washington, D.C. 20037

605 Third Avenue, New York, N.Y. 10158

240 Blackfriars Road, London, SE1 8BF, UK

### Bureau Chiefs

#### Auckland

Adrian Schofield [adrian.schofield@aviationweek.com](mailto:adrian.schofield@aviationweek.com)

#### Boston

Christine Boynton [christine.boynton@aviationweek.com](mailto:christine.boynton@aviationweek.com)

#### Cape Canaveral

Irene Klotz [irene.klotz@aviationweek.com](mailto:irene.klotz@aviationweek.com)

#### Chicago

Lindsay Bjerregaard [lindsay.bjerregaard@aviationweek.com](mailto:lindsay.bjerregaard@aviationweek.com)

#### Colorado Springs

Guy Norris [guy.norris@aviationweek.com](mailto:guy.norris@aviationweek.com)

#### Frankfurt

Jens Flottau [jens.flottau@aviationweek.co.uk](mailto:jens.flottau@aviationweek.co.uk)

#### Houston

Mark Carreau [mark.carreau@gmail.com](mailto:mark.carreau@gmail.com)

#### London

Tony Osborne [tony.osborne@aviationweek.co.uk](mailto:tony.osborne@aviationweek.co.uk)

#### Los Angeles

Vivienne Machi [vivienne.machi@aviationweek.com](mailto:vivienne.machi@aviationweek.com)

#### Lyon

Thierry Dubois [thierry.dubois@aviationweek.com](mailto:thierry.dubois@aviationweek.com)

#### Paris

Helen Massy-Beresford [helen.massy-beresford@aviationweek.co.uk](mailto:helen.massy-beresford@aviationweek.co.uk)

#### Seattle

Garrett Reim [garrett.reim@aviationweek.com](mailto:garrett.reim@aviationweek.com)

#### Washington

Lee Ann Shay [leeann.shay@aviationweek.com](mailto:leeann.shay@aviationweek.com)

#### Wichita

Molly McMillin [molly.mcmillin@aviationweek.com](mailto:molly.mcmillin@aviationweek.com)

**President, Aviation Week** Gregory Hamilton

**Senior Vice President, Data, Intelligence & Media** Anne McMahon

**Senior Vice President, Content** Joseph C. Anselmo

**Vice President, Sales of Data, Intelligence & Media** Thom Clayton

**Managing Director, Defense & Space** Andrea Rossi Prudente

**Senior Director, North American Media** Rob Howlett

AVIATION WEEK<sup>7</sup>  
by informa...



## BEHIND THE SCENES

1 Aviation Week President **Greg Hamilton** (right) and Editor-in-Chief **Joe Anselmo** inspected Encore Gas & Supply's attention-grabbing booth at Informa's Space Tech Expo USA. The two-day space show drew thousands of attendees and 354 exhibitors—up 15% from 2025—to the Anaheim Convention Center in California.

2 Executive Editor for Defense and Space **Robert Wall** (far left) moderated the show's keynote panel featuring (from left after Wall) **Christopher Adams**, vice president and general manager of Northrop Grumman's Intelligence Systems Division; **Jeffrey McCall**, vice president of mission solutions and payloads at Raytheon; and Col. **Andrew S. Menschner**, deputy commander of the U.S. Space Force Space Systems Command. 3 Military Space Editor **Vivienne Machi** (left) drew attendees to Aviation Week's STAR Pavilion for a fireside chat with **Carolyn Cossavella**, L3Harris Technologies' executive general manager for exquisite imaging systems. Space Tech Expo Europe will be held Nov. 17-19 in Bremen, Germany.



## THE REAL STORY

The financial pages of *Aviation Week & Space Technology* read differently today than they did 50 years ago. In the early 1970s, the magazine was filled with stories about military aircraft, Cold War competition, rockets and engineering breakthroughs. The financial side mattered, but it was secondary to the machines. Now the financial details may be the real story. Artificial intelligence (AI), quantum computing, advanced semiconductors, robotics and private space systems are creating fortunes at a speed that would have seemed unimaginable even 20 years ago.

What strikes me is not merely the technology but the concentration of wealth surrounding it. The people connected to the initial public offerings, venture capital pipelines, government contracts and semiconductor supply chains occupy the commanding heights of the modern economy. The new industrial elite is being formed in real time. In earlier generations, steel, oil, railroads and automobiles defined the economic order. Today it is data centers, AI infrastructure, chip fabrication and aerospace systems.

The divide may become brutal. Those attached to the technological ecosystem could accumulate extraordinary wealth and influence while those outside it drift into economic irrelevance. The middle ground appears to be shrinking. America in-

creasingly resembles a society split between designers of the machine and those servicing it. That may sound harsh, but after decades of reading the trends in *Aviation Week*, it no longer sounds unrealistic.

*Gerald Bradshaw, Crown Point, Indiana*

## TOO 'MARV-ELOUS'?

"Helos Lose Crew for Logistics Mission" (*May 18-31, p. 55*)

reports on Naval Air Systems Command awarding contracts



for Increment 2 of the Medium Aerial Resupply Vehicle-Expeditionary Logistics (MARV-EL) program. One team is to demonstrate an uncrewed, modified Bell 505. The taxpayers bought 38 uncrewed Bell 407/MQ-8Cs, and Naval Air Systems Command retired them in 2024 after less than five years of operational service. It doesn't seem necessary to buy a new helicopter for this MARV-ELous "science experiment."

*Kevin L. Smith, California, Maryland*

## SAMPLE COMPETITION

It is surprising to see the inconsistencies in how we are approaching NASA activities, specifically related to competition with China. The U.S. has made it a huge priority to return to the Moon before China gets there and to build a base there. On the other hand, China is preparing to retrieve samples from Mars and bring them back to Earth.

The U.S. has scientifically valuable samples prepared and waiting on the surface of Mars, and yet there is no push to find a way to get those samples back to Earth. There is no discussion of Mars sample return with respect to the competition with China.

*John Hanson, Huntsville, Alabama*

## CORRECTIONS

"SOCOM Assesses MV-75 Modification Approach" (*June 1-14, p. 32*) should have identified the technology application project manager in the Program Executive Office for Rotary-Wing as U.S. Army Col. Aron Hauquitz.

"Revamping Cabin Life" (*May 4-17, p. 54*) should have described Boeing's proposed workspace booths as having acoustic damping.

Address letters to the Editor-in-Chief, *Aviation Week & Space Technology*, 2121 K Street, NW, Suite 210, Washington, DC, 20037 or send via email to: [awstletters@aviationweek.com](mailto:awstletters@aviationweek.com) Letters may be edited for length and clarity; a verifiable address and daytime telephone number are required.



**Paul McElhinney** has been appointed CEO of *StandardAero*, effective Oct. 1. He succeeds Russell Ford, who is retiring but will stay on as executive chairman

until Dec. 31, after which McElhinney will assume that role as well.

Emirati airport services provider *Dnata* has hired **Nabil Sultan** to succeed Steve Allen as CEO. Sultan was executive vice president of passenger sales and country management at Emirates and previously was divisional



senior vice president of Emirates Sky-Cargo.

**Alex Veneziano** has been named CEO at *Airbus U.S. Space and Defense*, succeeding Robert Geckle.

He was chief administrative officer and prior to that was head of business operations and legal counsel.

*ST Engineering* has promoted **Jeffrey Lam** to deputy CEO. He was chief operating officer and president of commercial aerospace. **Kevin Chow** succeeds him as president of commercial aerospace, leaving his role as head of aerostructures and systems for commercial aerospace.

**Ann Stevens** has been appointed CEO of satellite imaging company *Iceye US*. She was chief strategy officer at ASRC Federal and before that was vice president of maritime and intelligence systems at Boeing.

*Ascent Aviation Services* has promoted **Tim McGuire** to president and chief operating officer from chief operating officer. Before joining the aircraft maintenance, storage, disassembly and modification services provider, he worked at Ally Aerospace Services and Bombardier.

**Maria Breton** has been appointed chief financial officer at *Aptus Aero*, a component maintenance, repair and overhaul service provider. She joined Aptus Aero from First Aviation Services, where she held the same title.

*Karman Space & Defense* has hired **Stefan Knighton** as chief information and artificial intelligence officer. He was enterprise transformation executive at Kyndryl. Before that, he was vice president, chief information

officer and digital transformation executive for missiles and fire control at Lockheed Martin.

**Martin Nüsseler** has joined *MHI RJ Aviation Group* as vice president of aircraft and new program development. He was chief technology officer at electric regional aircraft startup Maeve Aerospace, which declared bankruptcy in late May. Prior to that,



he held the same title at Deutsche Aircraft.

**Aron Backström** has been named chief commercial officer at *Swedavia*, effective Aug. 10.

He spent 12 years at SAS Scandinavian Airlines in several senior positions, most recently as vice president of product and loyalty.

Private aviation provider *FlyHouse* has hired **Anthony Banome** as president of its FlyHouse Solutions infrastructure division. He was chief revenue officer at Unique II Worldwide and prior to that worked at Fontainebleau Aviation and Meridian Teterboro.

*Janes* has promoted **Randy Nixon** to president of its U.S. business, a role he has held in an interim capacity since February, from chief customer officer. Before joining Janes, he was director of open-source enterprise at the Central Intelligence Agency.

**Ron Fehlen** has been promoted to vice president and general manager from vice president and deputy general manager of *Lockheed Martin Skunk Works*. He succeeds OJ Sanchez, who has become president of the company's aeronautics division.

Law firm *Greenberg Taurig* has hired **Christopher Senn** as a senior associate. He was assistant administrator for government and industry affairs at the FAA and before that worked as legal counsel for the U.S. House of Representatives Transportation



and Infrastructure Committee.

*Philippine Airlines* has appointed **Izham Ismail** and **Edgar Chua** to its board as independent directors. Ismail was managing director of Malaysia Aviation Group until his retirement in January. Chua is chairman of the Makati Business Club and before that was country chairman of Shell Philippines.

**Bryan Olaguer** has been hired by revenue management technology provider *TravelX* as director for the Asia-Pacific region. He was assistant vice president of revenue management at Philippine Airlines and before that worked at Etihad Airways.

Spanish technology group *GMV* has promoted **Ricardo Sáenz Amandi** to general manager for defense and security from director of defense and security programs. He has been with



the company for 30 years.

**Paul Bate** has joined the *University of Surrey* as a professor in practice and to assist in development of the newly estab-

lished Surrey Space Institute. He was CEO of the UK Space Agency.

## HONORS & ELECTIONS

The National Aviation Hall of Fame has selected **Mark R. Baker** and **Bruce Landsberg** for the *Neil Armstrong Outstanding Achievement Award* and named **Dan Mills** the *A. Scott Crossfield Aerospace Educator of the Year*. Baker is former president and CEO of the Aircraft Owners and Pilots Association. Landsberg was vice chairman of the NTSB in 2018-23. Mills, as an aviation teacher at Elizabethton High School in Elizabethton, Tennessee, helps students find paths into careers in the industry and contributes to development of state aviation education standards. 🇺🇸

To submit information for the Who's Where column, send Word or attached text files (no PDFs please) and photos to: [whoswhere@aviationweek.com](mailto:whoswhere@aviationweek.com) For additional information on companies and individuals listed in this column, please refer to the Aviation Week Intelligence Network at [AviationWeek.com/awin](http://AviationWeek.com/awin) For information on ordering, telephone U.S.:

+1 (866) 857-0148 or +1 (515) 237-3682 outside the U.S.



**AVIATION  
WEEK**  
by informa...

**MRO  
Americas**

**April 13-15, 2027**  
Orlando, FL

# Book your booth at **MRO Americas**, where the global MRO market connects.

MRO Americas is the essential gathering for the global maintenance, repair and overhaul industry. At the world's largest MRO event, you'll connect with thousands of buyers. Secure your space now and position your brand where it matters most.

- Access thousands of qualified buyers
- Generate high-quality leads and sales
- Showcase solutions to industry decision-makers
- Maximize your ROI and market presence

**Reserve today!** [mroamericas.aviationweek.com](https://mroamericas.aviationweek.com) | #MROAM



# FIRST TAKE

For the latest, go to  
**AVIATIONWEEK.COM**

AIRBUS



## DEFENSE

**At ILA Berlin, Airbus unveiled the U760** Ravenstorm collaborative combat aircraft and the U145 uncrewed variant of its H145 light twin helicopter for logistics and other missions.

**France and Germany have abandoned** plans for joint development of a next-generation fighter after failing to reach an agreement on the Future Combat Air System program (page 14).

**A U.S. Navy depot has delivered the first** Lockheed Martin F-35 with next-generation Technology Refresh 3 avionics. More than 700 U.S. F-35s need upgrading.

**Boeing and the U.S. Air Force have completed** the first phase of flight-testing the KC-46 tanker's upgraded Remote Vision System 2.0 (page 20).

**Saab rolled out the first F-39F Gripen** for Brazil on June 2 as Sweden explores potential acquisition of the two-seater (page 16).

**France has awarded MBDA a contract to** develop and deliver the ASN4G next-generation air-launched nuclear cruise missile, targeting service entry in 2035.

**The European Commission is to support** a project led by Safran, MTU and Avio Aero to develop technology for a next-generation military rotorcraft engine.

**Bell Textron has completed assembly of** composite wing structures for the first two test aircraft for the U.S. Army's MV-75 Cheyenne II advanced tiltrotor.

## COMMERCIAL AVIATION

**Boeing has received FAA approval for** 777-9 Type Inspection Authorization Phase 4B, the largest task remaining before certification of the first 777X variant (page 42).

**India's government is to establish a \$1** billion price stabilization fund to enable oil companies to cap jet fuel prices for local airlines.

**UK-based airline European Cargo, which** operated 10 Airbus A340-600 freighters, filed for administration on June 3.

**Passenger traffic across Europe fell in** April year over year for the first time since the COVID-19 pandemic, trade body ACI Europe said June 4.

**Kuwait International Airport resumed** operations June 3 after Iranian drone and missile attacks that day killed one person and injured 63.

**Yakovlev has been awarded a Russian** government contract for a shortened MC-21-210 version of its new narrow-body, with first flight planned for 2028.

**U.S. investment company Castlelake** has said it is considering a bid for European low-cost carrier EasyJet (page 39).

**NASA's Lockheed Martin X-59 Quesst** low-boom demonstrator conducted its first supersonic flight on June 5, reaching Mach 1.1.

## VIEW FROM FORT WORTH

### American-Google SAF Deal Hailed

American Airlines is to purchase 35 million gal. of sustainable aviation fuel over three years through a deal under which Google will purchase the environmental attributes of the fuel to offset emissions from corporate travel.

Produced by Valero, the fuel will be delivered for use at Chicago O'Hare International Airport, resulting in nearly 300,000 metric tons of CO<sub>2</sub>-equivalent emission reductions. The agreement for sustainable aviation fuel certificates (SAFc) is the largest to be publicly announced between an airline and a corporate customer.

American described the deal as a "critical step forward" in reducing its overall emissions. "Google will receive the environmental benefits to help address its emissions from employee business travel via the SAFc Registry, which enables transparent and traceable book-and-claim SAF," the airline stated.

While many factors still complicate efforts to scale production, SAF credit programs allowing corporate customers to offset the cost of the pricier fuel have enabled airlines to make progress. "That's what's allowing us to buy SAF today," American Chief Sustainability Officer Jill Blickstein said.

**GE Aerospace has completed ground** tests of a megawatt-class hybrid-electric engine ahead of flight tests on a modified Saab 340B.

**Dutch hybrid-electric regional aircraft** developer Maeve Aerospace has declared bankruptcy after failing to raise additional funding.

## SPACE

**China conducted the first flight of its** Long March 12B launch vehicle, which aims to rival SpaceX's Falcon 9, on June 1, orbiting 10 Qianfan satellites.

**Following the May 28 New Glenn pad** explosion, NASA wants other launch options for Blue Origin's lunar lander on the Artemis III demonstration flight in 2027 (page 27).

**The U.S. Space Force has awarded** SpaceX a \$4.16 billion contract to stand up an initial space-based airborne moving target indicator program.

**The European Space Agency has** awarded Thales Alenia Space a contract to build the Copernicus Sentinel-1 Next-



Generation Earth-observation satellite.

**Finnish space startup Iceye has raised €450 million (\$520 million) in a funding round valuing the synthetic aperture radar business at more than \$12 billion.** 🌐



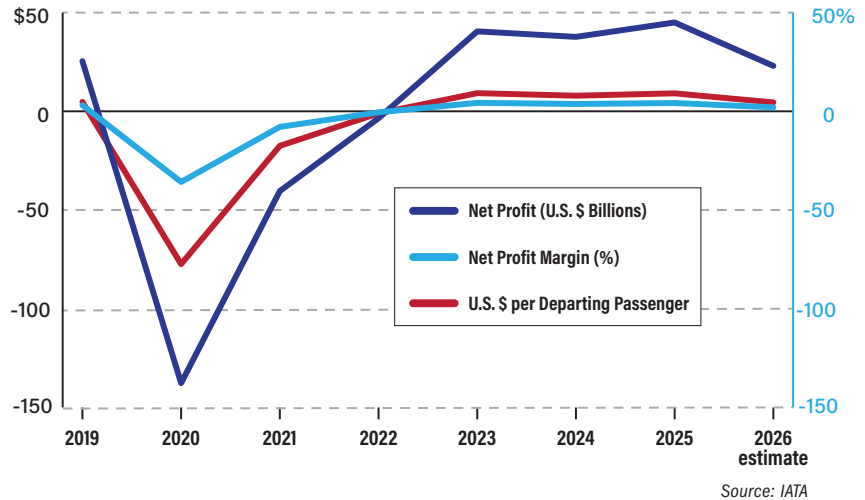
GEOFFREY THOMAS

## OBITUARY

**Geoffrey Thomas**, a veteran aviation reporter who served as Aviation Week's contributing editor for the Asia-Pacific region in the late 1990s, has died in Perth, Australia, following complications from heart surgery. He was 74. A prolific writer and commentator covering airline history, safety and sustainability, he made his break into aviation writing as a freelancer for Perth's *Sunday Times*. He joined *Air Transport World* in 2002 but left in 2012 to found websites ranking airline performance, safety and sustainability. He is remembered for his sense of humor and generosity in encouraging younger newcomers to aviation reporting.

## DATA SPOTLIGHT

### GLOBAL AIRLINES Iran War Effects in Numbers

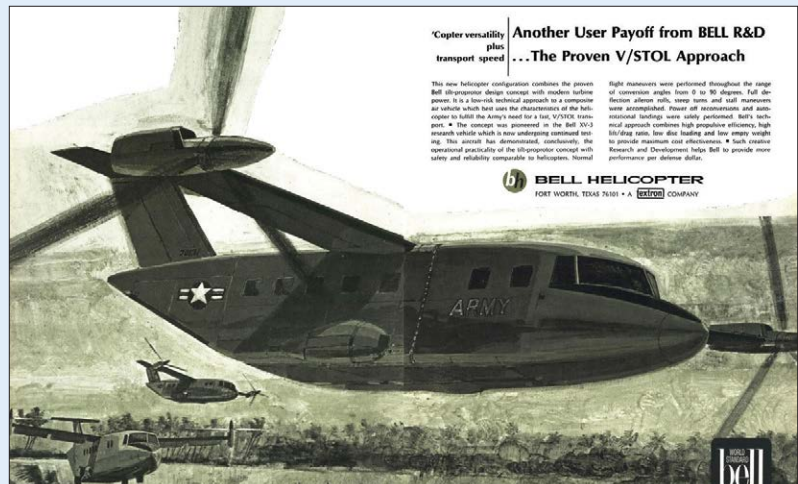


The International Air Transport Association forecasts a halving of profitability for the global airline industry as a result of disruptions and high fuel prices caused by the war in the Middle East. The trade body has revised its projected total net profit for 2026 down to \$23 billion from the previously projected \$41 billion (page 36).

## 60 YEARS AGO IN AVIATION WEEK

### In 1966, Bell Helicopter was flying high.

Thousands of UH-1 "Huey"—the unofficial nickname for the U.S. Army-funded Iroquois—helicopters had been deployed to Vietnam. An armed variant—the Huey-Cobra, later renamed simply the Cobra—was in flight testing, as a five-page pilot report detailed in our June 13 edition. But Bell was already thinking of the future. More than a decade had passed since the first flight of its experimental XV-3, the Textron company's first tiltrotor aircraft. In a few years, Bell and Vertol (later Boeing) would team to develop the XV-15, an advanced prototype for showcasing tiltrotor technology. Back in mid-1966, however, Bell had started socializing the military possibilities of a tiltrotor transport. Instead of inserting infantry squads into remote Vietnamese landing zones, an advertisement from the manufacturer (see photo) illustrated how



the Army could infiltrate entire platoons with a long-range aircraft that would not require a runway to take off and land. The concept would later be embraced by the U.S. Marine Corps, which launched the MV-22 Osprey into service after a painful development process nearly 40 years later.

Finally, Bell's 1966 advertisement to the Army paid off over half a century later: At the end of 2022, the Army selected Bell's latest tiltrotor design for the Future Long-Range Assault Aircraft program, which intends to field the MV-75 Cheyenne II by the end of the decade.

Subscribers can log in to access every edition of Aviation Week back to 1916 at: [archive.aviationweek.com](https://archive.aviationweek.com)



## UP FRONT

# BYRON CALLAN



### AS AEROSPACE INVESTMENT

banker Stephen Perry's recent column noted here, initial public offering activity in defense and aerospace has been burgeoning (*AW&ST May 18-31, p. 10*). The U.S. Defense Department's strong support for efforts to attract private capital to build competitiveness, resilience and innovation in the industrial base, coupled with expectations for sustained growth in defense spending, has opened a window to institutional investor capital that is flowing to defense contractors.

The Pentagon's engagement is mostly with venture capital and private equity investors. While there is no data on this, more sophisticated venture and private equity firms are likely to have people involved in defense deals who served in government or still serve in the military as reservists and therefore might have security clearances. Such clearances provide insights not available to most investors.

But the Defense Department must think beyond engagement with venture and equity investors in defense contractors. Investors might be patriotic, but they are in business to earn a return on capital. They often want to exit an investment after 2-5 years.

Such investors have three exit choices. They could sell to a larger company owned by venture capital or private equity. Anduril's acquisitions of multiple enterprises are examples of this. They could sell to a larger, established defense, aerospace or multisector company. Kongsberg's acquisition of Zone 5, which makes lower-cost strike weapons, is an example. Or, to Perry's point, they could sell in a public offering.

It is very important that the Defense Department recognize the difference in information available to institutional investors versus the venture and private equity ones with which it has been working. For instance, venture capital or private equity analysts and portfolio managers will not have security clearances, likely will not have served in the military—or will have served in a single branch—and are likely to be generalists.

This does not mean they would disclose information that could compromise national security. Classified programs have long been a factor that public companies cannot discuss in detail. Investors in Northrop Grumman dealt with this when the company was developing and producing the B-2 bomber. And KeyW, which had

multiple classified programs with the National Security Agency, made up names for large programs that had no relation to the names their customer used. The company was therefore able to discuss the financial impact of these with investors. Analysts and institutional investors can take cues from bookings and backlog changes as well as from financial guidance.

Still, the Pentagon could take steps to improve information flows that would provide institutional investors with more confidence about the outlook for defense contractors. Of course, not all such information is happy talk. These are businesses in a capitalist system, which should be seen as a strength.

The first step is for the Office of Management and Budget and the Pentagon to publish outlay estimates, not just estimates of budget authority. These were missing from the last two budgets the Trump administration sent to Congress. Outlay projections can help frame sales growth estimates.

The second step is for the Defense Department to resume publication of the Green Book, which

contained historic defense data in current and constant dollars and future spending estimates. It also included data such as the percentage of procurement budget authority that was expected to be converted into outlays each year. This data was invaluable in framing where U.S. spending had been and where it was headed.

The reliance on mandatory spending to be provided by reconciliation has also reduced transparency. This could change if and when the Pentagon resumes submitting discretionary spending requests, but the lack of detail in the mandatory request has lessened confidence in out-year growth expectations.

The Defense Department has to be mindful of risk allocation between itself and its contractors. A recent executive order promoting greater use of fixed-price contracts suggests the risk pendulum is swinging back toward contractors. Earnings blowups from charges on fixed-price contracts are an easy way to scare institutional investors away from the sector. There might not be one right answer on fixed-price versus cost-plus, but the implications of an imbalance should be considered. ☎

Contributing columnist Byron Callan is a managing director at Capital Alpha Partners.

## Seeking Transparency

How the Pentagon can help institutional investors



ZONE 5





## GOING CONCERNS MICHAEL BRUNO

### SPACEX, WHICH WAS DISMISSED

as a brash startup with a fanciful rocket reuse goal just a generation ago, will make world economic history with the largest initial public offering of stock ever.

But the most outsize effects of SpaceX's public debut could be yet to come within the cozy aerospace and defense industry that the company has transformed—and could remake again. From rocket competitors to satellite providers and government information technology contractors, analysts and experts are starting to place bets on where SpaceX's disruption will happen next.

One early read of analysis: SpaceX could become the dominant provider across swaths of defense and space programs, from rockets and satellites to the Trump administration's Golden Dome and even Washington's strategic decision-making systems.

"This is ultimately a platform play," said George Ferguson, senior industrial analyst for aerospace and defense at Bloomberg Intelligence. "If founder Elon Musk can integrate heavy-lift launch, low-Earth-orbit (LEO) communications and compute into a single stack, SpaceX could emerge as both the default U.S. launch provider and strategic backbone for resilient sensing, communications and military decision-making."

Ferguson has been speaking on and issuing reports about SpaceX's potential industrial impact since at least February, including a webinar earlier this month. He has surmised that SpaceX's initial public offering (IPO) proceeds could speed up Starship's maturation and launch cadence, supporting Pentagon payload delivery and the Golden Dome architecture.

What is more, orbital data centers powering artificial intelligence (AI) systems, which SpaceX founder and CEO Elon Musk has mused about repeatedly, "would mark a step change" in both civilian and defense systems, Ferguson added. Space-based computing at massive scale could obviate the need for centralized facilities on Earth and vault the command, control, computers, communications, intelligence, surveillance and reconnaissance ecosystem into a truly distributed LEO architecture.

"Execution risks remain, including power, thermal management and governance, but the model could reshape competition, favoring players that control launch,

networks and AI as space becomes a compute layer of national power," Ferguson said.

In space launch—SpaceX's *raison d'être*—the IPO could be an extinction event for some smaller startups. The company already has a commanding lead, and an infusion of cash could add proverbial fuel to the fire.

Archrival Blue Origin, government-aligned United Launch Alliance and scrappy one-stop-shop Rocket Lab are expected to survive in the U.S., along with heavily subsidized flag carriers launching in Europe, China and elsewhere. But newer providers, including recently public Firefly Aerospace, could be squeezed out.

"We think there are a number of these launch businesses that may not survive, especially as SpaceX lowers the cost of accessing orbit," Ferguson said. "It's kind of hard to see a lot of business for these companies."

Even so, SpaceX's launch business is not the main driver of the company's valuation. The Starlink satellite constellation providing connectivity is, while orbital data centers and other AI-related services in the

## Buy and Hold

A public SpaceX could **swamp industry**



SPACEX

future are expected to become dominant (*AW&ST* June 1-14, p. 14).

Bloomberg analysts Ferguson and John Butler see the potential for five or six LEO constellations ultimately, including Starlink, Blue Origin's TerraWave, Amazon LEO, a couple of Chinese constellations and a European one. What happens to smaller and newer rivals remains to be seen. AST SpaceMobile, which went public in 2021, has a LEO communications model similar to SpaceX's Starlink. Globalstar is another device-to-satellite communications provider that went public in 2006.

Then again, there is a scenario in which the aerospace and defense industry largely continues and the marketplace pie just expands, in part due to SpaceX. The company is already an aerospace and defense behemoth, and the industry as a whole is achieving record financial results.

Byron Callan, managing director at Capital Alpha Partners in Washington, noted in May that SpaceX's IPO filing made its end-market ambitions and future spending priorities relatively clear. "Because of its broader aspirations in AI and 'massive AI compute satellite constellations,' we assume SpaceX will be considered against a much broader swath of technology and other market sectors," he said. 🚀



## INSIDE BUSINESS AVIATION

# WILLIAM GARVEY

### HIS HEROES ALL GAINED FAME

by distancing themselves from others—vertically—as pilots. The 10-year-old pored over news reports on the exploits

of Roscoe Turner and Jimmy Doolittle and, of course, was transfixed by radio updates on Charles Lindbergh's progress toward Paris.

Naturally, he aspired to become a pilot, but his circumstances were not encouraging. He, his five siblings and parents lived and toiled on their dairy farm in rural Kentucky. There was plenty of work and love, but not much money. That would change.

In high school, he opened a part-time food stand, selling a dozen burgers for a buck, and pulled in enough of those to pay for flight lessons. He soloed at 16, bought a Waco at 18 and, two years later, was instructing. His big break came when he was hired by Pan American World Airways and appointed personal pilot of founder Juan Trippe.

In that role, Albert L. Ueltschi met, observed and learned from titans of business and industry—experience that would prove invaluable. It also gave him daily exposure to business aviation pilots who, unlike their airline counterparts, trained infrequently if at all.

That recognition sparked the idea of providing training for the nascent aviation subgroup, and in 1951, he incorporated that effort as Flight Safety Inc. The right concept, the right leader and the right time.

Fast-forward 75 years. Today, FlightSafety International employs more than 5,000 personnel across 70 locations on six continents. Its 38 aviation training centers are equipped with more than 260 full-motion flight simulators, plus visual systems and other learning aids that it manufactures. Annually, FlightSafety receives a quarter million enrollments in courses by pilots, technicians and others from business, commercial, military and government aviation operations. It rightly claims to be the world's preeminent professional aviation training company.

FlightSafety had remained an independent entity for nearly 50 years when Ueltschi, then turning 80, agreed to Berkshire Hathaway's acquisition of the company, thus ensuring its future. In 2003, he stepped down as CEO and in 2012, at age 95, flew west. Bruce Whitman, his longtime No. 2, succeeded as CEO but also flew west, in 2018. Management of the company, then paired with corporate sibling NetJets, was entrusted to a succession of executives, some with little training experience.

However, last December the CEO role went to Eric Hinson, who had spent years leading Simcom International, a training rival, after serving as FlightSafety's executive vice president from 2009 to 2012.

A former naval aviator and still-active pilot, he describes this as “a transformative time” for aviation. When asked to elaborate, he explains that he was referring to ongoing efforts to create new propulsion systems along with pilotless freight and passenger aircraft.

While acknowledging that of the estimated \$20 billion invested in advanced air mobility so far, most “is probably going to get lit on fire,” Hinson foresees that “some really interesting technology” will emerge and take aviation automation to a new level. He notes his TBM is equipped with Garmin's Autoland, which he regards as “the first step in getting people comfortable with this concept.”

FlightSafety's maxim has long been: “The best safety device in any aircraft is a well-trained crew.” But Hinson projects that in 30 years, technology could be in command on a preponderance of aircraft. Then the company will need to adjust to “continue to be relevant,” he says.

In the near term, however, Hinson says the focus will remain on training business aviation professionals but with an increasing emphasis on instructing military personnel as well.

He believes the armed services will have a growing need “for a highly adaptive training environment” in large measure “because of the complexity of what we deploy these days and the rapidly changing world in which we deploy them.”

In addition, Hinson sees opportunity in producing flight simulators for the airlines. Although FlightSafety was a major equipment supplier to regional carriers decades ago, he says it only “dabbled” in building simulators of the large jets used by trunk and international carriers.

“There's one dominant provider in that market,” Hinson says, naming CAE, and “the market wants choice.” He intends for FlightSafety to provide that.

Most important, Hinson says, with his appointment, “we're no longer reporting into NetJets,” but instead, “we're setting our own vision, our view of the world and what sort of role FlightSafety has to play in it.”

Al Ueltschi would surely approve. 

## Preeminent at 75

FlightSafety tallies 250,000 annual course enrollments



FLIGHTSAFETY INTERNATIONAL

*William Garvey was editor-in-chief of Business & Commercial Aviation from 2000 to 2020.*





## THE LAUNCHPAD

# IRENE KLOTZ

### A NEWLY ADDED MISSION TO

NASA's Artemis program portfolio is designed not only to test docking systems and techniques prior to a Moon landing

but also to give a novel commercial-U.S. government partnership a practice run at integrated operations.

"Artemis III is an incredibly exciting, complicated and highly coordinated multilaunch campaign [that] is going to happen in a short period of time with three of the world's most powerful rockets," NASA Artemis Program Manager Jeremy Parsons said during a June 9 event to announce the mission's crew.

With the goal of landing astronauts on the Moon in 2028, NASA in late February decided to spend its third Space Launch System (SLS) rocket and Orion capsule on a technology demonstration flight in 2027 to buy down risk for the lunar landing. The revamped Artemis III mission, which will take place in low Earth orbit, is designed to test rendezvous, docking and some operations of the Human Landing Systems (HLS), in development by Blue Origin and SpaceX.

The HLS is intended to ferry astronauts to and from lunar orbit and the surface of the Moon, although for Artemis IV, NASA is assessing docking the Orion with SpaceX's Starship in Earth orbit and then traveling to the Moon. Previously, HLS-Orion dockings were planned to take place in the highly elongated, gravitationally stable, near-rectilinear halo orbit (NRHO), where the now-canceled Gateway lunar outpost was to fly.

"We have an updated plan with NASA that includes docking Starship with Orion in Earth orbit instead of NRHO," said Jessica Jensen, vice president of customer operations and integration at SpaceX. "And then we use Starship to actually do the translunar injection with Orion attached.

"This approach improves crew safety by first conducting the critical docking event in Earth orbit," Jensen said at the Artemis III crew announcement. "The crew also can abort off the lunar surface nearly any time, versus waiting up to days from NRHO."

The new flight plan, envisioned for the first Artemis

Moon landing in 2028, also significantly cuts the amount of propellant SpaceX would need to store in space for the Starship HLS. "We have a more direct route to the Moon, and this lowers schedule risk overall," Jensen said.

NASA plans to kick off Artemis III with the launch of the Blue Origin Blue Moon Mark 2 HLS, which might fly

aboard a rocket other than the company's recently grounded New Glenn launch vehicle. An investigation is underway into the explosion of a New Glenn rocket during a static-fire test on May 28. The blast destroyed the rocket and severely damaged its sole launchpad (page 27).

However, Parsons, acting assistant deputy associate administrator of NASA's Moon to Mars Program Office, said he is confident the New Glenn and its launchpad will be ready to support Artemis III.

The Blue Origin Mark 2 HLS test article is designed to loiter in Earth orbit for up to about 90 days.

Next up will be NASA's third SLS carrying a four-person crew aboard an Orion spacecraft. The crew will be led by NASA's Randy Bresnik, with the European Space Agency's

Luca Parmitano serving as pilot and NASA astronauts Frank Rubio and Andre Douglas as mission specialists.

Following launch, the Orion will dock with the Blue Moon Mark 2 test article for two days of operations. "We intend to dock, perform integrated stack control, have crew cross the hatch, operate the lander and get critical tests of the life-support systems that can only be done in space," Parsons said. "This gives our teams key information on systems the lunar lander crew will depend on, all in an environment close to home versus four-plus days away around the Moon."

The vehicles will then separate, and the Orion will await launch of a SpaceX Starship test article into low Earth orbit. The Orion would then dock with the Starship for about a day. The crew, however, will not ingress that test vehicle, NASA noted. Following separation, the Orion will deorbit and return to Earth, splashing down in the Pacific Ocean.

NASA is hoping to follow Artemis III with at least one and possibly two lunar landings, Artemis IV and V, in 2028. 🌕

## NASA Looks Ahead To Artemis III

Trio of launches and docking tests on tap



**Selected for the Artemis III crew are (from left) NASA astronaut Andre Douglas, Luca Parmitano of the European Space Agency, and Randy Bresnik and Frank Rubio, both with NASA.**

# DEADLOCK TURNS

- > FRANCO-GERMAN FIGHTER PARTNERSHIP FIZZLES
- > AIRBUS CFO: "GOOD THE DEADLOCK IS OVER"
- > GERMANY ASSEMBLES INDUSTRIAL TEAM FOR WHAT COMES NEXT

**Robert Wall** and **Tony Osborne** Berlin

**M**ore than 40 years after France withdrew from the Future European Fighter Aircraft program, Paris and Berlin have called it quits on their effort to work on a sixth-generation combat aircraft in a partnership also involving Spain.

Although the outcome has been months in the making, it has created a sense of urgency among governments and industry to define what comes next. Stakeholders fear losing more

time than the roughly three years already wasted as governments worked to pull the program together and then to salvage it.

The failure of the New-Genera-

tion Fighter, the central pillar of the Franco-German-Spanish Future Combat Air System (FCAS), is largely due to industrial tensions, German Defense Minister Boris Pistorius said on the eve of the ILA Berlin Air Show—eight years after Airbus and Dassault Aviation agreed to work together on the project at a previous show outside the German capital.

Dassault, which was the industrial lead on the fighter program, a year ago voiced displeasure with the program's structure. The company said it lacked sufficient control and wanted change. That set off months of industrial bickering. The issue came to a head with a new phase of the development program that was due to start in October.

"An agreement was not attainable," Pistorius told reporters June 9.

Geopolitics also collided with the FCAS. When the governments shook hands, their ambition to develop a

**Airbus and Dassault unveiled a model of their New-Generation Fighter concept in 2019 before things went south.**





# TO DIVORCE

fighter was more an industrial and jobs undertaking than a military necessity. Russia's full-scale invasion of Ukraine in 2022 drove a change in mindset, making defense more central to French and German motivations. That also crystallized requirements differences. France needs a fighter that is carrier-capable and can deliver nuclear weapons. Germany does not.

Airbus CEO Guillaume Faury in May said that many assumptions underpinning the FCAS before the escalation in Ukraine were no longer valid, and that was one of the two major challenges facing the project. When the program was launched, the parties compromised "to get to a product at minimum cost," Faury said. With a war on Europe's doorstep and the prospect of wider conflict, "the specifications become more important," he added.

For months, politicians on both sides, including French President Emmanuel Macron and German Chancellor Friedrich Merz, tried to find a compromise.

"President Macron and I reached the shared conclusion that the companies would not be able to come together on the construction of a common combat aircraft," Merz said June 10, five days after formally deciding to pull the plug.

Still, the end to months of back-and-forth "opens new opportunities for industry to continue advancing modern combat aircraft development through other avenues," he said.

"It is good the deadlock is over," Airbus Chief Financial Officer Thomas Toepfer said in an interview at ILA. "Given the situation, this was the right and only possible solution."

Just how extensive the rupture will be is still unclear. MTU Aero Engines and Safran had formed a joint venture—the European Military Engine Team—to work on the fighter's turbojets. Both have indicated they are open to keeping the partnership alive even as the aircraft-makers part ways.

"The basic situation remains unchanged, and the need for a sixth-generation fighter jet remains as great as ever," MTU Chief Program Officer Ottmar Pfänder told journalists on the opening day of the event.

Companies are urging the governments to preserve national expertise and industrial capability. "We need a future framework to secure what has been achieved so far," Pfänder said.

The clock is ticking. Money for the current development program runs out in September. Industry officials are looking for bridge funding to keep teams working on the program while governments hammer out what to do. MTU has about 350 people on the program; Airbus has about double that. Smaller vendors could be even more pressed to pay the bill to keep engineering teams intact.

**"While fighter cooperation is dead, other elements of the FCAS program are progressing."**

An ideal outcome would be for governments and industry to coalesce around a new plan by year-end, one industry official says. "Speed is of the essence," a European defense executive states.

Berlin will likely pursue a partnership for a new effort at developing a future fighter; German Air Force Chief of Staff Lt. Gen. Holger Neumann said at ILA, noting that the timeline for such a program will be driven in part by political decisions about the path forward.

The new fighter would have to work with uncrewed platforms and connect with other systems, Neumann said. He added that he has told the German Federal Defense Ministry to buy only fifth-generation or more advanced platforms beyond 2035. That also drives the thinking that the new aircraft needs to materialize around 2040, when Germany's Eurofighter Typhoon Tranche 2 aircraft will reach the end of their service lives.

Fighter requirements are likely to be reset. Germany and Spain are no longer driven to shoehorn their needs into those of France, which were constrained by carrier compatibility. Throughout the program, Dassault

and Airbus concept drawings for the fighter differed, suggesting the gap in requirements definition.

Germany, for instance, wants an air superiority fighter with greater range and large internal missile carriage to accommodate bigger, longer-range weapons. That is driving the need for a large airframe and greater thrust. Another German requirement: greater stealth than the Lockheed Martin F-35.

Pistorius said it is premature to say how Germany will proceed, but he noted that the government has been talking to different actors for months.

Berlin and Madrid are likely to continue working together while looking for another anchor partner and possibly smaller participants. But government and industry officials want to avoid the trap of bringing in so many partners that harmonizing requirements and executing the program become impossible.

"With what we know today, we would not structure the program the way we did," Pistorius said. "That's a lesson we need to learn." The fighter program was a big, ambitious undertaking that has now collided with reality, he added. "We have to live with that."

One potential program partner is Sweden, although its fighter requirements have been more modest. Poland, the Netherlands and Belgium—the third formerly an observer to the FCAS—have skills that could bolster them as smaller participants.

Quietly, industry officials are keeping an eye on the rival Global Combat Air Program, where there have been simmering tensions. Japan and Italy have complained about elements of the program, and the UK has been caught up in internal budget squabbles that led to the resignation of the UK defense secretary on June 11. A rupture could open new partnership opportunities.

On the French side, the pathway is clearer, given its history with Dassault's Rafale. The airframer is to build the aircraft, Thales is to provide key electronics subsystems, and Safran is slated to deliver the powerplant. France is somewhat locked in after green-lighting a new aircraft carrier program.

Michael Schoellhorn, CEO of Airbus Defense and Space and president of German aerospace trade association BDLI, said German industry has the expertise, technology, industrial capacity and determination required to develop and build the FCAS and the

sixth-generation fighter. He stressed that industry is not advocating a go-it-alone approach for the country and only wants to ensure it has a “substantial and responsible role.”

German suppliers Airbus, Auto-fly, Diehl, Hensoldt, Liebherr, MBDA, MTU Aero Engines and Rohde & Schwarz have teamed in what they call Team 6 Gen. The group says it is ready to pursue a program and urge the government to act.

“We can’t lose time,” Team 6 Gen said as it unveiled its position paper, signed during ILA. Contractual progress is required to meet Germany’s ambitious timeline of fielding a next-generation stealth fighter before 2040, the group argued.

Germany has to take a leadership position while being open to multinational cooperation among like-minded countries, Team 6 Gen said.

While fighter cooperation is dead, other elements of the FCAS program are progressing, such as pursuit of uncrewed aircraft programs and development of a “combat cloud,” a network that can tie future platforms together.

German defense electronics spe-

cialist Rohde & Schwarz used ILA to unveil its concept for a multidomain directional communications system that, in the air domain, would be the backbone of a combat cloud. The company spelled out plans to start flight-testing elements as early as next year, with the goal of having key elements customer-ready by the end of the decade.

“You can really apply all the [electronic warfare] ideas of low probability of intercept, low probability of detection,” Andreas Domann, vice president of multidomain communications at Rohde & Schwarz, said in an interview. “You can really tune who is going to see you, who is going to hear you. You can hide away.”

Air domain applications include allowing stealthy fighters to communicate with each other without the risk of detection as well as networking crewed platforms and uncrewed swarms to share information.

For Europe, all this bickering is eerily familiar. Tension, deadlock and disagreement have been at the heart of almost every cooperative program in the region. The UK and France successfully developed the Sepecat

Jaguar in the late 1960s, but no other country has built a combat aircraft in partnership with French industry.

When an Anglo-French project to develop a variable-geometry combat aircraft failed in the 1960s after Paris pulled out, London pursued a program with Germany and Italy that ultimately produced the Panavia Tornado. The French withdrawal from the pan-European Future European Fighter Aircraft came two decades later, birthing the Rafale on one side and the Eurofighter Typhoon on the other. In the 2010s, Paris and London explored development of an uncrewed combat air vehicle. The two split when the UK voted to leave the EU, spurring France and Germany to explore the FCAS instead.

Merz said that despite the fighter rift, Paris and Berlin will remain defense partners and are poised to agree on new cooperation efforts next month. “Our defense ministers will present a comprehensive and modern road map for defense-industrial cooperation,” he said. “We want a small number of genuinely relevant and executable projects that can make a real difference to our collective security.” ☒

## Ukraine Deal Could Spark New Wave of Gripen Orders

> SWEDEN PLANS TO DONATE GRIPEN C/Ds TO UKRAINE

> METEOR MISSILES WOULD THREATEN RUSSIAN COMBAT AIRCRAFT

**Tony Osborne** London

**S**aab faces a bow wave of potential orders for more than 50 additional JAS-39E/F Gripen fighters as sales negotiations advance with Ukraine and Brazil.

Ukraine is in final negotiations to acquire a first batch of 20 E/Fs with funding from European loans, while Brazil has raised the prospect of acquiring 20 more to top off the 36 it has on order.

A Ukrainian Gripen E purchase could then unlock a Swedish buy of 12 aircraft, adding to the 60 on order, after Stockholm declared that it would donate 16 earlier-model Gripen C/Ds to bolster Kyiv’s air defense capabilities.

Ukraine is eager to expedite the

order and deploy the ex-Swedish Air Force aircraft to the front lines of its war with Russia.

Ukrainian President Volodymyr Zelenskyy said his country’s lawmakers have approved the allocation of €2.5 billion (\$2.9 billion) for the Gripen procurement from the EU’s €90 billion Ukraine Support Loan, after disbursement from the fund later this month to finalize the contract. Speaking to journalists in Sweden as the two governments advanced negotiations on the acquisition, Zelenskyy suggested that Gripen C/Ds armed with long-range weapons would serve as an effective countermeasure to Moscow’s long-range air-to-air missiles and enable the Ukrainian Air Force to target

Russian strike aircraft carrying stand-off weapons.

“These jets, with very specific weapons, especially [MBDA] Meteors . . . can destroy [air] targets [at ranges of] 200 km-plus [124 mi.-plus],” he said. “We think we will push back these Russian jets, and they will not be able to use their aerial glide bombs.”

Negotiations for a Ukrainian Gripen E order began last year, when Zelenskyy suggested Kyiv could acquire 150 of the fighters. His ambition remains, but the aircraft will be acquired in batches. Ukraine has made similar pledges to France for the Dassault Rafale, but negotiations have not matured at the same pace. Analysts have long argued that the Gripen is particularly well suited to Ukraine’s operational environment because of its ability to operate from austere locations and employ such weapons as the Meteor.

Analysts also point out that the Gripen is more forgiving to fly and maintain than the F-16s already delivered.

“Gripen was built for a country that may have to fight outnumbered, under pressure and from dispersed bases,





**Saab rolled out the first of eight two-seat Gripen Fs for Brazil on June 2.**

a force of about 66 aircraft but has lacked the funding to do so. An order for 20 additional fighters would move it significantly closer to its target.

At the same time, Saab rolled out the first two-seat Gripen F for the Brazilian Air Force on June 2. The two-seat model mates the wings and mid- and rear-fuselage section of the single-seat aircraft with a new forward fuselage and cockpit section.

The two-seater is designed to be fully operational; the rear cockpit can operate in several different modes, including independently or in tandem with the front cockpit to support training. Brazil has ordered eight twin-seaters; Colombia, two; and Thailand, one. Sweden has yet to order the Gripen F, but Jonson suggested that Kyiv's acquisition could reshape Stockholm's own future fighter requirements. 🇸🇪

—With Steve Trimble in Ottawa

[and] that makes it highly relevant for Ukraine,” Swedish Defense Minister Pål Jonson said.

The \$2.3 billion support package would include the donated Gripens, weapons, ammunition, training and maintenance support. Pilot training is underway and slated to accelerate in the fall. Delivery of the Gripen C/Ds would then facilitate the service entry of Ukrainian Gripen Es that Sweden intends to begin delivering before 2030.

Swedish Prime Minister Ulf Kristersson said there had initially been skepticism about Ukraine's plans to acquire Gripen E/Fs last year because Kyiv lacked the funding. At the time, pro-Putin governments in Hungary and Slovakia were blocking the Ukraine Support Loan. The European Council finally approved the loan in April after the two nations lifted their objections.

A Swedish order beckons if the 16 Gripen C/Ds are donated because its air force wants to maintain six fighter wings for a total of about 100 fighters. Discussions with Stockholm on the potential order are expected to begin shortly, Saab said.

The airframer has been making moves to ramp up Gripen production rates and expects to produce 20 a year in 2027, although Saab could lift production to 30 aircraft a year, CEO Michael Johansson told investors in April.

In the past 10 months, Saab secured Gripen E orders from Colombia and Thailand; Brazil is considering a follow-on purchase, Jonson said on June 4, as Brasilia and Stockholm moved to deepen their defense partnership.

The two formally began discussions on expanding the Brazilian Gripen fleet last September. Brazil has long sought

## Canada Signals New Urgency With Quick AEW&C Pick

- OTTAWA SELECTS SAAB GLOBALEYE AS PREFERRED PLATFORM
- THE COUNTRY'S FUTURE FIGHTER FLEET IS STILL UNCERTAIN

**Steve Trimble** Ottawa

**N**othing sends a message like a quick decision worth billions of dollars.

When Canada first revealed plans two years ago to spend more than C\$5 billion (\$3.62 billion) on a fleet of airborne early warning and control (AEW&C) aircraft, the move appeared to set in motion Ottawa's notoriously slow-paced procurement process.

Competitors—including the Boeing E-7A Wedgetail, L3Harris Aeris X and Saab GlobalEye—lined up for a years-long competition, and the National Defense Department noted that the requirements would be remain undefined until 2032.

Prime Minister Mark Carney, whom Canadians elected in April 2025 amid threats of annexation by U.S. President Donald Trump, then elevated national defense as a priority. The government created the Defense Investment Agency in November to fast-track procurements, including the AEW&C contract.

Six months later—a relative eye-blink, compared with the standard Canadian military procurement—Carney announced that the agency would enter negotiations with Saab to finalize a contract for a GlobalEye fleet. The AEW&C aircraft is based on the Canadian-built Global 6500 business jet.

“Saab's GlobalEye will be a key resource for Canadian Armed Forces to detect and deter threats across the Arctic,” Carney said in his keynote address on May 27 to the Cansec defense trade show here. It was the first time a Canadian prime minister attended the show.

The selection marks a dramatic step in the country's knotty, months-old campaign to forge closer security ties with Europe's NATO members and strengthen its long-neglected defense industrial base. In addition, Canada is looking at rapidly restoring a depleted military inventory that

struggles to sustain its share of the North American Aerospace Defense Command (NORAD) mission with the U.S. On top of everything else, Canada wants to check off those items quickly.

"I'm here because the world—and you know this far better than I, but even I sense it—the world of defense and security is changing rapidly," Carney said.

That realization drove him to promise a historic investment in defense. Over the next 10 years, the government plans to invest C\$180 billion directly in defense procurement and C\$290 billion more in defense-related capital investment. The plan includes a nearly 85% boost in spending on de-

fense Minister Władysław Kosiniak-Kamysz and German Defense Minister Boris Pistorius.

The spending plan and resulting attention puts pressure on the Canadian government to deliver on its promises. Carney's surprise move with the AEW&C acquisition program offers a telling case in point.

If Ottawa confirms a final deal, the GlobalEye would meet all criteria for Carney's new investment plan. Saab plans to complete mission systems integration on a second GlobalEye assembly line with Bombardier in Toronto and deliver about one third of a projected 40 AEW&C aircraft to the global market through 2036. In a sin-

uation changes will be necessary to integrate the GlobalEye aircraft with NORAD systems and the F-35A.

"The Swedish [GlobalEye fleet] are working with Norwegian F-35s right now," said Stephen Fuhr, Canada's secretary of state for defense procurement. "These things are designed to work with NATO and with key fighters, whether it be French or European or American. That's the way these things work."

But Saab's competitors for the Canadian AEW&C aircraft order argue that true integration is a more complex task. Swedish GlobalEyes "can talk on the radio, absolutely," with Norwegian F-35s, said Rich Foster, vice president of L3Harris Canada.

"Would you go across to that peer-to-peer fight, with fifth-generation fighters, fighting in Russia?"

Carney's announcement about selecting Saab as the preferred supplier for the AEW&C contract surprised and disappointed L3Harris, which was gearing up for a long and intense competition. Its Aeris X proposal, which features an ELTA Systems radar and is in development for South Korea, also is based on the Global 6500. If ordered by Canada, the Aeris X would be converted into an AEW&C aircraft in Mirabel, Quebec, according to L3Harris.

But the company remains hopeful about reentering the competition despite the announcement.

"The decision made [by Carney] is not a contractual discussion," said Jason Lambert, vice president of intelligence, surveillance and reconnaissance at L3Harris. "It was an intent to go and further negotiate with the party. So we're still very much interested. We're still very much, still very much in the game, and we believe that this technology approach, as well as our industrial approach, is the right solution for Canada and beyond."

As negotiations with Saab proceed on the AEW&C acquisition, the fate of Canada's future fighter fleet remains in limbo. Former Prime Minister Justin Trudeau signed a contract in 2023 for Canada to acquire 88 F-35As, reversing his own decision eight years earlier to

### Canada continues to review a 2023 decision to award a contract to Lockheed Martin for 88 F-35As.



LOCKHEED MARTIN

fense-related research and development. Ottawa plans for this to drive a wave of new Canadian defense products, creating a 220% leap in the value of the country's defense exports through 2036.

The planned spending surge has not gone unnoticed by the Canadian or global defense industry. Reflecting rising interest around the world in the country's defense market, more than 20,000 registered attendees squeezed into the Cohere Center's 200,000-ft.<sup>2</sup> exhibition space this year, a near-doubling of participation since 2022. Registrants browsing the booths of 320 exhibitors were so jammed at times that movement seemed impossible. In addition to Carney, Cansec hosted a parade of dignitaries attending the show for the first time, including Ontario Premier Doug Ford, Polish De-

puty Prime Minister Donald Tusk, and German Defense Minister Boris Pistorius. A contract for GlobalEye aircraft would achieve a rare win-win: helping to modernize the Royal Canadian Air Force's (RCAF) air sovereignty mission, adding defense sector jobs and bolstering the country's defense exports to the world.

"GlobalEye offers proven capability for the Royal Canadian Air Force, sovereign ownership for Canada and comprehensive and skilled work for Canadian industry," Saab CEO Micael Johansson said in a statement.

But there could still be complications. Ottawa might need U.S. government approval to adapt the GlobalEye for integration with NORAD's command-and-control systems as well as the RCAF's potential fleet of Lockheed Martin F-35As. A top Canadian official brushed off a question by an Aviation Week reporter about whether config-



scuttle a 2010 commitment to order the fighter.

Carney responded to Trump's threats to Canadian sovereignty by calling for a new review of the F-35 acquisition. That reopened an opportunity for Saab to offer a competing bid with the F-39E/F Gripen. Ottawa now is reviewing whether to continue ordering only F-35As from the U.S. or to buy a mixed fleet of F-35As and Gripens. Acquiring the GlobalEye as Canada's first AEW&C fleet would give the RCAF an aircraft designed specifically to operate alongside the Gripen for airspace defense of an Arctic country.

At the same time, L3Harris executives say the Aeris X has received U.S. government approval to carry an undisclosed subsystem that would integrate their AEW&C aircraft directly with the F-35A's mission systems.

Despite those connections, Cana-

dian government officials say that the review of the fighter acquisition portfolio remains independent of the decision to buy the GlobalEye.

"An AEW&C platform works with all fighter platforms," Fuhr said, answering an Aviation Week reporter's question during a press conference.

"So whether it's a current [Boeing] E-3 or any of the platforms that exist now, they work with all fighter platforms. [The GlobalEye] is a fantastic platform for Canada. I'm sure we'll get other questions about it, but it doesn't influence our direction to go one way or the other with the fighters." 

**Saab's GlobalEye, combining its Erieye Extended Range radar with the Bombardier Global 6500, emerged as Canada's favored AEW&C aircraft.**



SAAB

# PRECISION THAT POWERS FLIGHT

Precinmac supports aerospace programs with precision manufacturing solutions for complex airfoils and mission-critical engine components. Across our family of 13 companies throughout North America, we combine advanced machining expertise, operational scale, and execution-driven manufacturing to help aerospace & defense customers move critical programs forward with confidence.



**PRECINMAC**

**HOPPE**

**SHIELDS**

**PETERSEN**

**MAJOR**

**HPG**

**MMPCO**

**TRIMASTER**

**VIPER**

**OWENS**

**ICON**

**DECATUR**

**APPLGATE**

**CLEARWATER**

# U.S. Air Force Weighs Steps To Expand Its Tanker Force

> KC-46 VISION SYSTEM WRAPS UP EARLY TESTS

> SIX BOEING KC-135s UNDERGO REPAIRS FOLLOWING DAMAGE BY IRAN

**Brian Everstine** Washington

**T**he U.S. Air Force has set a goal for its refueling tanker fleet but lacks a clear plan to achieve it.

The service has a legal requirement to increase its overall fleet of refuelers to 502 by the end of fiscal 2028, up from its current 466. The bulk of those are aging Boeing KC-135 Stratotankers, but more Boeing KC-46s are being delivered to modernize in the interim. Beyond the current KC-46 program of record, a large gap needs to be addressed.

“Our intent, our strategy, is to replace all the 135s in the fleet going forward,” Air Force Secretary Troy Meink told the U.S. Senate Appropriations Defense Subcommittee on June 9.

This year is shaping up to be a pivotal moment for the service’s tanker modernization effort. More than 105 KC-46s have been delivered as of early June. Boeing announced on June 3

per year. That number is expected to jump to 18 per year beginning in 2028 under a budget increase as the service maxes out Boeing’s production line, Meink told lawmakers in June. This coincides with new contracts with the airframer, which include a substantial rise in individual flyaway unit cost to \$321.9 million per aircraft in fiscal 2028 from \$199.7 million in fiscal 2027.

The Air Force plans to field 188 total KC-46s under the current program; procurement is set to wrap up in 2032. The service then intends to begin a production extension for another 75 of the tankers, bringing the operational KC-46 fleet to 259—slightly more than half the congressionally mandated total.

In the early days of the fiscal 2027 budget process this spring, the service briefly publicized a goal of buying 319 total KC-46s. However, when Aviation Week asked about that number, the service said the figure was a mistake and needed to be revised down to 259. The changing tally indicates uncertainty about how the overall refueling fleet will increase and that more tankers could come from Boeing in the long term.

“We are essentially maxing out Boeing’s ability to produce really at the max rate that Boeing’s capable of producing tankers,” Meink said.

The Air Force had completed an analysis of what would follow as part of the Next-Generation Aerial Refueling Sys-

**The Air Force is pushing Boeing’s KC-46 production line to full capacity, the service’s leader says.**



STAFF SGT. TRYPHENA MAYHUGH/U.S. AIR FORCE

tem program before putting that on ice this year. Instead, the service is focusing on short-term upgrades to situational awareness and survivability in its current fleet.

that it had completed initial flight testing of the long-awaited and required overhaul of the tanker’s Remote Vision System, first announced in 2020 and repeatedly delayed. The new 4K, full-color camera system is slated for installation on new-build tankers beginning in 2028, though it is not yet clear how the rest of the delivered fleet will be overhauled.

At the same time, the Air Force has been touting the combat capability of its KC-46s with the existing Remote Vision System, some of which are serving heavily in operations in Iran. The fleet is picking up missions and taking major steps toward a refueling role for nuclear bombers that are on alert.

In mid-May, the 22nd Air Refueling Wing at McConnell AFB, Kansas, conducted a Nuclear Operational Readiness Inspection. Air Mobility Command in the announcement said it is committed to including the new tanker in the deterrence mission, adding that the inspection was a key step forward.

“Though we cannot comment on the status of the aircraft’s inclusion in the nation’s nuclear mission, this inspection marks a significant milestone toward the aircraft’s ability to conduct nuclear support operations,” the command tells Aviation Week.

The Air Force has been accepting KC-46s at a rate of 15

tem program before putting that on ice this year. Instead, the service is focusing on short-term upgrades to situational awareness and survivability in its current fleet.

Air Force Vice Chief of Staff Gen. John Lamontagne, who previously led Air Mobility Command, said during a June 4 event at the Mitchell Institute that the analysis looked at offloading more fuel at a long range, signature management of aircraft and other factors. However, the service’s procurement accounts have become “crowded,” and there was not enough funding to go ahead with the new development. To ensure it has enough tankers flying, the Air Force is metering out how many KC-135s it is retiring as the KC-46s come on board, Lamontagne said.

The tanker fleet has been damaged in recent operations in the Middle East. One KC-135 suffered a total loss in a crash in Iraq, and six others were damaged on the ground in Iranian attacks on bases across the region.

“The other six aircraft, we believe, are in the process of being refurbished and will be back in inventory, but nonetheless, it’s old,” Air Force Chief of Staff Gen. Kenneth Wilsbach told lawmakers on June 9. “These are old airplanes that we’re replacing as quickly as we can.”



# Budget Increase Prompts Refresh of U.S. Military VIP Fleet

## > THE AIR FORCE WANTS C-37 AND C-40 REPLACEMENTS

## > THE PENTAGON DETAILS AIR FORCE ONE SCHEDULE

**Brian Everstine** Washington and Nashville, Tennessee

**W**hile much attention has gone to major changes to the Pentagon's Air Force One plans under President Donald Trump, the administration's directed major budget increase is allowing services to fund other VIP transport and support aircraft fleets that have received less priority.

The Pentagon's fiscal 2027 budget request aims to reach \$1.5 trillion through a combination of base spending plans and a reconciliation process. That plan includes refreshing the U.S. Air Force's Boeing 737- and Gulfstream G550-based VIP fleet and expanding U.S. Marine Corps goals for its small fleet while outlining U.S. Army hopes for its aging yet in-demand support aircraft.

The Air Force's shift is the biggest in the Pentagon's new spending plan. The service expects to buy one C-37C in fiscal 2027 for \$208 million, followed by three in 2028, four in 2029, four in 2030 and five in 2031. Collectively, the plan calls for \$2.2 billion for 17 aircraft under the Common Small Executive Airlift Replacement Aircraft program.

The Air Force says it will modify an existing commercially derived aircraft with VIP interiors, along with a distinguished visitor compartment, mission communication and self-defense. Air Mobility Command describes a requirement of carrying five aircrew and 20 personnel for nonstop trips of up to 7,500 mi.

The current fleet is a mix of Gulfstream V-based C-37As and G550-based C-37Bs. Even though the G550 is out of production, it is still in demand as the Air Force grows its EA-37B Compass Call fleet based on the type. The service said in a statement that it would not comment on what aircraft the C-37C would be based on, pending an acquisition strategy, but keeping the same mission designation would require a similar aircraft like the Gulfstream G700. The U.S. Coast Guard recently procured

two G700s for its own C-37s. Eight C-37As and C-37Bs are to be retired over the next five years.

The Air Force's budget plan also calls for purchasing a used 737 to modify into a C-40C to augment its current fleet of the type. Last year, Congress called for \$250 million to buy the aircraft after lawmakers had blocked a plan for the service to buy a

**The U.S. Air Force has not specified what aircraft type will replace the C-37A/B beginning in 2027.**



737 MAX to create a new C-40D. Four C-40Cs are to be retired in 2028.

Air Mobility Command has called for recapitalizing both the 737-based C-40s and the 757-based C-32s with one type, potentially downsizing to a business-jet-size aircraft. The service also flies the much smaller Learjet-based C-21, although the command says this fleet is viable until at least 2030.

The Air Force One plan has become clear within the past year, as the service has detailed a new schedule to retire the Boeing VC-25As in 2029, and the VC-25Bs are expected to be delivered in 2028. This summer, the Air Force anticipates delivery of a Boeing 747-8 donated by Qatar. The aircraft has been modified into what the service designates as the "VC-25B Bridge Aircraft" with a much smaller suite of upgrades.

The Marine Corps flies a smaller fleet of Beechcraft UC-12 and Cessna UC-35 VIP transports. The service is in the early stages of its own recapital-

ization to a one-type UC-12W fleet, and the Pentagon's spending plan includes a major ramp-up in this procurement. The Marine Corps is to acquire 10 UC-12Ws in 2027, up from just one in 2026, followed by seven in 2028 for a total of 28, including previous buys.

The Army hopes to follow, although that spending has not been detailed yet. Col. Joe Minor, capability program executive for aviation within the service's portfolio acquisition executive maneuver air office, tells Aviation Week that the service has been updating the C-12—a military version of the Beechcraft Super King Air and Beechcraft 1900—to a modern two-variant fleet.

The updated C-12V features a Collins Pro Line 21 integrated avionics system, a fresh interior and new

paint. The C-12Y is modernized with a Garmin G1000 NXi integrated flight deck and a new autothrottle system to automate power management. Minor says the Army might acquire a standalone autothrottle system for the V variant.

The Army flies 13 Fairchild C-26 Metroliners that have sustainment and readiness challenges, and Minor says they should be recapitalized as spending allows.

Similar issues with aging and obsolescence face two jet transports. Minor says the Army is looking at replacing its UC-35 with something longer-range—such as an aircraft roughly the size of a Bombardier Challenger 3500, Cessna Citation Longitude or Gulfstream G280—that could operate in the Indo-Pacific region, where the current fleet is challenged in flying to places like Hawaii and Guam, he says. The Army also flies three C-37As older than the Air Force's fleet that should be replaced as age-related issues persist, he says. 🇺🇸

SENIOR AIRMAN TABITHA CHAPMAN/U.S. AIR FORCE

# Next-Generation Interceptor Is Set for Production as Golden Dome Grows

➤ LOCKHEED MARTIN EXPANDS SUPPLY CHAIN AMID DELAY

➤ ABOUT \$2 BILLION BUDGETED FOR PRODUCTION OVER FIVE YEARS

**Brian Everstine** Washington

**L**ockheed Martin is ready to begin manufacturing the next-generation ground-based interceptor to protect the U.S. from ballistic missiles. Meanwhile, the Pentagon's longer-term funding plan is coming into view, and a large increase in demand is expected through the Golden Dome program.

year on delivering hardware and beginning silo modifications for an initial flight test. Procurement is to begin in fiscal 2029; \$323 million is expected to start the process, followed by \$550 million in fiscal 2030 and \$1.17 billion in fiscal 2031. An award of \$1.1 billion is expected in November for continuing NGI

That rate increase is expected to come with the new Golden Dome for America architecture, beyond the existing plan to replace the 44 GMD interceptors at Fort Greely, Alaska, and Vandenberg SFB, California.

In the April hearing, Space Force Gen. Michael Guetlein, the direct reporting portfolio manager for Golden Dome, told lawmakers that the NGI is the ground layer of defense, to be combined with forthcoming space-based interceptors and new sea-based systems to ensure U.S. defense does not have "any exploitable holes."

U.S. Northern Command leader Gen. Gregory Guillot added that it is critical to keep the NGI on track because adversaries, such as Russia and China, collaborate in multiple ways to find gaps in U.S. defenses.

"It's extremely important that we keep NGI on track and, if possible, even pull it to the left," he said. "The NGI is essential to ensure that we can outpace those groups."

That schedule had been in question because the MDA had originally expected a rapid development process for the NGI. Collins reported to lawmakers in 2025 that there was an 18-month delay linked to development of the L3Harris-owned Aerojet Rocketdyne solid rocket motor.

Caldwell told reporters that Lockheed Martin has been focusing on collecting multiple suppliers for most components of the system, including solid rocket motors and sensors.

"We need a robust supply chain, and our intention is to make sure that for NGI, we have primary and backup suppliers for many of the systems," he said. "So we have been investing, and we'll continue to make investments, across the supply chain to make sure that we can build whatever quantity and rate that the nation asks us to build."

Amid the delay and design process, Lockheed Martin has been in a "methodical design and development cadence," testing individual components ahead of the all-up-round test expected this year, Caldwell said.

"We have done a rigorous job of burning down the technical risk of the program," he explained. "And we've had a number of successful test events over the last 18 months, with almost every element of the system showing that we're on a good path technically." 🌟

LOCKHEED MARTIN RENDERING



The Missile Defense Agency expects the Next-Generation Interceptor to be operational in 2030.

The Missile Defense Agency (MDA) says critical design review for the Next-Generation Interceptor (NGI) will come this year, confirming that the design is mature enough to enter full-scale fabrication. The overall NGI program is slated for fielding in 2030—a slight delay from a prior plan but still relatively quick for the Ground-Based Midcourse Defense (GMD) interceptor replacement.

"The game-changing step increase in capability that NGI brings to bear will help us to defend both the rogue nation threat as well as the peer adversary ICBM in the future," U.S. Air Force Lt. Gen. Heath Collins, director of the MDA, said at a U.S. House Armed Services Committee hearing in April. "It is critical to be able to do that."

The Pentagon's fiscal 2027 budget request says the MDA will focus next

development, following a \$1.3 billion award from November 2025, according to budget justification documents.

Lockheed Martin in late May formally opened its new NGI assembly plant, where it expects to start production in 2027. The 88,000-ft.<sup>2</sup> facility builds on the company's Terminal High-Altitude Area Defense and hypersonic work, using digital design capabilities and modular manufacturing components with the goal of scaling as needed.

"We can rapidly scale the facility up to handle future quantities," says Johnathon Caldwell, vice president and general manager of strategic and missile defense systems at Lockheed Martin. "We certainly anticipate that there will be a request for an increased production rate, and we're prepared to do that in a timely manner."



# Collaborative Combat Aircraft Surge Drives New Engine Concepts

- GE, HANWHA AND MTU SCOPE OUT NEW PROJECTS
- CCA POWERPLANT DESIGNS COULD BE STEPPINGSTONES TO COMMERCIAL ENGINES

**Steve Trimble** Washington and **Robert Wall** London

**A**ctivity is burgeoning in a long-neglected portion of the turbofan engine sector with the rise of a new category of jet-powered, autonomous warplanes.

In the past month, the U.S.' GE Aerospace, South Korea's Hanwha Aerospace and Germany's MTU have revealed plans to offer new propulsion systems crafted for the unique requirements of large collaborative combat aircraft (CCA). Those projects emerged publicly after previous CCA engine developments by Honeywell Aerospace and U.S. startup Beehive Industries.

As the industry jockey for position to power the emerging CCA class, several of these projects offer a stepping-stone to developing new turbofan engines for the market of small business jets that has been dominated for three decades by Williams International and Pratt & Whitney Canada.

For now, the incumbents remain the leaders in the CCA field. The 3,600-lb.-thrust Williams FJ44 powers both operational prototypes funded by the U.S. Air Force for CCA Increment 1: the General Atomics Aeronautical Systems Inc. YFQ-42 and the Anduril Industries YFQ-44. A similar-size member of the Pratt & Whitney Canada PW500 family powers Northrop Grumman's self-funded YFQ-48 Talon Blue.

But those CCA manufacturers and others around the world could soon have new options. GE Aerospace unveiled the GE426 engine project on May 19, aiming to establish a new turbofan architecture that could support CCAs with a propulsion requirement for 4,000-9,000 lb. of thrust. A week

later, Hanwha Aerospace announced a partnership with the Korea Aerospace Administration to develop a 4,500-lb.-thrust engine for CCAs. Finally, MTU also confirmed that it has begun talks with potential customers about engines for CCAs and other uncrewed aircraft systems.

The market for CCAs presents



**GE intends to reduce redundancy and complexity to deliver a CCA engine as quickly as possible.**

unique challenges for the traditional design mindset behind commercial engines—high up-front costs justified by thousands of flights with minimal maintenance. By contrast, keeping costs under control will be important, says Ottmar Pfänder, MTU head of programs.

Unlike crewed platforms, drone engines might require far fewer flight cycles—in some cases, just a test flight followed by a single operational mission. That could transform design parameters. Supply chain approaches and design iteration cycles are also different. In addition, the engines must withstand long-term storage yet function immediately once the system is pulled out of the box.

“What you now do in the civil mar-

ket is maximum performance and maximum safety,” Pfänder says. “This is a different business. We have to start with a different mindset.”

The pace, cost structure and business model in the CCA market have forced traditional engine manufacturers to change the way they operate. The customers want production engines available within a few years, not a decade or longer. The engines must be sufficiently powerful and reliable to support a combat aircraft but affordable enough to be expendable after perhaps dozens of missions instead of hundreds or thousands. Finally, CCA engines are expected to be lost or retired before major maintenance work is necessary, depriving engine manufacturers of the decades of sustainment work that traditional military aircraft engines generate.

“There’s not a huge sustainment tail for a cruise missile or a low-cost or small CCA by design,” says Steve Russell, head of GE Edison Works.

Another difference for the commercial engine market is the pace of development. To compete in the CCA market, engine-makers must find ways to avoid the decade-long cycles to design and certify new products. The GE426, for example, is expected to be delivered within 2-3 years.

“It’s not your typical big-engine design cycle,” Russell says.

GE and Hanwha also view the CCA engine projects as potential steppingstones to new turbofan engines for small business jets.

“The engine developed under this program is a high-bypass turbofan designed for fuel efficiency and both military and civil use,” Hanwha said in a May 28 statement. “It could also be adapted for small business jets and other commercial aircraft.”

To meet commercial certification requirements, GE’s architecture for the GE426 could be adapted, Russell says. The commercial design could use a similar architecture, but the component materials must be changed for durability, he adds. The commercial engine would also require additional redundancy for certain components, such as fuel-metering computers and cooling systems. ☐

# PRICE POINT



U.S. Army soldiers are slated to receive hundreds of thousands of drones by the end of next year to learn how to use them.

- > U.S. DRONE DOMINANCE STRATEGY HINGES ON PRICING CHANGE
- > COST OF GAUNTLET II ORDERS OFFERS A REALITY CHECK
- > PENTAGON TARGETS DRAW DIFFERING INDUSTRY PLANS

STAFF SGT. ADELIN WITHERSPOON/U.S. ARMY

**Steve Trimble** Detroit

**A** campaign to slash the price of small U.S.-made combat drones is entering a critical new phase. Before U.S. soldiers, Marines and special forces troops can wield drones by the millions every year—like their warring counterparts in Ukraine and Russia—the Pentagon wants to leverage a \$1.1 billion investment in the first 340,000 drones, slated for acquisition by the end of next year, to reshape the domestic industrial base.

As the Pentagon's Drone Dominance program nears the midway point, however, defense and industry officials are still grappling over what pricing level is feasible in the near term for the domestic drone industry.

Lt. Col. Leo Burkardt, co-lead of the Drone Dominance program within the Pentagon's Test Resource Management Center, broke down the challenge for an audience of hundreds of drone suppliers attending the Michigan Defense Expo here on May 12.

The Pentagon split the Drone Dominance program into four procurement phases, or gauntlets. Gauntlet I, now underway, challenges suppliers to deliver the first batch of drones for \$5,000 each. In Gauntlet II, which is now in competition, the Pentagon wants suppliers to drop their prices to \$4,500 for each long-range drone and \$3,500 for short-range systems. But those prices are still too high for the military's taste.

"If you look at the adversaries of the United States, if you look at friendly nations, if you look at Ukraine, they are building these things a lot cheaper than that," Burkardt told the industry audience. "So I'm intentionally overpaying a little bit."

Gauntlets III and IV, which are scheduled to be awarded this year, will attempt to lower those prices even further, since a smaller pool of companies will be building a larger number of drones.

"The expectation is by investing in that supply chain, the costs bump down," Burkardt said. "So I'm going to continue dropping the cost of Phase 3 and Phase 4."

At the same time, industry feedback is prompting Pentagon officials to rethink how much price-slashing is possi-



ble through the mechanism of volume orders. The pricing requirements for Gauntlets III and IV are still pending and might not be as aggressive as the mandated discounts established for Gauntlet II.

"We are watching what industry can do," Burkardt said. "We're not going to push them harder [than they can sustain]. The last thing we want to do is end up in a situation where we put a price point out, and we get two participants. We're very much aware of that concern."

The primary goal of the Drone Dominance program remains to fill a gap in the U.S. military arsenal. Military leaders want soldiers, Marines and commandos to become accustomed to operating with drones as if they were another item of personal gear, like a rifle and a radio.

But U.S. military units still lack an inventory of drones. In order to become familiar with the capabilities of small drones and to develop tactics, the Pentagon wants to start buying strictly U.S.-made drones in large quantities.

The goal faces several industrial constraints. The U.S. drone industrial base has struggled to compete with the quantities and prices of Chinese manufacturers. Shenzhen-based DJI alone controls more than 90% of the global commercial drone industry, according to a November report by the U.S.-China Economic and Security Review Commission. China's control at the assembled product level is mirrored across key drone subsystems, such as batteries, electric motors and payloads.

U.S. military rules prohibit buying hardware, including drones, from Chinese suppliers. So the path to equipping every soldier with a drone must start with energizing and scaling up a comparatively small domestic industrial base.

Some U.S. drone-makers welcome the challenge. "These drones do not cost \$5,000," Brett Velicovich, chief operating officer at U.S. drone-maker Powerus, told Aviation Week.

Velicovich said the Powerus lineup of small drones, including the newly launched MatrixFold, cost substantially less than other U.S. competitors.

"So when the Drone Dominance program says, 'Hey, we're going to give you \$5,000 for a drone that shouldn't cost more than \$2,000,' we're excited," Velicovich said. "Because it's so much more margin that we can now add into our manufacturing process. . . . We're excited that they're paying much more than these things really cost."

Component pricing still remains a challenge. Drone-makers typically source key subsystems, such as batteries and motors, from specialized suppliers. Since Chinese companies also dominate those industries, a U.S. industrial base for those systems must scale up at the same time, which can lead to scarcity and higher costs in the near term.

Powerus is aware of those issues and is considering various strategies to keep the final cost of the drones in check, Velicovich said.

"If we're buying thousands of batteries every quarter, maybe we should produce our own batteries," Velicovich

said. "Maybe we should buy a battery company. So we're looking at every single piece of the drone and saying, 'What can we get our suppliers to give us?' or 'In what areas is the supply chain really messed up to where we've just got to put capital in?'"

Other companies remain cautious about what the Drone Dominance program can achieve with the industrial base in the near term. Robinson Unmanned, for example, will not commit to participating in Gauntlet III until the government clarifies the pricing terms.

"I'm not pushing our team to look beyond Phase 2 right now," Paul Fermo, president of Robinson Unmanned, told

Aviation Week at the Xponential drone trade show here on May 12. "I want to be focused on Phase 2 and see what we can do there. Then when we figure out what Phase 3 is, we'll worry about what Phase 3 is."

For Robinson Unmanned, which acquired the former Ascent AeroSystems, the Pentagon's strategy to reduce prices with volume orders is sound, in theory. But the pricing strategy conflicts with new restrictions on using foreign suppliers for components.

"The scale-up will bring the price point down, but at the same time, if you're limiting your number of suppliers, now

what drives price up is scarcity," Fermo said. "So now you got fewer suppliers that drive scarcity up, that raises the price up. So you have this [situation where] it gets cheaper here but gets more expensive there."

Commercial pricing strategies also are complicated by the unique military requirements for combat drones. Soldiers are looking for capabilities that are not in demand for the commercial market. Autonomy software, specialized sensors and small munitions affect the pricing of military drones in ways that cannot be influenced by the volume of commercial demand.

"If you want autonomy and some of these added capabilities that I think the department is going to want, you have to have components that can provide that capability," Fermo said. "Those component providers are expensive. Sensors are expensive. Computers are expensive. Even down to individual components, such as capacitors, resistors, things like that, all the pressure is going to be on all those suppliers."

For the next few months, the Drone Dominance program and industry will define how far price levels can be reduced by an energized supply chain and at what timescale. Having selected industry teams to produce 30,000 drones in Gauntlet I in February, the Pentagon plans to choose a smaller group to build 60,000 drones through Gauntlet II. Another 150,000 drones remain in the order pipeline for Gauntlets III and IV, but the numbers for each—and their pricing levels—will be decided later.

"We are monitoring industry," Burkardt said. "We're seeing where things are being pushed, and we are going to push the envelope, but not so much so that we're going to break the bank on anybody." ☛



SGT. 1ST CLASS BRITANY CONLEY/U.S. ARMY NATIONAL GUARD

**The Pentagon's Drone Dominance program is scaling up U.S. production to deliver millions of uncrewed aircraft systems to fill a gap in the U.S. military arsenal.**

# U.S. Drone Demand Moves Acquisition to the Field

> U.S. ARMY UAS MARKETPLACE LAUNCHED IN LATE MARCH

> OPERATING UNITS EMPOWERED TO BYPASS ACQUISITION OFFICES

**Steve Trimble** Detroit

**A**s drones redefine battle tactics and war strategy, the need to procure a multitude of small uncrewed aircraft systems is transforming the U.S. military's acquisition system.

Hundreds of small drones and air-launched effects are now available for purchase on the U.S. Army's UAS Marketplace, an Amazon.com-like website that launched on March 24 (*AW&ST* April 6-19, p. 26). Thousands of soldiers can select their preferred

try is the demand signal piece," Lt. Col. Jeff Bess, the Army's product lead for the UAS Marketplace, told an industry audience at the XPonential trade show here on May 11. "The demand signal is probably the biggest beast."

U.S. defense procurement follows a familiar process for the industry. Annual budget documents signal the Pentagon's demand for specific weapons and systems several years into the future. The details sometimes change, but the guidance generally gives the indus-

try from drone suppliers. On the back end, military leaders used market incentives to shape operations. Units received credits to purchase drones based on their performance. If destroying tanks was the top priority, units received more credits for using drones to destroy armored vehicles than killing dismounted infantry.

The U.S. has no plans to use the UAS Marketplace to incentivize tactical priorities, but it intends to use the data collected from the website in other ways. "There's obviously a ton of data that we're going to be collecting on the marketplace, so figuring out how we can turn that data into information and then into knowledge to be able to inform future requirements is going to be huge," Bess said. "We'll be sharing that with industry as well, just so you're tracking completely what we're going after."

But the Army's drone suppliers still have questions about how the UAS Marketplace will present their products. The service already has agreed to mask details of some drone specifications from the manufacturer's competitors, Bess said. The soldiers will have full access to the company's product specification details, but not competing drone suppliers.

Executives at the XPonential conference asked industry suppliers about other potential issues. How would the Army verify which payloads are compatible with different drones? An uninformed soldier might order a preferred drone without realizing that it does not carry the payload needed.

The Army plans to upgrade the UAS Marketplace soon to list which payloads are compatible with each drone, Bess said. Other component-level add-ons will also be presented as options.

"So if you make brushless motors out there, and you potentially want to collaborate with another company on there and sell them, we're going to have that in the not-so-distant future, too," he said.

But the industry should also be on notice. The products they sell must deliver the advertised performance or soldiers will leave bad reviews on the UAS Marketplace.

"When I say 'perform,' if you say your system can go 40 km [25 mi.], it needs to go 40 km," Bess said. "Otherwise, you're going to hear feedback directly from soldiers." 📍



**A U.S. Marine launched a small drone during a 2025 exercise.**

systems and leave detailed product reviews, forcing defense contractors to respond with retail-like urgency.

The marketplace bypasses the military's centralized acquisition bureaucracy, delegating purchasing authority over weapon systems to the end users for the first time. The Army expects the UAS Marketplace to become the default platform for the other military services and for federal agencies—perhaps even state governments.

But the new acquisition path is challenging industry business models and supply chains accustomed to yearslong demand forecasts from the Pentagon's traditional process.

"The biggest thing I hear from indus-

try ample time to prepare themselves and suppliers to meet that demand.

The Pentagon's long-term plans to buy millions of an ever-evolving mix of small drones every year promises, however, to compress the interval between the military budget forecasts and delivery deadlines dramatically. Battalion-size units are learning to buy their own systems in monthly or six-week cycles. The same drone that receives thousands of orders one month could be out of demand the next.

The UAS Marketplace resembles aspects of the Ukrainian military's Bravel Market. Ukraine launched the site nearly a year ago, giving front-line soldiers the ability to order directly



# A Defining Moment for Blue Origin

> COMPANY'S PLANS SHIFT TO VERTICAL INTEGRATION > NASA ASSESSES EFFECTS ON ARTEMIS PROGRAM

Irene Klotz Cape Canaveral

**S**onic booms and rocket plumes are part of everyday life on Florida's Space Coast, so when a thundering roar and brilliant light shattered the balmy night on May 28, it was presumed that another booster was heading into orbit.

Instead, a fully fueled, two-stage New Glenn rocket, built and operated by Blue Origin, went up in flames on

Center]. Then I headed up to the Cape, joining the emergency operations center as personnel started coming in, and we started making real-time decisions on what the next steps were."

Fires burned throughout the night. Once those were under control, explosive ordnance disposal (EOD) teams began clearing the area around Space Launch Complex 36 (SLC-36) where

are very long lead items," he added. "The water tower is also good. The big support tower is damaged, but it can be repaired in place rather than torn down and replaced."

Limp did not address the condition of the onsite integration hangar itself but noted that a first-stage New Glenn booster and three upper stages that were in the hangar at the time of the



A fully fueled Blue Origin New Glenn rocket went up in flames on May 28, triggering the largest explosion in Cape Canaveral history.

its launchpad during the start of what was expected to be a routine preflight static-fire test. "It was the largest explosion that we've had out here," Col. Brian Chatman, Space Launch Delta 45 commander and director of the U.S. Space Force's Eastern Range, told reporters on June 2.

No one was injured or killed in the blast, which occurred at about 9 p.m. EDT on May 28 and, according to the U.S. Geological Survey, registered 2.5 on the Richter scale. "I had just gotten home and sat down in the living room, talking to my kids and wife and looked out the window and saw the explosion," said Chatman, who lives on Patrick SFB, Florida, just south of Cape Canaveral. "I called over to the fire team and activated the [Emergency Operations

the accident occurred. Blue Origin and EOD personnel made an initial assessment of the damage on May 29. The Eastern Range was able to resume support for other launch service providers; SpaceX and United Launch Alliance both flew from Cape Canaveral SFS less than 24 hr. after the explosion.

Ground, aerial and satellite photographs of SLC-36 show that portions of the transporter-erector and at least one lightning protection tower were heavily damaged or destroyed, as well as pad plumbing and umbilicals. The blast spared the propellant farm, leaving oxygen, liquid hydrogen and liquefied natural gas tanks in good shape, Blue Origin CEO Dave Limp wrote in an update late June 1.

"This is good luck because these

explosion "look good." Manufacturing of additional vehicles will continue at its current pace, and the stages will be stored until needed, Limp added.

"We will fly again before the end of this year," he wrote.

While the company has not yet announced any root cause of the accident, the ambitious six-month return-to-flight timeline implies no major hardware redesign is needed. Instead, the pacing item will be restoration of the launch site. Toward that goal, Blue Origin will not rebuild the transporter-erector, which was used to haul the assembled rocket out of its processing hangar horizontally and hoist it vertically for launch.

The company now plans to assemble New Glenn stages in the SLC-36

Integration Facility as usual and then hoist the vehicle vertically by crane for transfer to the launchpad. Payloads will be installed, also by crane, at the pad.

Blue Origin had planned to phase in vertical integration operations for its larger New Glenn variant at a second launchpad at SLC-36. The company's \$2.4 billion contract with the U.S. Space Force, which last year selected the booster to fly up to seven National Security Space Launch missions as part of its Phase 3 Lane 2 competition, also calls for vertical payload integration.

"We'll now go directly to that, so we don't need a new transporter-erector," Limp wrote.

Blue Origin had been hoping for a quick turnaround between the New Glenn's problematic third flight on April 19 and New Glenn-4 (NG-4), which was to be the first of 24 for Amazon, its biggest customer.

The 48 Amazon Leo broadband satellites due to fly in early June on NG-4 were not aboard the rocket during

no other launchpads to support New Glenn flights. The rocket debuted on Jan. 16, 2025, and has flown three times. During its most recent mission, the New Glenn failed to deliver AST SpaceMobile's BlueBird 7 into its intended orbit due to an upper-stage

**"Spaceflight is unforgiving, and developing new heavy-lift launch capability is extraordinarily difficult."**

issue that prevented one of its two liquid-hydrogen-fueled BE-3U engines from reaching full thrust.

The FAA, which oversees U.S. commercial spaceflights, signed off on May 22 on Blue Origin's NG-3 mishap investigation report and the company's corrective actions to return to flight. In a statement, the FAA said it is aware of

NASA is also paying an undisclosed sum to fly two science instruments on Blue Origin's first Mark 1 lander, which had been slated to launch to the lunar surface this year.

Blue Origin holds a separate \$3.4 billion contract with NASA for a crewed lunar lander, known as the Blue Moon Mark 2, to ferry astronauts to and from lunar orbit and the surface of the Moon. That Human Landing System (HLS) contract includes an uncrewed Mark 2 lunar landing demonstration. In late February, NASA added a new mission to the Artemis portfolio to test both Blue Origin's and a second HLS provided by SpaceX in low Earth orbit. After the accident, NASA Administrator Jared Isaacman said the agency wants other options besides New Glenn for launching Blue Origin's HLS in time to support Artemis III in mid-2027.

"Spaceflight is unforgiving, and developing new heavy-lift launch capability is extraordinarily difficult," Isaacman said in a statement. "We will work with our partners to support a thorough investigation of this anomaly, assess near-term missions impacts and get back to launching rockets."

The day after the accident, the Space Force announced it had awarded Blue Origin a Phase 3 Lane 1 contract, the value of which was not disclosed, to fly a New Glenn mission for the National Reconnaissance Office (NRO) in late 2027 or early 2028.

The Space Force and the NRO remain "committed partners" with Blue Origin following the incident and will work with the company to investigate the root cause, Col. Eric Zarybnisky, the Space Force's acting portfolio acquisition executive for space access, said in a statement.

Blue Origin is among a pool of launch providers the Space Force has identified as potential Phase 3 Lane 1 vendors, alongside Rocket Lab, SpaceX, Stoke Space and ULA. Only Blue Origin, SpaceX and ULA are eligible to win Lane 1 contracts now, since they have achieved at least one successful flight with their respective rockets. Prior to this contract award, only SpaceX had received Lane 1 task orders, under three contracts awarded in October 2024, June 2025 and March 2026. 🌕

—With Vivienne Machi in Los Angeles and Robert Wall in Anaheim, California

BLUE ORIGIN



**A New Glenn first stage, which was in the launch complex hangar at the time of the hot-fire explosion, was taken back to Blue Origin's KSC base while damage and repair assessments continue at the launch site.**

the hot-fire test, a lesson the industry learned following a failed SpaceX Falcon 9 static fire on Sept. 1, 2016.

That accident at SLC-40 claimed Israel's AMOS-6 communications satellite, which was being prepared to launch two days later. SpaceX eventually traced the problem to a failed composite overwrapped pressure vessel in the rocket's upper-stage oxygen tank. It was 15.5 months until SpaceX flew from SLC-40 again.

Unlike SpaceX, Blue Origin has

the NG-4 static-fire test anomaly and that the test was not within the scope of FAA-licensed activities. "There was no impact to air traffic," it added.

The incident does fall squarely under NASA's purview; the agency purchased another two missions from Blue Origin on May 26 to deliver lunar rovers to the surface of the Moon. That contract, worth up to \$468 million, follows a previous award for a Blue Moon Mark 1 lunar lander to deliver its water-hunting VIPER rover to the Moon.



## New Glenn Blast Yields Silver Lining on a Bad Day

Irene Klotz Cape Canaveral

**THE ROOT CAUSE FOR THE FAILED NEW GLENN FLIGHT 4** static-fire test has yet to be disclosed, but one metric stands out—7,174 ft. That is the diameter of the New Glenn launch site that comprised the blast damage area ahead of the rocket's May 28 hot-fire test at Cape Canaveral SFS' Space Launch Complex 36.

Eastern Range, told reporters June 2. "Nobody was injured, and nobody was killed in this event."

The explosion—the largest ever at storied Cape Canaveral—was the first launchpad accident of a booster fueled by liquid methane and liquid oxygen (LOX).

Relativity Space's 110-ft. Terran 1 rocket, which conducted a single test flight in March 2023, was the first methane-LOX rocket to fly from the Cape. That was followed by the January 2024 debut of United Launch Alliance's Vulcan and then by Blue Origin's New Glenn in January 2025. The Vulcan has flown four times, and the New Glenn was being prepared for its fourth flight when the accident occurred.

Space Launch Delta 45 also is preparing to support the methane-powered mega-launcher Starship-Super Heavy, which SpaceX plans to fly from Kennedy Space Center's Launch Complex 39A and from Cape Canaveral SFS' Space Launch Complex 37. Preliminary assessments put the Starship's BDA at about 12,000 ft. (see map).

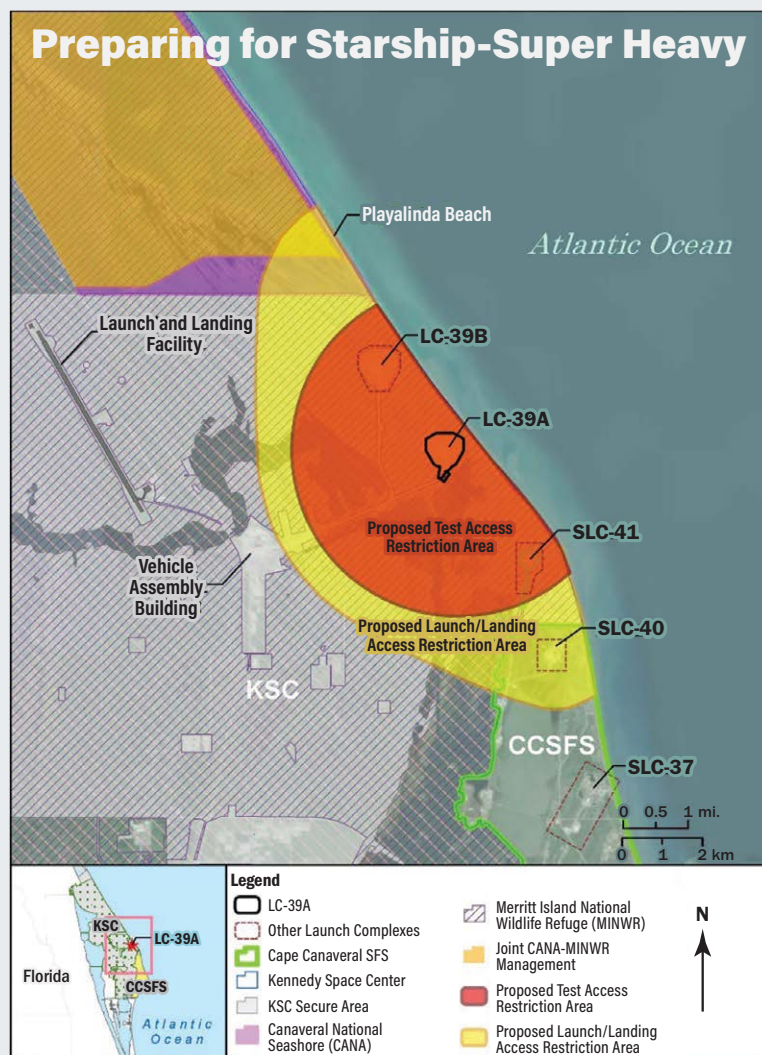
"We know we have a conservative approach," Chatman said. "We know that we will be able to bring in that BDA to some level. We don't know how far we'll be able to bring that in."

"We are going to make a data-driven decision on how much we reduce the BDA," he added. "But until we have all that data fed into the models and have that true analysis done, we're going to continue with the conservative approach."

The Space Force sets BDAs for methane-LOX systems as if the rocket fuel is equivalent to the standard explosive demolition charge, TNT (trinitrotoluene). "We really think that's at the high end," Chatman said. "On a really bad day, we want to make sure all personnel are safe. So we take that conservative approach coming in and use that

to establish the BDA while we collect data through different tests to really solidify what the blast damage area should be—or the equivalency should be—with regards to that LOX-methane combination."

Data from the New Glenn-4 mishap is expected to speed that work. Measurements of both the initial explosion and related overpressure events around the area will be fed into computer models that inform future Starship, Vulcan and New Glenn BDA keep-out zones. "That data is going to fine-tune the models," Chatman said. 🚀



The rocket exploded about 9 p.m. EDT at the start of a routine test before launch scheduled for the following week.

A myriad of calculations contribute to determining the boundaries of the blast damage area (BDA) safety zone, including how much fuel is aboard a rocket, local weather patterns and atmospheric conditions. "This event showed us we have the right approach, the right measures in place," Space Force Col. Brian Chatman, Space Launch Delta 45 commander and director of the



Falling remnants of a SpaceX Starship rocket caused commercial airlines to divert in January 2025.

## Rising Launch Pace Drives Calls for Tighter Airspace Integration

➤ FAA EXPEDITES CLOSURE OF HAZARD AREAS

➤ JETBLUE SAYS ONE LAUNCH CAUSED MAJOR DELAYS

**Mark Pilling** Lisbon, Portugal

**T**he skyrocketing launch activity projected for the coming years is driving calls to coordinate those activities more closely with day-to-day commercial airline operations.

Launches have long been treated as largely one-off events, but with their cadence at roughly once a day and only going up, stakeholders in both space and commercial air transport argue that needs to change.

FAA Administrator Bryan Bedford said SpaceX recently told him it aspires to perform 10,000 launches per year, which caused his jaw to drop.

"I can see a future where we will be the limiting factor, because we are not putting enough funding into our space team," Bedford told the Royal Aeronautical Society in Washington. The FAA needs more resources

for that team, he said, noting that the agency is charging for launch and reentry.

"We need to be able to treat rockets just like we treat airplanes, where we can see each other in real time and coordinate around each other in real time," Kiko Dontchev, vice president of launch at SpaceX, told delegates at the Civil Air Navigation Services Organization Leadership Summit, held during the Airspace World event in Lisbon on May 25.

SpaceX, by far the largest launch operator, flew its Falcon 9 rocket 165 times in 2025, and is on pace for a similar number this year. The U.S. Space Force forecasts more than 1,500 launches annually from all operators by 2030 just from home soil.

"Space transportation operations

are no longer experimental or occasional," Vanessa Robertson, assistant vice president of operational support at Nav Canada, said while chairing a debate on space operations and air traffic management at Airspace World. "They're becoming a regular and increasingly complex component of global airspace environment with higher launch and reentry frequency, the emergence of suborbital operation and the expansion of spaceport infrastructure."

Ottawa has spelled out a desire to have its own spaceport, eyeing Nova Scotia for the launch facility.

The FAA, SpaceX and other operators have been collaborating on space launches for years. "We are launching every other day now, so it is common for us," said LaKisha Price, vice president of system operations services at the FAA. "We used to be static and close huge areas of airspace for about 4-6 hr. Now we do time-based launch procedures where, when the rocket is successful, we can close that hazard area quickly."

Even so, some events have indicated the need for more cooperation. A SpaceX Starship rocket suffered an inflight breakup on Jan. 16, 2025,



causing several commercial airline flights in the northern Caribbean to enter brief holding patterns or divert as a precaution against potential impact with falling debris. The FAA launched a mishap investigation because of the loss of the vehicle and cleared SpaceX to resume Starship flights after the company detailed corrective actions planned.

More recently, the agency has begun investigating a booster mishap during the May 22 Starship V3 flight, which did not affect commercial air travel.

As the FAA seeks to make managing space launches a repeatable process, the agency routinely produces and shares “pre-mission datasets” with all players for launch days and runs a “hotline” to keep all informed of launch progress, Price said.

Regulators issue notices to pilots to alert them of launches and keep-out zones. “An airline will assume that for the entire window, the airspace is hot, and so they will go ahead and reroute airplanes around that entire window,” Dontchev said. However, from the time of launch, the “reality is this area is actually hot for 9 min.,” he noted.

Despite some Starship mishaps, SpaceX has built up a high level of reliability with its workhorse Falcon 9. Dontchev argued that the time is approaching when industry can move from the static hazard area approach to a dynamic one.

“We really must start treating these launch vehicles and these space operations just like we treat airplanes, where we’re deconflicting in real time and managing it in real time—not closing airspace for a large portion of time,” he said.

Price said that step would require increased automation and data sharing, and he indicated that the FAA is keen to see that happen to minimize disruptions for carriers.

For airlines, streamlining could yield direct savings by eliminating disruption, rerouting and extra fuel burn caused by airspace closures.

One delayed launch led JetBlue Airways to incur “hundreds of hours of delays,” said Tania Helena, the carrier’s senior analyst for international programs. Improved information sharing with the FAA since has cut delays by 85%, she noted. ☼

—With Graham Warwick in Washington

# Defense Market Analyzer



## Easily Navigate the Global Defense Landscape.

Access data covering the key political, economic, budgetary, and strategic trends driving defense markets to identify new opportunities.



International  
Procurement Data



Detailed Spending  
Projections



In-Depth Analysis  
by Country



Learn More:  
[aviationweek.com/  
DefenseMarketAnalyzer](https://aviationweek.com/DefenseMarketAnalyzer)

AVIATION  
WEEK  
by informa...

# Landsat's Next Chapter: NASA Pushes Commercial Follow-On

- ADVOCATES BEMOAN POTENTIAL EFFECT ON EARTH MONITORING
- NASA ISSUES DRAFT RFP FOR LANDSAT 10 SPACECRAFT

**Vivienne Machi** Los Angeles

**F**or the second year in a row, NASA is proposing to commercialize the world's longest-running satellite imagery program.

Managed jointly by NASA and the U.S. Geological Survey (USGS), the Landsat program has operated contin-

dors use Landsat to cross-calibrate their own EO fleets.

But as the Trump administration looks to return U.S. astronauts to the Moon and lead a burgeoning orbital economy, NASA Administrator Jared Isaacman wants to lean increasingly

launched in 2013 and 2021, respectively, and each carrying two sensors. The two systems collectively add nearly 1,500 images per day to the program's archive, according to a 2025 Congressional Research Service report.

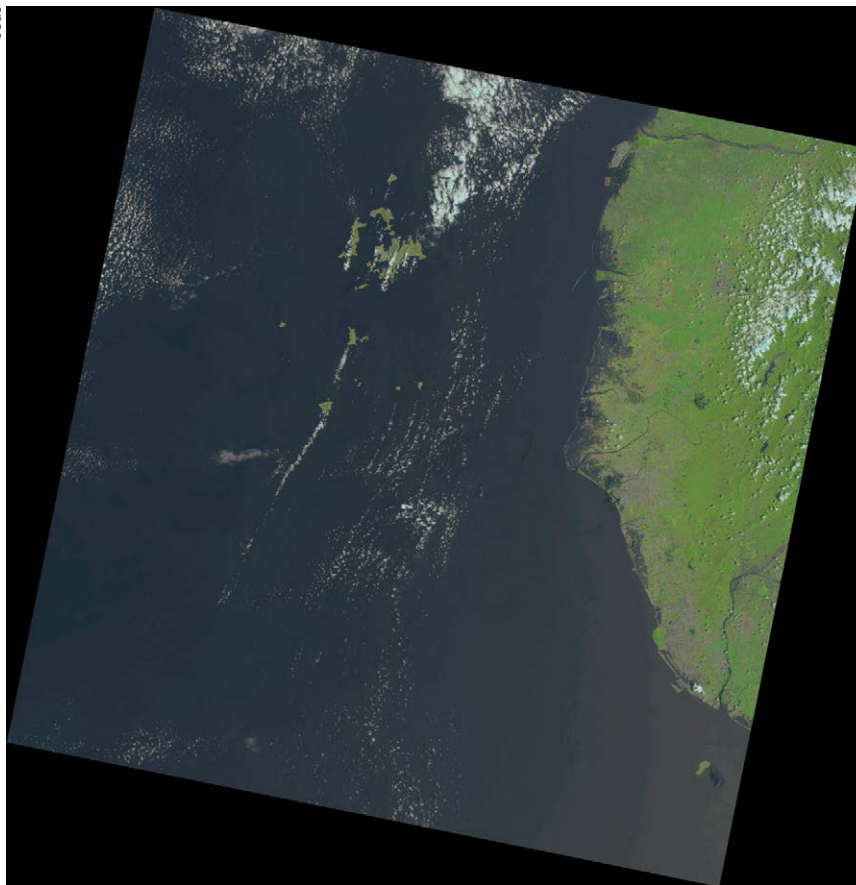
A team from NASA and the USGS began exploring options in 2019 for what would succeed Landsat 9. The top recommendation described a constellation of "superspectral" space-based sensors that would improve upon Landsat 9's predecessors; that plan was named Landsat Next and initiated in 2020. The team intended for Landsat Next to collect about 15 times more data compared with Landsat 9 while improving its revisit time from eight days to six days.

But in March, NASA rearchitected and redesignated the mission as a single satellite now known as Landsat 10, a draft spacecraft solicitation released May 18 states. NASA plans to release a final solicitation by the end of June and award a contract by year-end while USGS leads development and integration of the Landsat 10 ground segment.

The satellite is slated to launch by the end of 2031. After launch, Landsat 10 will operate in a sun-synchronous low Earth orbit and carry a single integrated suite of sensors called LandIS. RTX is building that sensor suite and has supported the Landsat program for more than five decades, starting with the second system. The company recently completed a preliminary design review for the instrument, and it expects to deliver the first sensor in 2028, a May 18 announcement indicates. Once on orbit, the new multi-spectral imager will more than double the current spatial resolution and capture twice the number of spectral bands, says Nick Yiakas, RTX director for mission solutions and payloads.

The reason behind this shift is largely cost savings. NASA described Landsat Next as "unaffordable" in a 2025 budget document. In a May 22 update, Isaacman called for the agency to "find efficiencies in commercial Earth observation, space weather and other missions beyond their original design life, to free up more resources to pursue challenging flagship missions that only NASA is capable of undertaking."

But Landsat users and remote-sensing advocates worry that moving to a commercial model risks the program's core elements: continuous and open data access that is driven by scientific



**A Landsat 9 satellite imaged the Taiwan Strait on April 19.**

uously since 1972, providing a carefully calibrated, science-quality archive of Earth observation (EO) data used to monitor crop health, assess water quality, prepare for natural disasters and support war planning. Its proponents consider it a critical public good in the vein of GPS—a government-designed and -operated system with an outside economic value across multiple sectors. Indeed, commercial ven-

on commercial remote-sensing providers for science data rather than field government-owned satellites.

Landsat is one program that appears targeted by this "science-as-a-service" approach. NASA's fiscal 2027 budget request funds one final government satellite for the program while advocating for a commercial follow-on.

The current constellation includes two satellites, Landsat 8 and Landsat 9,



## Landsat Satellite Missions

| Mission Name/<br>Number                 | Launch Date     | Operational Status/<br>Life Span | Primary Sensor Names | Spectral<br>Resolution | Image Data      |
|-----------------------------------------|-----------------|----------------------------------|----------------------|------------------------|-----------------|
| <b>Landsat 1</b><br>(Originally ERTS-1) | July 23, 1972   | 5.5 years                        | MSS and RBV          | 4 bands                | 147 scenes/day  |
| <b>Landsat 2</b>                        | Jan. 22, 1975   | 7 years                          |                      |                        | 122 scenes/day  |
| <b>Landsat 3</b>                        | March 5, 1978   | 5 years                          |                      | 5 bands                | 70 scenes/day   |
| <b>Landsat 4</b>                        | July 16, 1982   | 11 years                         | TM and MSS           | 7 bands                | 50 scenes/day   |
| <b>Landsat 5</b>                        | March 1, 1984   | 28 years, 10 months*             |                      |                        | 147 scenes/day  |
| <b>Landsat 6</b>                        | Oct. 5, 1993    | Failed to achieve orbit          | ETM**                | N/A                    | N/A             |
| <b>Landsat 7</b>                        | April 15, 1999  | 26 years, 2 months               | ETM+                 | 8 bands                | 550 scenes/day  |
| <b>Landsat 8</b>                        | Feb. 11, 2013   | 13+ years†                       | OLI and TIRS         | 11 bands               | >700 scenes/day |
| <b>Landsat 9</b>                        | Sept. 27, 2021  | 4+ years†                        | OLI-2 and TIRS-2     |                        |                 |
| <b>Landsat 10</b>                       | 2031 (expected) | In development                   | LandIS               | 26 bands               | N/A             |

**ETM** Enhanced Thematic Mapper, **ETM+** Enhanced Thematic Mapper Plus, **MSS** Multispectral Scanner, **OLI** Operational Land Imager, **RBV** Return Beam Vidicon, **TIRS** Thermal Infrared Sensor, **TM** Thematic Mapper

\*Guinness World Record \*\*Never deployed †Currently operational

Sources: NASA and USGS

requirements rather than market demand. They also point to the difference between EO—a snapshot that captures what is happening at a particular time and place—and Earth monitoring, a long-term, continuous effort enabling analysts to determine if an event is a normal variability or a true shift.

The U.S. attempted to commercialize the program starting in the 1980s. When EOSAT—a partnership between Hughes Aircraft and RCA—ran Landsat operations between 1985 and 2001, Landsat scenes were available for a fee ranging from \$200 to more than \$4,000 per scene, a 2023 USGS report shows. The USGS opened the Landsat data archive to all in 2008, completely free of charge, accelerating its usage by the private sector, academia and entities such as Google Earth Engine.

The pricey period of commercial operations deterred users from downloading that data and set back the utility of land remote-sensing data for decades, says Jim Irons, a retired NASA civil servant and former director of the Earth Sciences division.

To be sure, times have changed. The commercial EO market has expanded dramatically in recent years. The global market was valued at \$5.5 billion in 2025 and is expected to grow to \$12.34 billion by 2034, according to Forbes Business Insights.

But those constellations are optimized for commercial interests rather than systematic coverage, Aravind Ravichandran, founder and CEO of EO consulting firm TerraWatch Space,

asserted in a December newsletter.

That could lead to gaps in coverage, he wrote. “A provider might offer Arctic coverage if NASA pays for it specifically, but that is different from the standing requirement to observe everywhere, all the time, regardless of who is paying for any particular image.”

The result could be that those providers end up running two constellations: one for paying customers and one for NASA, Ravichandran tells Aviation Week. “If they are operating a constellation that they’re actually monetizing, giving data away from that constellation for free does not make any sense,” he says.

Robbie Schingler, cofounder and chief strategy officer at Planet Labs, sees opportunities for commercial providers to fulfill Landsat’s scientific mission while keeping the data free and open. NASA’s Jet Propulsion Laboratory (JPL) and Planet Labs participated in a similar effort, partnering with the state of California and a nonprofit called Carbon Mapper to build a set of satellites and a cloud-based data network to detect global methane and carbon dioxide emissions, Schingler notes.

That led to the creation of Planet’s Tanager hyperspectral satellite line, using sensor technology pioneered by JPL to provide “Landsat-quality accuracy” on those satellites. The partnership has been successful enough that Planet is building three more satellites, says Schingler, who formerly worked at NASA. “We own

it, we operate it, it has a digital public good mission, and we can still commercialize on top of it,” he says.

EarthDaily Analytics, a software and analytics company based in Vancouver, British Columbia, has launched seven out of 10 planned satellites for a constellation its leaders say will use 5-m (16.4-ft.) resolution and 22 spectral bands, along with thermal and methane sensors to collect data daily over the entire globe. The data is calibrated to Landsat and the European Space Agency’s Sentinel systems with the goal of being able to contribute seamlessly to those data streams over time, Chief Revenue Officer Eric von Eckartsberg says. EarthDaily’s satellites also are designed with a 10-year life span, which would provide for consistency over time.

Proponents remain concerned about what may happen to Landsat’s multi-decadal record and its vast array of users if a commercial provider fails or shifts strategy. A recent report from the USGS—the primary distributor of Landsat data—included about 250,000 active user accounts, more than 4,500 publications per year citing Landsat and greater than 200,000 TB of Landsat products downloaded.

But the shift is not completely set yet. House appropriators reinserted \$110 million for the Landsat Next program into 2027 bill language for the program, keeping flat with 2026 numbers. Senate appropriators are expected to release their own bill language in the coming weeks. 🌐

# Space Tech Challenge Winners Close the Gap Between Innovation and Mission

Mike McClary Anaheim, California

**T**he Space Tech Challenge started with a question that anyone close to the space sector has asked: How do you close the gap between innovations sitting in labs and garages and university research centers, and the missions and programs that need them?

The space economy is accelerating—but acceleration can create its own problems. There are critical capability gaps in propulsion, manufacturing, life support, domain awareness, and the technologies that will let humans live and work beyond Earth. And part of the reason those gaps persist is the right innovators aren't always in front of the right decision-makers.

That is what the Aviation Week Space Tech Challenge

is designed to fix. Launched in late 2025, the program drew 50 submissions from startups, established primes and university research teams spanning four continents and every corner of the space technology landscape. An eight-member evaluation team of independent industry experts scored each entry on how directly it addresses a real capability gap, how feasible and novel the solution is, and what evidence exists that the market recognizes the need. That framework was designed to find innovations that aren't just impressive on paper—but that are going somewhere.

The five category winners honored at Space Tech Expo USA in Anaheim on June 3 are going somewhere.



BACKGROUND IMAGE: SRIFOTO/GETTY IMAGES

## COLONIZATION

### ACCURATE ATOM INC. MARS-REACT

Tao Xu, Founder

Accurate Atom's modular electrocatalytic system converts Martian carbon dioxide and subsurface water directly into breathable oxygen and the chemical precursors needed for rocket propellant—powered entirely by solar or nuclear electricity.

The core innovation is an electrolyzer that simultaneously performs two reactions: water oxidation at the anode to produce high-purity oxygen for life support, and CO<sub>2</sub> reduction at the cathode to generate ethylene and ethanol, compounds that can be upgraded into rocket-grade fuel. This dual-function architecture eliminates the need for separate oxygen and propellant production systems, dramatically simplifying the supply chain for Mars colonization.



Tao Xu

## INDUSTRIALIZATION

### VARDA SPACE INDUSTRIES W-Series Reentry Capsule

Marat Kulakhmetov,  
Head of Analysis

Varda has built and is actively operating a commercially available, recoverable orbital platform providing routine, affordable access to true hypersonic reentry conditions at Mach 25 and above. The W-Series capsule treats reentry testing as a service and a logistics problem rather than a bespoke vehicle design challenge. Each mission delivers commercial launch, orbital operations, controlled ballistic reentry, parachute deployment and terrestrial recovery—with flown hardware returned directly to customers for inspection and analysis. In the past year, three capsules have completed reentry, carrying payloads for the Air Force Research Laboratory, the U.S. Navy, NASA and commercial partners.



Marat Kulakhmetov



AFRL has awarded Varda an indefinite delivery, indefinite quantity contract for flight services through 2028, and the company is on track for a monthly reentry cadence by 2027.

PROTECTION & DEFENSE

CONNECTICAL

LiteGuard

Noa Liron-Levy, CEO

Connectical's winning entry is LiteGuard—an ultra-lightweight EMI and RFI shielding braid that replaces traditional tinned-copper shielding in aerospace and defense cable harnesses. LiteGuard delivers up to 60% weight reduction while maintaining copper-equivalent shielding performance across frequencies from 0.1 to 40 gigahertz. Built from a modified copper-aluminum-magnesium alloy woven into a high-coverage braid, the material is solderable, corrosion-resistant and fully compatible with existing aerospace harness manufacturing processes—no redesign required. Every kilogram of copper shielding eliminated is a kilogram returned to endurance on a UAV, payload capacity on a launch vehicle or thermal margin on a spacecraft. LiteGuard has reached TRL 8: deployed in serial production, installed on operational platforms, validated by a major global defense aerospace manufacturer and actively evaluated by multiple U.S. defense developers.



Noa Liron-Levy

COMMERCIALIZATION

BLUESHIFT

AeroZero Tapes

Tim Burbey, President

Blueshift has developed AeroZero Tapes—an ultra-low thermal conductivity material engineered to address one of the most overlooked stress points in LEO satellite design: the interface between a solar cell and the composite structure it is bonded to, across 10,000 orbital cycles of extreme heating and cooling. In low Earth orbit, a spacecraft transitions between roughly 120C (248F) in sun-



Tim Burbey

light and -100C in eclipse every 90 min. Standard polyimide tape transfers heat quickly across those interfaces, creating gradients that fatigue adhesives, stress composites and shorten mission life. AeroZero Tapes are built around an open-cell architecture of approximately 85% air—a structured thermal gap that dramatically slows conductive heat transfer. In vacuum testing, they demonstrate 19 times lower thermal conductivity than standard polyimide and reduce composite temperatures by approximately 40C. They meet NASA outgassing standards, integrate in a familiar peel-and-stick format and have already been deployed across more than 10,000 ft.<sup>2</sup> of spacecraft applications.

UNIVERSITY PROGRAMS

UNIVERSITY OF ILLINOIS  
URBANA-CHAMPAIGN

LEAP

Justin Yim, Assistant Professor

The LEAP program at the University of Illinois Urbana-Champaign, led by Assistant Professor Justin Yim, has developed a multimodal jumping and rolling robot platform designed for planetary surface exploration—originally conceived to explore Saturn's moon Enceladus, where gravity is just 1.2% of Earth's. LEAP achieves its extraordinary range of motion through a single powerful jumping leg combined with two large, angled wheels that serve triple duty: as reaction wheels for attitude control during flight, as protective bumpers on impact and as rolling wheels for ground travel. A prototype tested at NASA Glenn Research Center has demonstrated jumps of 0.8 m (2.6 ft.) on Earth, translating to 5 m on the Moon. The program is funded by NASA's Innovative Advanced Concepts program and counts flight operations experts at NASA JPL and two NIAC Fellows among its team. LEAP earned the second-highest score across all five categories in this year's program—a remarkable result for a university team competing alongside fielded commercial technologies. ■



Justin Yim

RACHEL BERRY PHOTOS

**Digital Extra** See the list of this year's finalists at [spacetechnologychallenge.com/finalists/](https://spacetechnologychallenge.com/finalists/)



SPACE TECH CHALLENGE EVALUATION TEAM

Aviation Week thanks the eight independent judges who evaluated this year's submissions:

**Russ Matijevich**  
Matijevich International Consulting

**Chris Coker**  
Vice President,  
Civil Space Programs &  
Robotics, Lanteris Space

**Anna-Maria Rivas McGowan, Ph.D.**  
Former NASA Deputy Administrator for Technology, Policy and Strategy

**Jeff Grant**  
Aviation Week  
Space Advisory Board

**Robert Chambers**  
Lockheed Martin

**Debra Emmons**  
CTO, Aerospace Corp.

**Jeremy Fix**  
ispace Technologies U.S.

**Robert Katz**  
CEO & Executive Director,  
World Innovation Network

# 'ANOTHER MONSTER'

> IATA PREDICTS 50% DROP IN AIRLINE PROFITS THIS YEAR > DEMAND REMAINS STRONG—FOR NOW

Jens Flottau and Lori Ranson Rio de Janeiro

**W**hen Brazilian Vice President Geraldo Alckmin gave his opening remarks at the International Air Transport Association Annual General Meeting here, he sounded like someone from a different era.

He spoke of aviation as a force for democratizing opportunities and a driver of global integration. As for sustainability, Alckmin said his country is in a “privileged position to be a leader,” given its potential for sustainable aviation fuel (SAF) production.

the Iran war and a “tectonic shift in trade,” he said, the latter largely the consequence of the U.S.’ shift in trade policy since the beginning of President Donald Trump’s second term. Alckmin’s vision of a world united by aviation—a vision the industry likes to adopt as its mission statement—is further away from reality than it has been in decades.

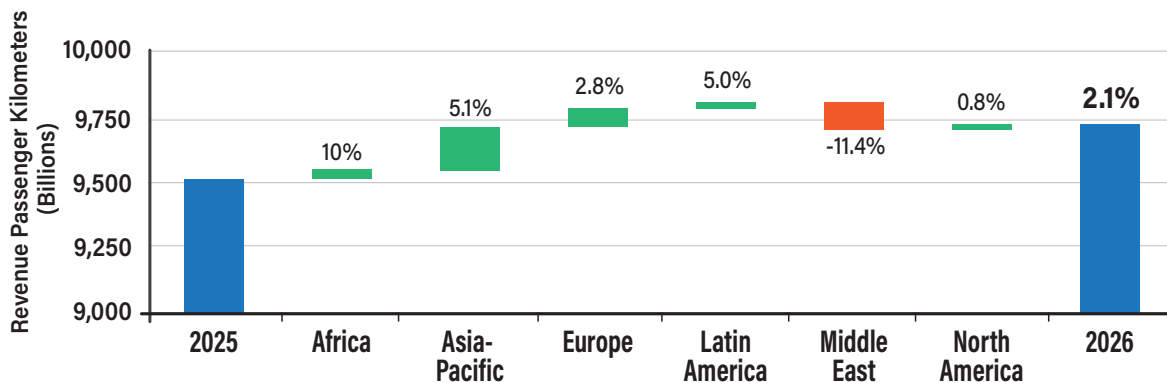
That radical shift is reflected in IATA’s financial and traffic forecast. The lobby group slashed its expected profits for the industry to just \$23 bil-

lers. “They will regain their position once we see stability,” he predicted. “The model is not damaged by the short-term impact.” Obviously, that assumes an end to the war in the region.

In the first four months of the year, traffic in the Middle East was down 24%, but IATA predicts only an 11.4% decline in revenue passenger kilometers for the full year, expecting a gradual recovery. Walsh praised carriers in the Gulf as doing “everything they possibly can to operate as many flights as they can.” He added that custom-

## Air Transport Market Trend by Region

Annual Growth % Year Over Year



Source: IATA

But when International Air Transport Association (IATA) leaders presented their latest forecast for the financial performance of aviation and the state of the industry, attendees at the event were jolted back to the harsh reality of the world today and its consequences for airlines.

“We see costs increasing everywhere,” IATA Chief Economist Marie Owens Thomsen said. “We are living through this crisis—an oil crisis compounded by a refining crisis.”

“Once again, we meet in challenging and unpredictable times,” outgoing Director General Willie Walsh said.

The industry is facing the fallout of

lion from \$45 billion, with the net margin shrinking to 2% from 4.2%. Airlines will have to digest about \$100 billion in additional fuel costs this year, as the average jet fuel price will be about 70% higher than IATA projected in January.

Airlines in all but one major region will nonetheless remain in profit territory. Europe leads in absolute numbers at \$9.6 billion, followed by North America and the Asia-Pacific. Airlines in the Middle East, the most severely affected by the war, are expected to post a \$4.5 billion loss this year.

However, Walsh does not foresee structural change for the Gulf carri-

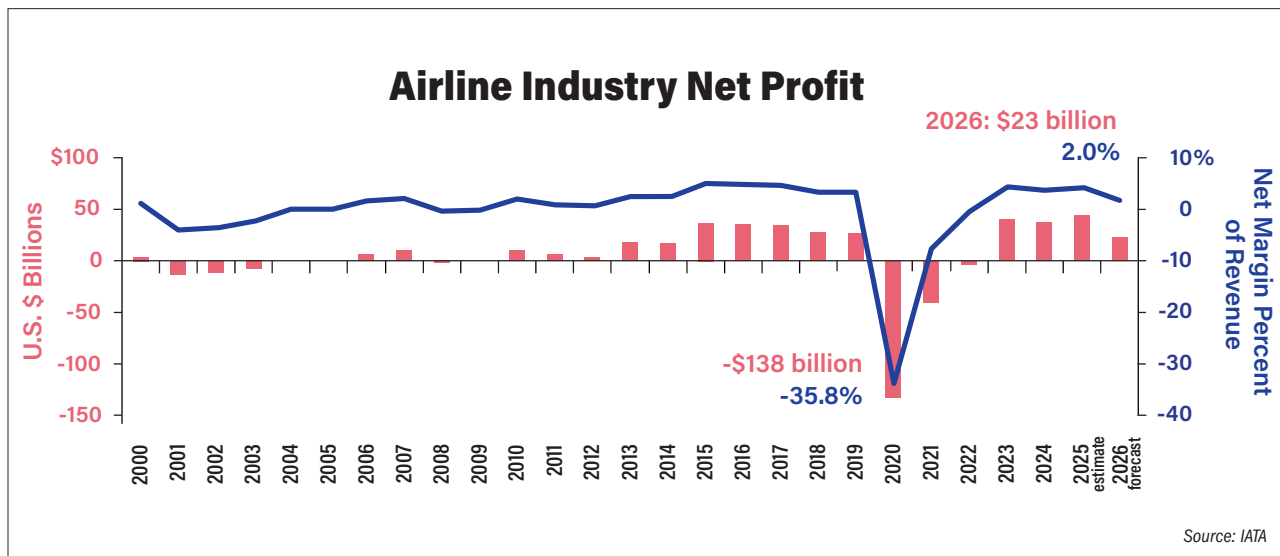
ers are “strongly appreciative” of the airlines’ efforts to accommodate them under difficult circumstances.

Walsh also said he saw “no way” that Gulf carrier capacity can be replaced in the Europe-Asia-Pacific market.

This has been “a tough year for all airlines, particularly those whose balance sheets have not recovered,” Walsh said, noting that “the good news is that demand is holding up” even though airlines globally have raised fares, and many carriers expect to pass through up to 100% of the increased costs over time.

Walsh also dismissed the notion of a shortage of jet fuel: “The fuel situation





has been addressed. I don't believe there are concerns about a shortage of supply."

IATA predicts an average jet fuel price of \$152 per barrel through 2026, with Brent crude at \$95 and therefore a \$57 crack spread.

"This is eye-watering stuff," Owens Thomsen said. "It will affect absolutely everyone in the global economy." She pointed out that a \$10 increase in the price of crude oil typically generates a 0.1 percentage-point reduction in global GDP. "All of this produces system stress, and no part of the body is spared," she said.

IATA still expects passenger traffic to grow by 2.1% in 2026 and cargo demand by 0.7%.

"The daily news fluctuates," Oman Air CEO Con Korfiatis said. "That has been the journey over the last couple of months." He observed that fares are higher but not high enough to recover the additional costs in full.

Abra Group CEO Adrian Neuhauser described the Iran war and resulting fuel price hike as a "sea change in our business"—another major disruption in an industry used to crisis management. "There is always another monster," Neuhauser said.

"If you chose to work in this industry, you better get the briefing right," TAP Air Portugal CEO Luis Rodrigues said. "I cannot recall any consecutive four years that went well, but we are still here," Pegasus Airlines CEO Güliz Öztürk said.

Abra's carriers, Avianca and Gol,

are "aggressively passing through" the additional costs to consumers, who are continuing to buy tickets. Neuhauser does not see a softness in demand for now.

Therefore, he says his "worst nightmare"—and that of many of his colleagues—is that demand will eventually fall off. The decline would not be due to high air fares alone. Inflation is driving up the cost of living, and holidays are becoming ever more expensive. At some point, Neuhauser fears, "the consumer will not travel." Airlines cannot afford to reduce fares, and lower fares alone would not lure people back to flying. "The ticket is ultimately a small part of the trip cost," he said.

What the industry has seen is a renewed drive toward consolidation. The sale of TAP Air Portugal to a strategic investor is expected this year; a decision will be made in the fall. In the latest twist, Air France-KLM appears to be considering a joint bid with Castlake and MSC for EasyJet, and other players in the region could consider such a move, too.

In the U.S., United CEO Scott Kirby appears to be continuing to dream about a much bigger deal but believes nothing is imminent. "You can go ask American's customers, 'Would they like United to buy American?'" he remarked to reporters here. "I hear from them all the time, the answer is 'yes.'"

Focusing on what benefits customers is admittedly a different way

"of looking at it than people have historically," Kirby said, but a tie-up between American and United is focused on doing something beneficial for customers, "and I think that's apolitical."

From a practical perspective, a merger would require support from unions, customers, shareholders, regulators and the management team. "I think we can get four of those five," Kirby said, but he added that United needs the support of American's management, "and we don't have that."

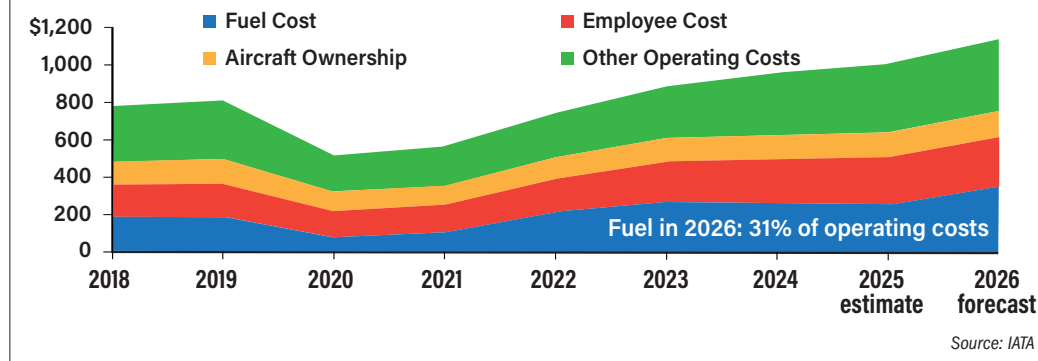
Although the fuel cost surge is the latest drama—one that executives hope is short-lived—structural problems persist. The industry is facing about \$11 billion in higher costs annually because of delayed deliveries of engines and aircraft. "We are missing 5,000 replacement aircraft," Walsh said, explaining that this leads to missed efficiency gains, higher lease rates and other unwelcome effects. "The supply chain continues its failure to deliver aircraft and engines."

Walsh criticized engine manufacturers for making high profits when customers are suffering and accused them of "gouging" airlines. "They have disappointed us with the new-technology engines they have developed," he said. "It used to be taken for granted that the engine was going to work and that it was going to stay on wing for years."

"Stop gouging us, and get back to making great engines that work and last," he demanded. "Allowing these

## Airline Fuel Cost Trends

(U.S. \$ Billion)



and CEO of International Airlines Group.

"I am happy to have a list of strong candidates," Gallego said. A subcommittee of the board in charge of the selection process is conducting interviews with candidates, and recommendations to the board are expected by the end of the month, "if everything goes according to plan," he said.

failures to continue into the next decade is completely unacceptable."

Given slow progress in SAF production, Walsh made clear that "there is still hope for net-zero 2050, but it is fading fast." An estimated 2.1 million metric tons of SAF were produced in 2025, representing just 0.8% of global jet fuel demand. Production needs to

rise to 500 million metric tons by 2050 to reach the targeted volume of 65%, according to IATA estimates.

Walsh will soon leave IATA to become CEO of IndiGo, and the IATA board of governors plans to review recommendations for the next director general before the end of June, said Luis Gallego, chairman of IATA

According to industry sources, the list includes candidates from inside and outside aviation. The last several IATA leaders had previously been airline CEOs. 🗣️

**Check 6** Aviation Week editors discuss the news from the IATA AGM: [AviationWeek.com/Check6](https://www.aviationweek.com/Check6)

## Regulatory Headwinds Are Tempering Brazil's Aviation Potential

- BRAZILIAN MARKET HAS CONSIDERABLE ROOM FOR GROWTH
- GOVERNMENT APPEARS TO LACK LONG-TERM AVIATION PLANS

**Lori Ranson** Rio de Janeiro

**A**t the start of the International Air Transport Association's Annual General Meeting here, LATAM Airlines CEO Roberto Alvo reminded attendees that the last time airline leaders had gathered in the city for the event was in 1999.

Twenty-seven years ago, airlines in South America transported 68 million passengers annually, Alvo said. That was before Chile's LAN and Brazil's TAM kick-started consolidation through a megamerger completed in 2012 that created the region's largest operator: LATAM Airlines Group. Back in 1999, LAN transported 4 million passengers annually, and TAM's passenger levels were 8 million, Alvo said.

During the past 12 months, LATAM has carried about 90 million passengers, he said, almost 50% more than the entire region transported nearly

three decades ago, and passenger numbers in South America have grown to 447 million.

Latin America's largest aviation market, Brazil, helped propel LATAM to its powerhouse position in the region. LATAM Airlines Brazil holds a 40% domestic market share.

Offering a big-picture view, Brazil's Vice President Geraldo Alckmin told attendees that nearly 130 million passengers were transported on domestic and international flights in 2025. It was the first time the domestic market surpassed 100 million passengers in a single year. In addition, 28.4 million customers traveled on international flights, exceeding pre-COVID-19 pandemic levels by more than 20%.

While those numbers are impressive, there is ample room for greater air passenger growth in Brazil. Inter-

national Air Transport Association (IATA) data shows only 0.5 average trips per capita in the country, one of the lowest in South America. Chile has the highest trips per capita in the region, 1.26, followed by Colombia at 0.94.

LATAM's introduction of the Embraer 195-E2 could create more opportunities for Brazilians to boost their annual airline trips. Rival Azul has been operating Embraer jets since its inception in 2008. Even as the carrier cut its E2 orderbook to 25 from 51 aircraft during its recent Chapter 11 restructuring, the type remains a key pillar of its strategy.

LATAM is preparing to take delivery of the first of 24 E195-E2s on order in the fourth quarter, marking a milestone for the carrier as it adds a smaller-gauge fleet type.

It is unclear how large a role the E2s ultimately will play in LATAM's fleet. Alvo said that South America has 200 cities with 200,000-500,000 residents, and half of those markets are in Brazil. Roughly a 10th of the trips per capita originate in those cities; the continent's larger cities have much higher levels of connectivity.

LATAM plans to deploy its 24 E2s in Brazil domestically, either in new



markets and for additional frequencies on existing routes. LATAM Airlines Brazil CEO Jerome Cadier said here that the carrier will unveil new destinations for the aircraft at the end of July. Previously, LATAM stated that the aircraft are slated to be based in Sao Paulo, Brasilia and Fortaleza.

As Brazilian airlines work to unlock the market's passenger growth potential, country-specific hurdles could create roadblocks. Brazil plans to introduce a 26.5% value-added tax on airfares. IATA calculates that would drive a 30% decline in demand and add \$195 to the average international fare of \$740. "With such an increase, up to 3.6 million international journeys would vanish," IATA Director General Willie Walsh warned. "The impact domestically would be many times worse. What the government will gain in revenue will pale in comparison to the economic damage caused."

Carriers are dealing with a government "that needs more tax revenue," LATAM's Cadier said. "That puts pressure not only on the tax reform,

but also in small things." He cited taxes on lease and overseas payments that did not exist a couple of years ago. Brasilia is running at a deficit and looking for tax revenue to accommodate additional spending. "This creates an environment where, when we

"We want to fly more, so we should be actually reducing the costs of flying.

### **We should be bringing efficiency to this industry."**

try to look for efficiency, we're actually against a wall" with a government that is seeking tax increases, he explained.

"We want to fly more, so we should be actually reducing the costs of flying," Cadier said. "We should be bringing efficiency to this industry."

Noting that Brazil needs to adopt a longer-term perspective on the aviation sector, he highlighted that over the past 20 years, the country has

had 23 tourism ministers. "There is no long-term plan," he said. "It just changes every year."

Cadier acknowledged that Brazil's government is taking steps to help airlines manage the fuel crisis with loans and postponing some payments for navigation fees. "But once this crisis is over, as I know it will be, we will continue not discussing the longer-term issues," he said. "We've been dealing with a short-term crisis, which is a big one, but not necessarily changing the future."

It is unclear if Brasilia aims to improve its strategic planning. The country's next presidential election is in October. But Vice President Alckmin recognizes Brazil's promise. "We are the largest aviation market in South America and one of the largest in the world, and we still haven't reached our full potential," he noted.

The long-standing, unanswered question remains: Will the government become a willing partner in enabling Brazil's aviation sector to achieve its full potential? 🌐

## **Castlelake's EasyJet Bid Could Shake Up Europe's Airline Landscape**

➤ U.S. INVESTMENT FIRM HAS EXPERIENCE IN AIRCRAFT LEASING

➤ THE AIRLINE HAS KEY SLOT PORTFOLIOS IN SEVERAL COUNTRIES

**Helen Massy-Beresford** Paris

**T**he announcement by U.S. investment company Castlelake of its interest in a possible takeover bid for EasyJet came as a surprise. Yet the move would make sense, given the company's aviation background and the carrier's strong network, fleet and slot portfolio—not to mention the recent hit to EasyJet's share value amid the war in the Middle East.

This news comes amid uncertainty and upheaval for the sector at large. The longer the fuel price crisis drags on, the more industry watchers predict a reshaping of the European airline landscape, with weaker, less hedged carriers liable to fail or change hands. A change in ownership for EasyJet—if Castlelake goes ahead with a bid and succeeds—might not be the only consolidation move in store.

Castlelake said in a May 29 stock market filing that it was "in the early stages of considering a possible offer for the company."

"EasyJet has 196 daily slot pairs at London Gatwick Airport—  
**around 46% of the airport's total capacity."**

The U.S. firm has a strong history in the aviation sector through leasing as well as the acquisition of a stake in Scandinavian Airlines during the carrier's restructuring in 2023.

In that deal, Castlelake worked with Air France-KLM, whose CEO, Ben Smith, has signaled the airline group

is closely watching the moves around EasyJet and could be interested, although it is not currently involved.

On the sidelines of the International Air Transport Association's Annual General Meeting, Smith told Bloomberg Television that EasyJet is an "impressive" airline with an attractive slot portfolio at airports such as London Gatwick, Geneva and Paris Orly. Those slots would appeal to the group's low-cost unit Transavia, which is expanding after Air France's shift to Paris Charles de Gaulle.

If Castlelake approached Air France-KLM, Smith said he would be interested "for sure," as would competitors.

Besides increasing its SAS stake, Air France-KLM is pursuing another consolidation opportunity through the ongoing TAP Air Portugal privatization process. "We remain focused on the TAP privatization process as well as the regulatory process to go to majority in SAS," a group spokesperson said.

Castlelake already manages 16.2 million EasyJet shares—roughly 2.14% of the airline. The company has until June 26 to make an offer or step back formally.

EasyJet's board said June 1 that it

“has not had any discussions, nor received any approach or proposal from Castlelake.” However, the board said it would consider a proposal if one were made and added that any potential takeover would bring “considerable regulatory, financial and other execution challenges.”

Highlighting the complicated hurdles such a bid would face, Italian newspaper *Corriere della Sera* reported that Castlelake might be considering teaming with Italian shipping group MSC in a consortium. That could help

fallen to only £3 billion today,” Boyle said. “Since the end of 2019, Ryanair’s shares are up 76% in sterling terms, whilst EasyJet’s are down by 72%.”

Beyond the carrier’s attractive share price for a bidder, its fleet of Airbus aircraft and strong orderbook would be a big draw. As of March 31, the fleet consisted of 356 aircraft, including 75 A320neos, 22 A321neos, 180 A320s and 79 A319s. All the A319s are due to be retired by 2029 as the airline accelerates its upgauging plan. Out of the total fleet, EasyJet owns 208.

to accommodate up to 80 million passengers per year, nearly doubling capacity and easing pressure on slots at the UK’s second-busiest airport.

EasyJet has significant slot portfolios at other constrained European airports, including Amsterdam Airport Schiphol, Geneva Airport, Paris-Orly Airport, Milan Linate and Malpensa airports, and Humberto Delgado Airport in Lisbon.

The carrier also has a strong position in a growing European market. OAG Schedules Analyser data for this year’s summer season shows EasyJet remains Europe’s second-largest airline by seat capacity, even if its relative position has weakened despite network growth over the past four years.

Since the summer of 2022, EasyJet has increased capacity from and within Europe by almost 10%, growing to 67.7 million seats from 61.6 million and expanding its route portfolio to 1,170 airport pairs from 913.

However, the broader European market has grown faster. EasyJet accounted for 7.7% of all departure seats from and within Europe in the summer of 2022. For this summer, that share has slipped to 6.9%, reflecting the rapid expansion of rivals, including Ryanair.

EasyJet has grown at a number of core UK airports—such as Bristol, Edinburgh, Liverpool, London Luton and Manchester—and opened bases at Birmingham, Newcastle and London Southend. The airline’s largest base remains London Gatwick, where it is expected to operate almost 7.2 million departure seats this summer.

In addition, following Lufthansa’s investment in ITA Airways, EasyJet was awarded slots at Linate as a remedy.

EasyJet plays a key role in European short-haul travel. Any move by a successful bidder to realize value by breaking up the airline—for example, selling off its Holidays business—would have a big impact on the overall market. Industry observers are considering that possibility.

“We see merit in the deal, underpinned by attractive assets (aircraft, orderbook, slots) that could well fetch higher returns in a sale than remaining part of EasyJet,” Bernstein analyst Alex Irving wrote in a research note. “Under a breakup of the company, we could see value of £7-8 per share. Castlelake’s experience in aircraft leasing may suggest this could be the plan.”

GARETH FULLER/PA IMAGES/ALAMY STOCK PHOTO



EasyJet’s Future Fleet

|                         | Fiscal Year |      |      |
|-------------------------|-------------|------|------|
|                         | 2026        | 2027 | 2028 |
| Current Fleet Plan      | 370         | 381  | 389  |
| New Aircraft Deliveries | 17          | 30   | 43   |
| Aircraft Retirements    | 3           | 19   | 35   |

Source: EasyJet

it cross hurdles linked to European Union ownership requirements.

For now, EasyJet stresses that nothing is certain—not even whether Castlelake will actually make an offer.

“The board notes the highly opportunistic timing, when EasyJet’s share price is temporarily depressed due to the current situation in the Middle East and its impact on customer confidence and jet fuel prices,” the airline said. It added that it remains focused on its strategy and medium-term profitability target of at least £1 billion (\$1.34 billion) profit before tax.

Robert Boyle at GridPoint Consulting noted that the airline’s shares have been underperforming for some time, not just as a result of the war.

“At the end of 2019, the company was valued at £4.8 billion, and that has

The airline expects to receive 17 new aircraft deliveries in the remainder of fiscal 2026, 30 in fiscal 2027 and 43 in fiscal 2028.

In reporting its first-half results on May 21, EasyJet stated that the net book value of its owned assets amounted to £5 billion, with 86% of its A320neo-family aircraft owned. The airline projects that will grow to more than £7.5 billion by fiscal 2028.

EasyJet’s attractiveness to a potential bidder goes beyond its fleet. The carrier has 196 daily slot pairs at London Gatwick Airport—around 46% of the airport’s total capacity, which Boyle estimated is valued at £500 million.

However, government approval last year for Gatwick’s second runway plan could call that valuation into question. The additional runway should allow it



# War, Fuel and Fares: Second-Half Questions for U.S. Airlines

> STRONG DEMAND CONTINUES IN THE SECOND QUARTER

> AIRLINES PREPARE TO NAVIGATE THE LATTER HALF OF THE YEAR

**Christine Boynton** Charleston, South Carolina

**W**hile resilient demand has helped sustain airline optimism through the first half of the year, outlooks remain murky past the peak summer months.

The fuel crisis caused by the war with Iran quickly became the industry's most significant headwind early in 2026, and airlines reacted by raising fees and fares. Since Feb. 1, at least seven consecutive industrywide fare increases have been implemented.

"Southwest has participated in all of those," CEO Bob Jordan said of the fare hikes at the Bernstein Strategic Decisions Conference in New York on May 28. "That's the most [consecutive fare increases] that I could remember in my 38 years in the industry. But with fares up that much, there's been no drop-off in demand at all, no indication that the consumer is elastic in this fare environment."

United Airlines and American Airlines shared similar observations. But carriers' commentary has yet to peer past the second quarter in any depth. Will signs of demand destruction emerge in the back half of the year? If so, who will most feel the impact?

In full-year 2026, U.S. airlines are expected to spend \$24.1 billion more for jet fuel than prewar forecasts, John Heimlich, vice president and chief economist for Airlines for America, said May 27 at the CAPA Airline Leader Summit Americas here. Coping with the added costs, U.S. airlines have trimmed scheduled growth. Heimlich compared prewar published schedules with ones from late May, focusing on the second and third quarters.

"Domestically, we've gone from 2.8% scheduled growth to just 0.4%, and the quarter is not even over," he said. "For the third quarter, a more dramatic reduction from 4.6%—loaded in the published schedules—falling to 0.9% growth, and not surprisingly, each week I look at this, it tends to be a more dramatic revision. International, we've gone from 3.3% to 0.6%, and when we go to the third

quarter, it's actually turned negative."

Looking ahead, "this becomes a second-half story," Heimlich said. "Will we see signs of demand destruction?"

Recent analysis from Moody's Ratings supports U.S. airline commentary: Demand from higher-income customers buying premium remains strong, outpacing budget cabins. "U.S. consumer fundamentals are increasingly split among haves and have-nots," the May 5 report states, noting that higher-income consumers

was a stark reminder that, in times of crisis, it is the carriers with stronger balance sheets that survive.

Some are working to take advantage of Spirit's early May exit. JetBlue Airways has expanded aggressively into its former markets, in particular capitalizing on a "generational" opportunity to grow in Fort Lauderdale, Florida, the ULCC's former home base. Those routes "have demonstrated outperformance" following the carrier's shutdown, JetBlue said. That observation follows similar comments from budget rival Frontier Airlines, which earlier in May said it expected a unit revenue uplift, post-Spirit.

Encouraged by solid spring demand, JetBlue is hopeful that current trends will carry forward in the third quarter—even as its fuel cost estimates rise for the three-month period ending June 30. The carrier expects



JUSTIN SULLMAN/GETTY IMAGES

**In updated second-quarter guidance, JetBlue expects fuel prices in the range of \$4.26-4.36/gal., compared with prior expectations of \$4.13-4.28/gal.**

continue to drive spending while rising costs and slow wage growth limit discretionary spending from lower- and middle-income households.

"Clearly, the lower-income clientele is hurting the most," Heimlich said. "Every airline has to think about its core clientele, or where it has been, where it wants to go. This is something I think helps explain why the surge in fuel price is accelerating some restructuring in the business."

While lucrative loyalty programs, growing credit card remunerations and more premium options help larger legacy carriers navigate the higher-cost environment, their smaller peers are more exposed to current challenges. The recent demise of pioneering ultra-low-cost carrier (ULCC) Spirit Airlines

second-quarter revenue per available seat mile (RASM) to be up 9-12% year over year versus prior expectations of a 7-11% increase. JetBlue's recently updated guidance assumes fuel price in the range of \$4.26-4.36/gal., compared with prior expectations of \$4.13-4.28/gal. for the second quarter.

Analysis from Raymond James' Savanthi Syth notes that the New York-based carrier's guide "was underwritten using the May 22 Brent forward curve, which has since improved." Syth added: "While JetBlue (and Frontier) had idiosyncratic tailwinds from Spirit's demise, today's update should lend an unsurprisingly constructive read-through to the now further consolidated U.S. group."

Maintaining an optimistic outlook,

JetBlue projects it can recapture 40% or more of increased fuel costs by the end of the second quarter. The update also provides a glimpse of what could come next. “We continue to see positive demand trends across all cabins and geographies,” the carrier said. “Although it remains early in the third-quarter booking curve, we are encouraged current trends may carry forward.”

Newer entrant Avelo Airlines is committing to slow, disciplined growth, maintaining a low-cost position and selectively scaling bases, CEO Andrew Levy said at the CAPA event. That follows earlier efforts to optimize its network and fleet.

“We went backward at the beginning of this year in order to simplify our business [and] raise capital, which was very fortuitous, because it’s put us in a terrific position to deal with this dramatic spike in fuel,” he told conference attendees. “We’re the tortoise. . . . But if you have the lowest cost, you have a very strong balance sheet, [and] you will always have opportunities.”

Breeze Airways, which launched operations around the same time as

Avelo, today operates more routes than JetBlue, CEO David Neeleman said, as “the 10th-largest airline now in the country, with a billion and a half sales this year.”

The middtier and smaller airlines “below the Southwest Airlines line” are most affected by the current environment, Neeleman said, adding that Breeze’s first-class product on its Airbus A220s is helping to drive its own profitability. And he sees room for the brand to grow. According to internal analysis, a market with at least 10 passengers daily each way (PDEW) is viable for Breeze’s model to move in and stimulate demand.

“That’s 4,000 routes in the United States,” Neeleman said. “There is a place for what we’re doing . . . but if you’re outside that, you know, at Frontier, JetBlue and others—even Alaska had kind of a tough quarter—there’s really the haves and have-nots.”

Allegiant is another outlier, he mused, a carrier focused on serving markets with no direct competition.

The Las Vegas-based carrier is one of the few remaining ULCCs in the U.S.

following Spirit’s exit and its own mid-May acquisition of fellow niche industry outlier Sun Country Airlines. Combined, their cargo and charter flying will help Allegiant navigate the current environment, with roughly 10-15% of revenues generated by fuel-insulated fixed-fee flying, CEO Greg Anderson said here. He noted that this helps the business flex its scheduled service capacity in reaction to the demand environment. Improving uplift from ancillary products and co-brand credit card programs are priorities going forward.

“I want to see the growth of non-ASM revenue outpace the growth of ASM revenue,” Anderson said. Improving on its strong balance sheet allows the company “in periods like we’re in today, to be less reactive, more strategic, more front-footed,” he added. “Having that balance sheet in the right place gives us a lot more flexibility for the long term to make better decisions.”

**Window Seat** Aviation Week editors recap the CAPA summit, covering LCC strategy and more: [AviationWeek.com/WindowSeat](https://www.aviationweek.com/WindowSeat)

## ETOPS Testing Will Not Delay 777-9 Delivery Timing, Ortberg Says

➤ NO 777-9 DELIVERIES PRIOR TO COMPLETION OF ETOPS WORK

➤ TIA 4B TEST PHASE IS UNDERWAY



**Guy Norris** and **Joe Anselmo** Seattle

**W**hile the final stretch to certification of the long-delayed Boeing 777-9 is turning out to be taking longer than expected, the aircraft-maker insists that initial deliveries remain on track for early 2027.

For a program that once targeted service entry as early as 2020, holdups are nothing new. But this time, with

the final few phases of certification flight underway or in sight, Boeing CEO Kelly Ortberg is bullish on progress, despite recent assertions from FAA Administrator Bryan Bedford that approval for the big twinjet might slide into early next year.

Bedford’s comments, which came in late May during the CAPA Airline

Leader Summit in Charleston, South Carolina, were considered surprising, as Boeing had previously suggested that flight tests were on track for completion in time for the award of an amended type certificate by year-end.

**Boeing’s first 777-9 development aircraft, WH001, has amassed over 2,450 flight-test hours on more than 800 test flights.**

“I think we’re all just teetering on the edge of the year, and how much breathing space we want to give our teams to get this thing done,” Ortberg tells Aviation Week. “There is no big delay in the program right now; it’s going to be around that time. We will see.”

Boeing’s schedule as it moves toward certification and deliveries is paced by the FAA’s phased release of Type Inspection Authorization (TIA) flight-test blocks. The latest and penultimate block, TIA 4B, was approved in early June and covers further tests of avionics as well as final evaluation of the aircraft’s stability and control characteristics.

TIA 4B is “a big slug of flight test-



ing,” Ortberg says. “After that comes TIA 5, [extended-range twin engine operations (ETOPS)] and function and reliability testing, which are generally done at the same time,” he adds. “So it’s just a matter of all the work we’ve got to get done now.”

TIA 5 “will unlock a small number of systems certification tests with our final software updates,” Boeing added in a statement.

Ortberg, who also provided an update on 777-9 progress at the Bernstein annual Strategic Decisions Conference in New York on May 27, acknowledged that all but ETOPS should be wrapped up by the end of December. “You should expect that we will hopefully be done with our flight-test program by the end of the year, with the exception of ETOPS,” he said. “ETOPS is going to extend into next year.”

Some operators, such as Lufthansa, which hopes to operate the first 777-9s beginning in March, say they can fly the aircraft on some initial routes that do not require ETOPS—a set of performance standards that permit

**“We’re making the progress we need to make. We have not uncovered any new airplane issues here, and so we’re hoping that’s the case going forward.”**



flights on long-range routes that are more than 60 min. away from a diversion airport.

However, clarifying Boeing’s position, Ortberg says: “We do not plan on making any deliveries pre-ETOPS completion. Customers for this airplane want an ETOPS configuration, so we’ve just got a lot of work to do between now and the end of the year. The team’s trying to get this thing accomplished as fast as they can.”

The 777-9 ETOPS campaign is ex-

pected to hew to the model established in late 2003, when two 777-300ERs made 38 flights totaling 267 flight hours over a period of several weeks. Simulated system and engine failures were included in the flights, eight of which involved shutting down one of the aircraft’s GE Aerospace GE90-115B engines for prolonged periods. The longest such test lasted 6 hr. and 29 min.—the longest engine-out demonstration flight ever in support of ETOPS certification.

AVIATION WEEK  
**MRO**  
EUROPE

**October 27-29, 2026**  
RAI Amsterdam, The Netherlands  
#MROE

**THE GLOBAL AVIATION  
AFTERMARKET LANDS IN  
AMSTERDAM**



**Registration Now Open!**

Scan the QR code or visit [mroeuropa.aviationweek.com](https://mroeuropa.aviationweek.com)  
for more information

**AVIATION WEEK**  
by informa...

Configured with newly applied nacelle test instrumentation, the third 777-9, WH003, is participating in Phase 4B certification flights tests.



The 777-300ER ETOPS testing also demonstrated range capability. The longest flight, between Sydney and Recife, Brazil, lasted 18 hr. and 25 min. Other stops included Longyearbyen, Norway; Yakutsk, Novosibirsk, and Petropavlosk, Russia; Easter Island, Chile; and Keflavik, Iceland.

FAA authorization to begin ETOPS also includes an agreement with Boeing and GE Aerospace on the corrective action plan for the GE9X engine midseal durability issue that emerged in January. However, both companies have reiterated that the fix will not affect delivery timing next year.

“We understand the issue, and we’re working through the fix,” Carlos Perez, GE Aerospace vice president of commercial engine systems engineering, said to reporters on May 19. “We don’t expect it to really impact the entry [into service] of the program. The flight-test program is continuing to be ongoing, and we’ve been supporting Boeing every step of the way through that.”

“Obviously, at the same time we are discussing with the regulator the changes that might be necessary here,” he added. “So I think we’re bullish on what we’re going to be able to go do here. We don’t expect any significant challenge from that discussion.”

Adding to the pressure of scheduling the start of the complex ETOPS campaign, Boeing’s flight-test department is under a heavy workload. It is simultaneously completing certification work on the two final members of the 737 MAX family, the -7 and the

stretched -10, while flying four development 777-9s.

“We have worked with the FAA in doing some activities around resource planning, which I think has been very beneficial for both of us to make sure that we both know what work is coming down the pike as we are aligned on the resource allocation,” Ortberg says. “As we get the 737-10 and -7 complete, we have a common flight-test team, [and] that flight-test team will be able to allocate some more resources, so we’ll see.

“There’s an aggressive schedule to get that work done, and that’s why I think we’re being a little bit cautious on picking a date here,” he adds. “We’ll see it’s in that zone, and I feel pretty comfortable that we’re making the progress we need to make. We have not uncovered any new airplane issues here, and so we’re hoping that’s the case going forward.”

Timing of the completion of the 737 derivatives certification is, however, coming into focus. “There’s clearly light at the end of the tunnel here, and we’re going to get these certification programs done,” Ortberg said at the Bernstein conference.

“Certification flights are scored for both the -7 and the -10, and we have authority from the FAA for the entire flight-test regime now, so we don’t need any more TIA approvals from the FAA,” he said. “So it’s just a matter of getting through that flight-test program, and we’re clicking them off as we speak.”

Boeing’s two 737-10 development

aircraft, 1G001 and 1G002, have recently been used for a final set of flight tests to gauge avionics as well as stability and control. The sole 737-7 development aircraft, 1E001, is meanwhile winding down test activity, having undertaken a functional check flight on May 28. The 737-7, which was originally due to begin deliveries in 2019, is expected to clinch certification slightly ahead of the -10, the service debut of which was first scheduled for 2023.

“We’re really banging this down, and that will get to the end of the year, where we’ll get the certification, so we can really support next year’s deliveries,” Ortberg said. “We’re building -10s, so we need to get that certification done so that we can start those deliveries.”

With flight tests of the engine anti-ice system—the major redesign originally pacing the remaining MAX derivatives certification effort—now behind it, Boeing’s final checklist includes “just the normal things you do at the end of the flight-test program,” Ortberg says. “We’re pretty confident that we’re not going to see any hiccups here in the remaining regime of flight testing.”

—With Christine Boynton and Jens Flottau in Rio de Janeiro

**Check 6** Aviation Week editors and Bank of America analyst Ron Epstein discuss the 777X program’s long-term outlook and how Airbus will respond: [AviationWeek.com/Check6](https://www.aviationweek.com/Check6)



## From Data to Action: Maintenance Tracking Transformed

Whether you are an MRO provider optimizing growth, a lessor protecting asset value, or a supplier anticipating parts demand, our NEW Tracked Aircraft Maintenance module delivers the clarity to act with confidence.



Track, analyze and predict maintenance at the tail-number level.

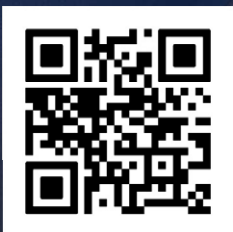


Real-time insights and historical data for smarter decisions.



Pinpoint maintenance events and plan ahead with confidence.

## Your Trusted Data Solution, Now Even Better



Visit **[aviationweek.com/TAM-MROP](https://aviationweek.com/TAM-MROP)** to schedule your demo.

Or call Melissa Crum at +1 (913) 284-2951  
[melissa.crum@aviationweek.com](mailto:melissa.crum@aviationweek.com)

# In for the Long Haul

> AIRBUS CHANGES INDUSTRIAL SETUP FOR A321XLR PRODUCTION

> REAR CENTER TANK REQUIRES INVESTMENT IN NEW FACILITIES

**Jens Flottau** Augsburg and Hamburg, Germany

**D**istinguishing between a standard Airbus A321neo and the A321neoXLR from the exterior is an exercise for experts, particularly when watching the aircraft taxi at an airport from a distance. But what looks like minor changes to an aircraft—the first version was introduced decades ago—represents major investment and alteration to Airbus' industrial base in Germany.

Show, has been popular with airlines globally. According to Aviation Week's Fleet Discovery database, 30 aircraft so far have been delivered, including Saudia's first in late May. The outstanding orders for 438 aircraft represent about 8% of the total A321neo backlog, making the type Airbus' most popular aircraft ever.

Iberia operates the largest sub-fleet, with seven aircraft, followed by

as it rolls out further updated batches of the aircraft.

The RCT sits between and is part of fuselage Sections 15 and 17. Section 15 houses the center wingbox and the main landing gear and, on the XLR, the forward wall of the new tank. The rest of the tank is part of Section 17 directly behind. The tank's outer lower wall is also part of the aircraft's primary structure. The center fuselage (Section 15) and aft fuselage (Section 17) are built in Hamburg, too. On the XLR, Section 17 now features a Z-shape cut-out to accommodate the RCT.

But the piece itself is entirely built in Augsburg's Hall 130, which is still in the process of being completed. Augsburg was initially selected for the complex component because the



The construction of a new assembly hall at the Airbus Aerostructures Plant 1 in Augsburg, Germany, is nearly complete. The new Hall 130 houses assembly of the A321XLR's core element, the rear center tank (RCT), which holds slightly more than 13,000 liters (3,430 gal.) of fuel. In Hamburg, Germany, two new facilities, Halls 246 and 259, are largely dedicated to integrating the RCT with the center fuselage section and equipping the modified section afterward.

The A321XLR is a key part of Airbus' drive to gain even more market share in the single-aisle segment. With a range of up to 4,700 nm, the variant expands the A320 family operating radius to include thin true long-haul routes across the North Atlantic and from North America to Latin America, Europe to Africa, India to Europe or within the Asia-Pacific region. The version, launched at the 2019 Paris Air

Aer Lingus and Qantas with six each. IndiGo is the single largest customer, with 70 aircraft ordered, two of which have been delivered.

The RCT represents the biggest design change from the original aircraft. Airbus chose to incorporate it into the aircraft structure rather than relying on one or more auxiliary tanks that could be added or removed as necessary. The RCT triggered many changes for other systems; wiring and hydraulics had to be rerouted, among other updates.

The RCT was also the subject of intense European Union Aviation Safety Agency scrutiny that led to a major redesign ensuring a level of fire, crash and passenger protection that satisfied the regulator. The requested changes delayed service entry from 2023 to 2024 and came with a weight and slight range penalty that, Airbus hopes, will be fully compensated for

site, formerly a Premium Aerotec facility, had significant experience with building the center fuselage of the Eurofighter Typhoon.

The first 50 RCTs were assembled in Augsburg's legacy Plant 3, not the new site south of the city. That facility was originally dedicated entirely to A350 work involving autoclaves to produce carbon fuselage panels, but it was clear that the old building would not provide sufficient room for the RCT. "It was new for everyone to build a component of this size," says André Mögele, head of RCT production.

Early this year, all RCT work moved to Plant 1 in Augsburg after a phase when the tanks were being built at both sites. About 200 Airbus employees are allocated to the facility.

Not only does the new site provide ample space for much higher rates of XLR production—Airbus keeps the details confidential—but the site also



enabled the company to design more ergonomic workplaces. As large as the tank is, building the internal structure requires workers to enter it in uncomfortable positions. One innovation, an electrically powered sled, moves into the tank from the jig. Other jigs allow the assembly to be moved in every direction to optimize handling.

Hall 130 houses four main divisions: preassembly of the forward wall (part of Section 15), structural assembly of the tank itself, surface treatment and equipping. There are seven parallel stations for structural assembly of the Section 17 part and three for Section 15, which requires less work. Processes are still being fine-tuned as the team gains experience with the new tooling.

hangar was built for it, as evidenced by the hall's large sliding doors, which have an opening in the middle to accommodate the vertical tailplane. However, the hall was tall enough for Airbus' industrial planners to introduce a new component assembly concept for the A321XLR.

In the facility, Sections 15 and 17 (which are themselves Hamburg work packages) are put together with the RCT. The enormous height allows Airbus to deliver subassemblies from above, maximizing floor-space efficiency and improving ergonomics.

Tooling and processes have to guarantee maximum density of the structure, given the large quantity of fuel it houses.

Five stations are organized to build

craft," XLR project manager Henning Dechow says. "Systems like the fuel system have to be built around the tank." That is especially true for pipes, hydraulics and electrical wiring along the center of the aircraft, which were displaced by the new tank and had to be rerouted. The solution: Airbus introduced carve-outs at the right and left top of the RCT, internally called "canyons," to accommodate most of the wires and pipes.

Still, the outfitting creates about 25% more work hours than a standard A321neo requires, Dechow says. Hall 259 can do work on "normal" Airbus Cabin Flex aircraft, too, but the bulk of the work is on the XLR. There are eight stations in the north portion of the facility and another



❶ Airbus built a new assembly hall for the rear center tank in Augsburg. ❷ The tank is an integral part of the fuselage structure. ❸ In Hamburg, the tank is integrated with Sections 15 and 17. ❹ Airbus extended the belly fairing to provide better crash protection.

The completed RCT is then hauled into a temperature-controlled bay on the side of the hall where it is loaded into a specially designed truck that transports it to Hamburg.

Hall 246 in Hamburg was originally built for a very different purpose. Back in the day when Airbus still believed in very large widebody aircraft, A380s were flown empty from Toulouse to Hamburg for cabin outfitting. The

fully spooled up. As usual, the company does not disclose how many XLRs Hamburg is able to put out, but the industrial capacity is believed to be higher than the current share of the XLR in the A321neo backlog. Once completed, the combined Sections 15/17 are moved into Hall 259, a newly built hangar dedicated to outfitting work.

"The XLR is a very particular air-

a flow line that Airbus expects will allow much higher production rates once processes are

five in the south, and 300 technicians work in two shifts in this hangar alone. In addition to the assembly itself, testing is time-consuming. There are two supplementary stations on the side of the hangar in case extra work is required on some subassemblies that need to be pulled out of the workflow.

Final assembly of the XLR in Hamburg is focused on Final Assembly Line 4 (FAL 4), the most recent of the four FALs on site. However, the version can be built on the other three lines as well. Toulouse also builds A321XLRs; Tianjin, China, and Mobile, Alabama, could follow. On the



day of the Aviation Week visit, several XLRs were in FAL 4 stations along with regular A321neos. FAL 4 also has a supplementary station in case out-of-sequence work is required on a particular fuselage.

### Air Canada took delivery of its first A321XLR in April.

While the main changes in the build process are upstream, final assembly is somewhat different, too. This leads to the initial question of how to distinguish between the XLR and the standard A321neo. The easiest way is to check whether the belly fairing stretches underneath Door 3 behind the wings. If it does, it is an XLR. ☛

## Daher Rethinks Business Aircraft Design Strategy and Methods

> WITH FUTURE AIRCRAFT DESIGNS IN MIND, COMPANY BETS ON GOVERNMENT-FUNDED RESEARCH AND TECHNOLOGY

> FLY'IN TECHNOLOGY CENTER MAY HELP RAPID PROTOTYPING

**Thierry Dubois** Tarbes, France

**W**hen Daher designs a new variant in the single-turbo-prop TBM 900 series or a clean-sheet successor, the company's engineers will use their new Fly'in technology center here.

Since its inauguration in 2025, Fly'in has become central to the airframer's research and development work. The site is an outcome of the EcoPulse demonstration project—which flight-tested a modified TBM featuring a hybrid-electric, distributed propulsion architecture in 2023-24—and carries out Daher's iterative, rapid-prototyping methods.

Here, engineers can advance technologies to similar readiness levels in order to flight-test their ideas on a single platform. Fly'in regroups all the equipment needed to build demonstrators and prototypes. Under Daher's approach, component design starts with studying the part's use and the consequences if it fails. The method can validate the design regardless of material, giving the company leeway when defining the part for production, Christophe Robin, Daher Aircraft's head of design, said during Aviation Week's visit to the site.

The center also demonstrates Daher's approach to research and technology work, which has been shaping the company's transformation. Daher depends on funding from France's Council for Civil Aeronautics Research (CORAC) to be ready to launch incremental versions of existing aircraft and new aircraft programs. But with CORAC under budgetary pressure, the company is championing continued funding and collaboration efforts across the industry.

The council's promoters usually give few details about the technologies on which the program is focusing. Daher is shedding light on what supervised cooperation between industry players can yield. Basing its entire research and technology strategy on CORAC projects has been a consequential decision, and that might show—via Fly'in—through the airframer's next TBM or business aircraft program.

Daher relies on CORAC extensively to prepare future aircraft. "We have built a plan that addresses the entire value chain, including production and operations, and we participate in a CORAC project for every link in

the chain," Robin said. The company, which sits on the technical committee that defines CORAC's road map, is participating in 16 projects—nine for Daher Aircraft and seven for aerostructures specialist Daher Industries.

French civil aviation authority DGAC, in CORAC's organization, distributes the funding. The authority performs preparatory work according to the government's priorities, which are innovative technologies that are likely to materialize.

Despite President Emmanuel Macron's 2023 commitment of €1.2 billion (\$1.4 billion) over 2024-27, or €300 million per year, CORAC's budget gradually declined to approximately €220 million for 2026. With this limitation, research and technology work toward an Airbus A320 replacement has taken priority, a Daher spokesperson told Aviation Week. Daher Aircraft is therefore looking at projects that could benefit both business aircraft and a future narrowbody, Robin explained.

Even for a company with €1.9 billion in annual revenue, a €5 million contribution to research and development from CORAC could make a difference. "We self-fund €23 million, and tax credits account for €4 million, so the total stands at €32 million," Robin said. "But between state funding and the contributions of other partners in a collaboration project, we are talking of a 1:9 ratio between what we invest in a CORAC project, such as EcoPulse, and the value for us."

EcoPulse was a joint effort among Daher, Airbus and Safran. The coun-





**The EcoPulse demonstration project enabled Daher to define a technology center that can support future developments.**

cil funded half of it, and tax credits topped it off.

CORAC's greatest merit may be collaboration, as the funding stipulates working together. "Preparation may take 12-18 months, but the project becomes much stronger, and you avoid launching something that does not make sense," Robin said.

Each of EcoPulse's three associates did their homework, but sharing their studies—before embarking on designing the modifications—made them realize something was wrong, he

explained. "We eventually understood the damage certain failure modes of the high-voltage cables would cause to the airframe," Robin said.

The main result of EcoPulse was discouraging, as it showed battery weight—especially with the likely certification requirement to isolate a potential thermal runaway from the rest of the aircraft—had a prohibitive effect on payload and performance. Nevertheless, EcoPulse's human-system interface influenced the new TBM 980, Robin said, highlighting a benefit of the project.

Daher still hopes to launch a hybrid-electric business aircraft, and CORAC's Tagine project goes in that direction. Bringing together Daher, Safran, Collins Aerospace and Ascendence, the project aims to assess the technical feasibility, economic viability and decarbonization potential of hybrid-electric propulsion on an aircraft in the category of Daher's Kodiak multi-role turboprop. Another follow-on project, OSCAR, is studying the aircraft's overall architecture, focusing on weight and the wing. ☼

## Go Beyond the News of the Day with Aviation Week Intelligence Network's Market Briefings.

Intelligence on programs, organizations, and market developments conveniently delivered directly to your inbox.



Visit [www.aviationweek.com/marketbriefings](http://www.aviationweek.com/marketbriefings) to learn more



AVIATION WEEK  
by informa

# Innovators Try To Break Reliance on Old Airspeed Sensing Technology

➤ PITOT TUBES REGULARLY SHOW THEIR LIMITS

➤ CANADIAN AND UK COMPANIES ARE WORKING ON DEVICES TO COMPLEMENT CURRENT MEASUREMENTS

**Thierry Dubois** Lyon

**G**iven that pitot tubes are a proven but imperfect way to measure airspeed, some companies are working on novel sensors. Surrey Sensors, based in Guildford, England, and Montreal's Cert Center Canada are leading the latest effort: They are focused on monitoring the airflow on the wing and miniaturizing a constant-temperature anemometer.

Airspeed—the relative speed of the aircraft to the air—is vital information. A low, decreasing airspeed will lead the pilot to increase the angle of attack, possibly approaching stall. Not knowing the airspeed and resulting stall margin can be a factor in a crash, as the Air France Flight 447 tragedy reminded the aviation community in 2009.

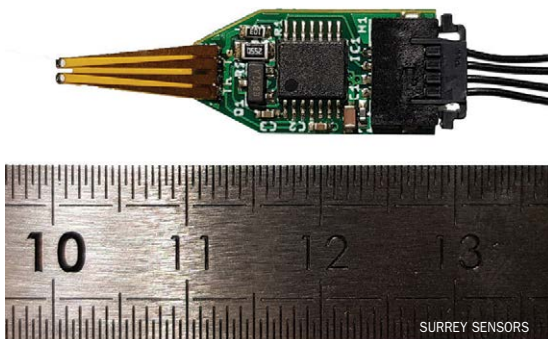
Yet, air transport is still using a 300-year-old technique to obtain safety-critical data. In 1732, engineer Henri Pitot published a “Description of a machine to measure the speed of running water and ship wakes,” which he used for water speed measurements in the Seine River in Paris. That device is the pitot tube on which every aircraft relies for measuring airspeed based on dynamic pressure.

The age of a technology may not be an issue per se, but the problems pitot tubes can encounter are particularly frustrating and leave room for improvement.

In the late 2010s or early 2020s, the captain of an Airbus A330 rejected a takeoff after noticing an airspeed indication failure, a safety publication by the manufacturer notes. After some troubleshooting, a second takeoff passed the critical V1 speed when an airspeed discrepancy was noticed again. The takeoff had to be continued, but the A330's autothrust and flight directors disengaged, the flight con-

trols mode switched to alternate law, and the autopilot became unavailable. After an uneventful landing, the cause was found to be a pitot probe that had become partially blocked in less than 2 hr. by nesting wasps.

Dust, dirt, sand or other materials can also obstruct pitot probe inlets. In the case of the AF 447 crash, ice crystals probably blocked the tubes, according to France's BEA air accident investigation bureau.



**Surrey Sensors' miniaturized solid-state constant-temperature anemometer could help improve airspeed measurement.**

Airframers have consistently improved airspeed measurement safety, adding redundancies, backups and workarounds. Those plans come with their own complications, however.

The Airbus A350's New Air and Inertia Automatic Data Switching (Naiads) system provides a backup. It relies on angle of attack and weight, or static pressure probes located in the engines.

In 2023, a bird strike damaged the nose section of an A350 and caused an “unreliable airspeed” event. The crew decided to disconnect the autothrottle, autopilot and flight director and remain in manual mode until landing. In fact, all three systems were still available, and the crew disconnected them because they ignored Naiads' details, the incident's investigators noted. The lack of knowledge of the

complex Naiads system details may find its origin in the flight crew operating manual, where the description might have been difficult to comprehend, the report added.

Companies working on alternatives to pitot tubes have been struggling to find customers. In Manassas, Virginia, Optical Air Data Systems has been developing lasers to measure wind velocity outside the airflow over the aircraft since 1987. Boeing tested the system on a FedEx-owned 777F as a turbulence detection sensor as part of its 2018 EcoDemonstrator campaign, but aviation has yet to adopt laser Doppler velocimetry.

Meanwhile, Surrey Sensors and Cert Center Canada are collaborating on Cert Center Canada's airflow performance monitor—a pressure-based system designed to detect the effects of contamination on a lifting surface, such as ice—and Surrey Sensors' micro-constant-temperature anemometer (CTA). The tiny, waterproof and solid-state sensor measures flow speed using the heat transfer principle, which relies on the power needed to maintain constant temperature on a component that a running fluid tends to cool down.

Augmented with the micro-CTA, the airflow performance monitor's mast does not only measure the effect of ice buildup, it also can provide the additional data required to extract airspeed, Surrey Sensor Product Manager David Harvey says.

“Our innovation is we used a semiconductor to make the micro-CTA sensor more sensitive, by orders of magnitude, than conventional materials,” says David Birch, Surrey Sensors director of research for advanced projects. “And it does not need to be too hot.”

Surrey Sensors and Cert Center Canada are not developing the system as a pitot tube replacement. “The aim . . . is rather to provide a second, high-integrity sensor to complement the information provided to the pilot and the flight control computer,” Harvey says. The system can also supply angle-of-attack and sideslip information.

The two companies are conducting wind tunnel tests, including in an icing tunnel. A flight test program is underway to support a certification effort, Harvey adds. Innovate UK and the National Research Council Canada are funding the project. 🌐



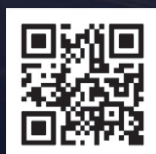
# Trusted Insights. Simple Solution.

Aviation Week Intelligence Network's (AWIN) data solutions and services provide the news, fleet data, analyses and forecasting models your organization needs.

- Industry insights covering the latest developments
- 10-year outlooks of the commercial market
- Aircraft histories and global fleet tracking
- Independent utilization data
- MRO contracts and tracked aircraft maintenance data



**Gain access and start turning data into solutions.**



To learn more, go to:

**[aviationweek.com/commercial\\_data](https://aviationweek.com/commercial_data)**

Or call Melissa Crum at +1 913-284-2951

# The FAA Needs Funds To Take the Next Step in ATC Modernization

> INFRASTRUCTURE REPLACEMENT IS PROGRESSING QUICKLY UNDER THE FIRST PHASE

> MORE FUNDING REQUIRED FOR AUTOMATION AND DATA MANAGEMENT

**Graham Warwick** Washington

**A**rmed with \$12.5 billion in funding, the FAA says it is making good progress building the foundations of a modernized air traffic control system but requires additional funds from Congress for software development to transform how the agency manages U.S. airspace—from tactically every day to strategically months ahead.

lance and surface movement radars; and moving to electronic flight strips.

In addition, the FAA is installing surface safety awareness systems at smaller airports and new display systems at control towers; deploying cameras in Alaska to give pilots a better understanding of weather and visibility; and building a new Air Route Traffic Control Center (ARTCC) and

sites planned to receive 27,600 new radios, more than 250 were complete.

New surface movement radars were installed at two of 53 planned sites, and installations were underway at three more, she said. Surface safety awareness systems, planned for 220 sites, were active at 54 and being installed at 42 more. These use automatic dependent surveillance-broadcast (ADS-B) data to display surface traffic at airports that do not have radars.

The Terminal Flight Data Manager—which digitizes flight data collection and distribution and provides real-time updates that replace paper progress strips as well as decision support tools to build departure schedules and balance demand across the system—was live at 17 of 89 planned sites, Ray said.

But reequipment is just one-third of the task, Bedford said. The second pillar is intended to solve the chronic controller staffing shortage through a recruitment campaign launched in 2025.

“We onboarded over 2,000 last year, another 2,200 this year, [will onboard] another 2,300 next year, [and] 2,400 the year after that,” he said. “We will solve the staffing issues before the end of 2028, and how we’ll do that partly relies on the final pillar, which is redesigning the national airspace system (NAS).”

“How do we get from an unpredictable, chaotic and disorganized air traffic management system to a strategic, predictable and precise air traffic management system?” he asked. “And do so in a way that reduces the controller workload, that allows them to manage more traffic—not less—with the resources that we have?”

Part of the answer will be through machine learning and other solutions enabled by artificial intelligence (AI), Bedford said. “Today, the compute power and the predictive power of the conflict probes in our Tracons, en route centers and towers gives our controllers 18 min. of visibility into the future.

“But we can use AI to solve the math problem,” he said. “We can use the unlimited compute power of the cloud to source terabytes of data to solve the math problems of 55,000 trajectories in the NAS, deconflict, optimize and sequence them at top of descent to optimize the capacity that we have.”

The FAA is already taking technology out of the laboratory and operationalizing it, Bedford said. Ceasing visual separation between helicopters



Airline executive  
Bryan Bedford became  
FAA Administrator  
in July 2025.

BONNIE CASH/UP/ALAMY LIVE NEWS

At various venues in May, FAA Administrator Bryan Bedford touted the agency’s progress with the “wires, radios, radars and flight strips” phase of the Brand New Air Traffic Control System (Bnats).

But Bedford made clear this is only the start. “If we stop there, we can high-five and say, ‘OK, we have a highly reliable, woefully inadequate air traffic control system,’” he told a Royal Aeronautical Society (RAeS) meeting in Washington on May 20.

The initial phase of Bnats is renewing the telecommunications backbone by replacing copper wires with high-speed fiber, low-Earth-orbit-satellite and 5G wireless connections; replacing decades old radios and unreliable voice switches; installing new surveil-

lance and surface movement radars; and moving to electronic flight strips.

All this is to be completed in three years, by the time President Donald Trump leaves office at the end of 2028. “I can say with a high level of confidence we will complete the reequipment portion of our modernization efforts by the third quarter of 2028,” Bedford told the RAeS meeting. “I have a keen line of sight on the outcomes. We will get it done.”

Giving a progress update in late April at the Transportation Department’s Modern Skies Summit in Washington, FAA Chief Technology Officer Rebecca Ray said nearly 50% of copper lines had been replaced, and 2,400 of 5,100 communications connections were upgraded. Of 1,600





**Paper flight strips are going away; existing automation systems will be next.**

and aircraft in high-density airspace, prohibiting parallel approaches at San Francisco and changes to airspace at Van Nuys and Burbank were all the result of AI identifying safety issues.

The FAA has been working with Palantir to create a foundry for aviation safety data and this has been operationalized with massive amounts of data, Bedford said. “We can see perturbations on ADS-B in turbulence, see unstabilized approaches, high-energy landings, long landings that create intersection risk, and we can identify, ‘Is that a user with a training issue?’ or ‘Is it a runway design issue?’”

The FAA funded Palantir, Thales and Airspace Intelligence to develop digital twins of the NAS, which could form the basis of the Strategic Management of Airspace Routing Trajectories (SMART) system. “We’ve built digital twins of the NAS,” Bedford said. “I can go back and look at any day over the last 20 years and tell you how it flew. And we can use that to then predict the future day of the NAS.”

Using the digital twins, he said, the FAA can look at 45,000 flights in any day and see that there could be 3,000-8,000 trajectories that would collide if controllers did not tactically deconflict that traffic. “We can fix all that before the airplanes leave the ground by using four-dimensional trajectories and machine learning with unlimited compute power,” he said.

“Now we are to the point where we can run a real-time day of the week and see how well it predicts the reality of what unfolds,” Bedford told the International Aviation Club in Washington on May 27. “And what we are

getting is somewhere between a 96-97% confidence level.”

The FAA plans to deploy the SMART strategic trajectory system this year and operate in parallel with the existing safety system. “The way we convinced the FAA bureaucracy to get on board with this and get out of the way was to say, ‘There’s this thing over here called safety, and we’re not going to touch that,’” he said. “All the tactical aircraft following and deconflicting—none of that changes.”

Changing the behavior of airspace users is the final piece of the puzzle, he said. “We have to acknowledge that we can’t have seven airlines all trying to land an airplane at LaGuardia at 2 p.m. What the industry does is schedule in a chaotic way then ask the FAA to sort it out.”

The FAA is already managing airline schedules with “brute-force maneuvers,” such as the delay reduction program at Chicago O’Hare International Airport. In effect from May to October, this effort allocates operations based on airlines’ approved schedules for the summer of 2025 rather than the 13% increase that was proposed.

“We’re not going to let you fly 100 flights in a 15-min. period when we can only manage 40,” he said. “I’d rather figure that out three months in advance before they accrue a schedule because now I have line of sight on my resource limitations . . . match that to the gating, runway and airspace limitations and actually build a plan that optimizes the traffic.”

Managing capacity limitations on the day leaves the FAA with only one option. “Everything has to go later,”

Bedford said. “If I look at that same problem three months in advance, I have a 50% larger solution set—I can pull things forward into voids that are unoccupied. It will require us to change behavior, but we will end up with much more capacity.”

Airlines could also reduce block times, removing padding that incurs crew and fuel costs. “I think the cost savings are going to be dramatic, in the billions of dollars,” Bedford said. “And if we pull this block pad out, there’s opportunity to reschedule that block time productively to reduce costs or increase capacity.”

With reequipment funded and underway, the Transportation Department is asking Congress for further funding for two key elements of the Bnatscs: the Common Automation Platform, to replace and standardize systems used in its ARTCCs and Tracons to track and control aircraft; and the Flow Management Data and Services system, to replace the legacy Traffic Flow Management System and strategically deconflict and optimize air traffic.

To move quickly with Bnatscs, Bedford has been forced to work around the FAA bureaucracy. “There’s a tiny team of people working their tails off because they buy into the vision,” he said. “There’s a layer at the top that buys into the vision, [and] the front-line layer is hungry for this. Then there’s this bureaucracy that separates us from them . . . clay that’s hard to tunnel through. So we’ve been going around the clay.” ☐

—With Karen Walker and Aaron Karp in Washington

# Twelve Starts Commercial Production of e-SAF

- > COMPANY TRIES TO DEFY ANOTHER DIFFICULT YEAR FOR SUSTAINABLE AVIATION FUEL
- > MOSES LAKE FACILITY IS A “BLUEPRINT” TO SCALE e-SAF PRODUCTION TO TENS OF MILLIONS OF GALLONS ANNUALLY

**Garrett Reim** Seattle

**A**mid a difficult market for sustainable aviation fuel, clean-tech company Twelve sees reasons for optimism. Nearly three years after construction started, Twelve's electro-sustainable aviation fuel facility in Moses Lake, Washington, entered commercial production this quarter. The company expects commercial aircraft to begin using the fuel as soon as this month.

The AirPlant One facility is Twelve's “blueprint” for future production sites that could produce “tens of millions of gallons” of electro-sustainable aviation fuel (e-SAF) per year, CEO Nicholas Flanders tells Aviation Week. A ribbon-cutting event at the facility on June 10 featured representatives from customers Alaska Airlines and Microsoft.

AirPlant One is coming online as the commercial aviation industry struggles to meet its self-imposed SAF production goals. The International Air Transport Association (IATA) estimates that global SAF production will hit about 2.4 million metric tons this year, far less than is needed for the industry to achieve its ambitious goals.

SAF represents about 0.8% of total commercial aviation use at a cost of \$4.3 billion to airlines, the group said in a June 6 press release.

“The path to meeting 65% of our needs in 2050 is growing more difficult with each year of ineffectively sequenced government policies and oil companies’ manifest lack of interest,” IATA Director General Willie Walsh said at the trade association's Annual General Meeting in Rio De Janeiro.

In the U.S., President Donald Trump's 2025 One Big Beautiful Bill Act extended some clean fuel subsidies but made them less generous for SAF and shortened support for clean hydrogen, a major ingredient in e-SAF.

Still, Berkeley, California-based Twelve is confident about U.S. production and sees a path for its e-SAF—branded E-Jet—to become cost-competitive with conventional aviation fuel. “The U.S. has a lot of the site conditions that make for attractive e-fuel projects, including the power and the CO<sub>2</sub> availability [and] the logistics infrastructure,” Flanders says.

Twelve makes e-SAF using CO<sub>2</sub> feedstock from corn ethanol production facilities, where the gas is a byproduct of fermentation. AirPlant One receives CO<sub>2</sub> from a plant about 90 mi. from Moses Lake, Flanders says.

Hydrogen—the other ingredient in Twelve's synthetic hydrocarbon fuel—comes from splitting H<sub>2</sub>O using electrolysis, powered by electricity generated by Washington state's plentiful hydroelectric dams. Cheap hydroelectricity from dams on the nearby Columbia River is critical to the company's design. Flanders says Twelve's e-SAF is produced within the typical industry range of 80-100 kWh/gal., although he declined to cite a specific figure for AirPlant One.

The company argues that its corn-ethanol-fed power-to-liquid process is a more feasible path to producing SAF than using biofuels derived from feedstock such as cooking oil.

“There are 200 ethanol plants in the U.S., making tens of millions of tons of CO<sub>2</sub> per year,” Flanders explains. “As a byproduct, it comes out fairly concentrated already, and so the cost and complexity to capture the CO<sub>2</sub> from an ethanol

plant is lower than a more diluted industrial source.”

Twelve says its e-SAF production process can reduce life-cycle CO<sub>2</sub> emissions by up to 90% compared with conventional jet fuel.

Achieving those dramatic reductions is not coming easily, however. Twelve planned to supply e-SAF for Alaska Airlines Flight 655, a June 11 flight from Seattle to San Francisco, but had to postpone the demonstration after initial production hit a “temporary” snag, creating e-SAF with “higher carbon

intensity levels than are expected.” The symbolic flight is anticipated to happen this year, the company says.

Nonetheless, initial gallons of e-SAF are certified to ASTM standards, blended with conventional aviation fuel and ready for delivery to Seattle-Tacoma International Airport. Flanders anticipates the fuel will power a commercial airliner imminently. The Moses Lake facility is expected to ramp up production to its target rate of 50,000 gal. per year within a few months, he says.

Twelve plans to boost production and reduce costs in part by relying on power-to-liquid facilities that are modular and standardized.

“Through that modularization and repetition, you can really drive down the cost,” Flanders says. “You’ve seen that in batteries and renewables and [liquid natural gas] and air separation units.”

Lessons learned from the Moses Lake facility are central to Twelve's plans. “You have all of the unit operations and complexity that you’d have in the next plant up, as well as getting all the operating data, yield information that will inform you how to really optimize the economics of the next project,” Flanders says. ☉

—With Karen Walker in Rio de Janeiro



**Twelve says CO<sub>2</sub> feedstock from corn ethanol production gives it an edge.**



# TECH TAKE

By **Graham Warwick**

For the latest, go to [AVIATIONWEEK.COM](https://www.aviationweek.com)

## Carbon-Fiber Precursor Comes From Plants

U.S. startup Trillium Renewable Chemicals has secured \$13 million in funding to scale up its technology to produce acrylonitrile—a chemical used in the production of carbon fiber—from plant-based feedstock.



**Trillium's Project Falcon bio-based acrylonitrile plant is scheduled to be commissioned in the second quarter.**

The Series B fundraising, led by South Korean materials company HS Hyosung with participation by Capricorn Partners, follows a previous \$10.6 million Series A round and a \$2.5 million award received from the U.S. Energy Department in 2022.

After a multiyear pilot program that Trillium says validated its glycerol-to-acrylonitrile technology, the company has completed construction of a demonstration plant, Project Falcon, at a Texas plant owned by Eneos that produces acrylonitrile from fossil resources.

Commissioning of the plant, the first of its kind, is scheduled for the second quarter, and the first shipments of bio-based acrylonitrile are planned for this year. The Series B funding will also finance the engineering design of Trillium's first commercial plant.

"Our pilot program validated the chemistry, and Falcon validates scale and manufacturability," Trillium CEO Corey Tyree says, adding that the funding will allow the company to show that bio-based acrylonitrile meets industry standards at meaningful production volumes.

"Accessing sustainable acrylonitrile is an important milestone for the industry, and Project Falcon will prove that it can be scaled to produce a viable, drop-in sustainable product," says Young-Joon Lee, senior vice president of HS Hyosung Advanced Materials.

Aerospace materials manufacturer Syensqo in March said it had completed an evaluation at its Piedmont, South Carolina, research center in which it produced aerospace-grade carbon fiber from a blend of Trillium's bio-acrylonitrile and commercial fossil acrylonitrile.

## Study: Ambition in Decarbonization Would Pay Off

An ambitious strategy to decarbonize aviation by 2070 would require billions of dollars in annual investment but would avoid trillions of dollars in long-term societal costs from aviation's climate impact, a Bauhaus Luftfahrt study concludes.

"Despite high investment costs, greater ambition for climate-friendly aviation will pay off economically," says Mirko Hornung, executive director of research and technology at the Munich-based aviation think tank, which is backed by Airbus and other aerospace entities.

"An ambitious transformation will pay off for the overall economy as early as 2050, when highly efficient aircraft using sustainable fuels significantly reduce the societal costs of climate change," he says.

The study looked at four potential futures—a conservative baseline assuming 70% sustainable aviation fuel (SAF) use by 2070 and three more aggressive scenarios: 100% SAF use by 2060, 60% more efficient aircraft combined with SAF, and a "radical switch" to liquid hydrogen.

In all scenarios, the use of higher-priced alternative fuels, SAF or hydrogen would increase direct operating costs per passenger-kilometer 35-55% by 2070. Even achieving a baseline of 70% SAF use by 2070 would require several hundred billion dollars in annual investment, and 100% SAF use by 2060 would increase the cost by 30%, the study says.

The conservative 70% SAF pathway

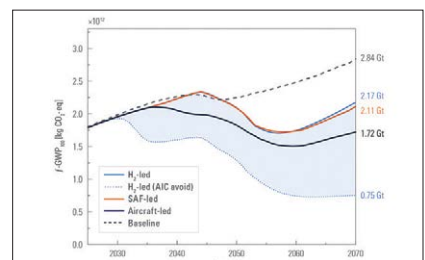
would initially be about 10% cheaper per passenger-kilometer than the other scenarios, Bauhaus says, but the gap would gradually narrow, reverse after 2050 and then exceed the projected costs for all the more ambitious pathways.

"Although hydrogen-powered aircraft incur higher acquisition costs, they can lead to lower operating costs in the longer term, primarily due to increasing synergies within the energy system," the think tank says.

"Highly efficient next-generation aircraft offer the greatest potential for significantly mitigating fuel-related cost increases—despite high development and acquisition costs," Bauhaus Luftfahrt says.

Under the study's baseline 70% SAF scenario, annual emissions would reach about 2.84 gigatons of CO<sub>2</sub> equivalent by 2070, an increase of around 60% over 2025. Increasing SAF use to 100% by 2060 would reduce 2070 emissions by 24%, the study says.

Emissions would decrease by 40% under the highly efficient aircraft plus SAF pathway and by up to 74% in the best-case scenario combining the radical-hydrogen pathway with minimizing non-CO<sub>2</sub> emissions by avoiding aviation-induced contrails.



**A Bauhaus Luftfahrt study assessed the societal costs of aviation's climate impact across various decarbonization pathways.**

Even after accounting for the billions of dollars in annual investment required for alternative fuels production and highly efficient aircraft development, Bauhaus projects trillions of dollars in avoided societal costs across health, agriculture, energy systems and weather patterns.

By 2070, the cumulative additional societal costs of aviation's climate impact could reach \$43.7 trillion under the conservative baseline scenario, Bauhaus projects. The 100% SAF pathway could reduce this cost by 10% and the highly efficient aircraft route by 23%.

## Online Platform Aids Contrail Mitigation

A data platform designed to make estimates of the climate impact of contrails more accessible for the aviation industry and other decision-makers has been unveiled by research organization Contrails.org.

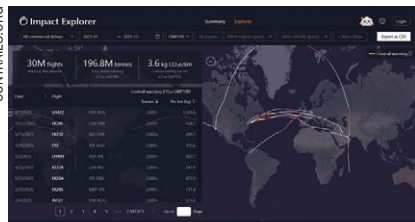
Only a small share of flights generate the bulk of contrail warming, the organization says, and much of that impact can be reduced through modest changes in altitude or routing. But broader adoption depends on trusted data and practical tools that help quan-

ship, a team from Google working for six months to enhance the accuracy of contrail models and enable users to explore complex climate data and identify effective mitigation opportunities.

Research suggests persistent contrails cause 1-2% of anthropogenic warming, roughly half of aviation's total climate impact. The Impact Explorer provides data from almost 30 million flights by all commercial airlines between January and December 2025 on all global routes.

Only 3% of kilometers flown generated warming contrails, producing estimated warming equivalent to 196.8 million metric tons of CO<sub>2</sub>, or 3.6 kg of carbon dioxide equivalent per kilometer (CO<sub>2</sub>e/km). Contrails.org says: "80% of contrail warming comes from 3% of flights. That's only 2,285 flights per day."

The cost of avoiding 70% of the persistent contrails generated in 2025 would have been \$241.1 million, Contrails.org estimates, based on \$1.75 per metric ton of CO<sub>2</sub>e avoided. That is \$8.04 per flight when averaged across all commercial flights, making contrail mitigation relatively cost-effective, the organization says.



**Contrails.org Impact Explorer allows users to research contrail formation and potential mitigations.**

tify where contrails form and where mitigation can have the greatest effect.

The Contrails.org Impact Explorer platform is intended to address that gap by providing open access to a global dataset of estimated contrail climate impacts and observed contrail conditions from historical commercial flights, the organization says.

The platform allows users to explore where contrails formed, examine their estimated climate effects and better understand where mitigation opportunities might be concentrated, says Contrails.org, which is hosted within Bill Gates' Breakthrough Energy.

"To make a meaningful impact, the aviation industry needs credible, accessible data that clearly quantifies the problem and illuminates the path to a solution," Contrails.org Director Marc Shapiro says. "Contrails.org Impact Explorer is designed to help provide that foundation by making the contrail climate impact easier to understand and act on."

Development of the Impact Explorer was supported by a Google.org Fellow-

## South Korea Launches Dual-Use Turbofan Project

South Korea has launched projects to develop a 4,500-lb.-thrust-class high-bypass turbofan for collaborative combat aircraft and more-electric business jets as well as core technologies for future hybrid-electric propulsion systems.

Launched by the Korea Aerospace Administration (KASA), the projects have a total budget of almost 90 billion won (\$60 million) over four years to 2029. The funding will be split between the agency and industry led by Hanwha Systems.

Briefing industry on the program on May 26, KASA said development of the dual-use turbofan would propel South Korea's aeroengine sector beyond component manufacturing to become a global player with independent engine system integration capabilities.

In parallel, the turbine-electric hybrid propulsion project would secure technologies essential to the future

of aviation, KASA said, and position South Korean companies to be key partners in the global aeroengine supply chain.

With 43.8 billion won in total funding, of which 28.5 billion won is from KASA, the dual-use turbofan project is planned to develop a 4,500-lb.-thrust-class engine with a bypass ratio of 4 or higher and an embedded generator that produces 100 kW or more of electrical power.



**Hanwha's 4,500-lb.-thrust electrified turbofan could power CCAs developed by Korean Air and others.**

The turbofan project will focus on the development and testing of the high-bypass fan and booster, combustor and rotor-integrated starter/generator (ISG). Hanwha will design, build and test the engine while South Korean electric-motor manufacturer KAES will develop the ISG.

In addition to more-electric business jets, the dual-use engine is intended for collaborative combat aircraft that require high electrical power for such payloads as radar and electronic warfare systems.

Hanwha Aerospace has separately committed about 750 billion won toward broader development of a platform for uncrewed aircraft systems (UAS) and propulsion. These include a 5,500-lb.-class low-bypass turbofan for low-observable UAS, a 1,400-shp-class turboprop for medium-altitude UAS and core technologies for a future 10,000-lb.-class turbofan intended for larger stealth platforms.

With 43.1 billion won in funding, 39 billion won of it from KASA, the hybrid-electric project is led by the Korea Aerospace Research Institute (KARI). Under the project, KARI will conduct conceptual design and analysis of a 1.5-megawatt-class hybrid propulsion system while Kyungintech will develop a 500-kW-class turbogenerator, and KSEP Co. will develop a 300-kW-class redundant electric motor. KARI will integrate and ground-test the system. 🌐



## Contact Us

**President/Publisher:** Gregory D. Hamilton  
hamilton@aviationweek.com

**Vice President, Sales of Data, Intelligence & Media:**  
Thom Clayton  
thom.clayton@aviationweek.com

### U.S. Sales Offices

**Senior Director, North American Media:** Rob Howlett  
rob.howlett@aviationweek.com

### International Regional Sales Offices

**Managing Director, Defense & Space:**  
Andrea Rossi Prudente  
andrea.rossiprudente@aviationweek.co.uk

### Marketing Services

**Director, Digital Customer Solutions:** Jason Washburn  
jason.washburn@informa.com

**Sales Team Listings:** @AviationWeek.com/sales-contacts

### Business/Production

**Ad Operations Manager:** Bonnie Streit  
yvonne.streit@informa.com

### Advertising/Marketing Services

**Media Kits, Promotions or Custom Media:**  
www.aviationweek.com/mediakits or Elizabeth Sisk  
elizabeth.sisk@aviationweek.com

**Business and Finance Manager:** Gabriel Balmes  
gabriel.balmes@informa.com

### Subscriber Service

**U.S.:** (877) 369-3767

**Outside the U.S.:** +1 (913) 850-6931

**Manage Your Subscription (and Claim Digital Edition) at:**  
aviationweek.com/awstcustomers

### Conferences/Exhibitions

**www.aviationweek.com/events:**

**To Sponsor/Exhibit:** Beth Eddy;  
(561) 279-4646; betheddy@aviationexhibits.com

**To Register:** Virginia Gongora  
virginia.gongora@aviationweek.com

### AW&ST Mailing List Rental and Sales

**Anthony Treglia** anthony.treglia@informa.com

### Reprints, Photocopies and Permissions

**Custom Reprints:** informa@wrightsmedia.com

### Social Media

**Join the conversation. Follow us at:**

linkedin.com/company/aviation-week  
X.com/AviationWeek  
Facebook.com/AvWeek  
YouTube.com/AviationWeek

*Aviation Week & Space Technology* is published biweekly, with one issue in August by Informa Markets, a trading division of Informa Media, LLC, 22701 W. 68th Terrace, Ste. 100, Shawnee, KS 66226-3583. Member of Audit Bureau of Circulations and Magazine Publishers of America. Periodicals postage paid at Kansas City, MO and additional mailing offices. Canadian GST #R126431964. Title reg.® in U.S. Patent Office. Copyright © 2026 by Informa Markets, a trading division of Informa Media, LLC. All rights reserved. All rights to these names are reserved by Informa Markets. **Postmaster:** Send address changes to *Aviation Week & Space Technology*, Attention: Subscription Services, 22701 W. 68th Terrace, Ste. 100, Shawnee, KS 66226-3583.

**Aviation Week & Space Technology**  
**June 15-28, 2026**

**Vol. 188, No. 12 (ISSN 0005-2175)**

**AviationWeek.com/AWST**

# AVIATION WEEK MRO EUROPE

**October 27-29, 2026**  
RAI Amsterdam  
The Netherlands

## THE GLOBAL AVIATION AFTERMARKET LANDS IN AMSTERDAM

*Connect with 11,000+ attendees and  
explore innovations from 600+ exhibitors  
shaping the future of MRO in the region*

**Registration Now Open!**

**Use code *AWST20* for 20% off!**

**mroeurope.aviationweek.com | #MROE**

**AVIATION WEEK**  
by informa

## Aviation Week Events

**Events.AviationWeek.com**

**July 28-29**—CAPA Airline Leader Summit – Australia Pacific. Adelaide, Australia.

**Sept. 1-2**—AeroEngines Europe. Lisbon, Portugal.

**Sept. 10-11**—CAPA Airline Leader Summit – Latin America and Caribbean.  
Panama City, Panama.

**Sept. 22-24**—MRO Asia-Pacific. Singapore.

**Oct. 1-2**—GAD Asia. Hokkaido, Japan.

**Oct. 1-2**—CAPA Airline Leader Summit – Asia. Hokkaido, Japan.

**Oct. 21-23**—Routes World 2026. Frankfurt.

**Oct. 27-29**—MRO Europe. Amsterdam.

**Nov. 10-11**—MRO Australasia. Brisbane, Australia.

**Nov. 16-17**—AeroEngines MENA. Abu Dhabi, United Arab Emirates.

**Dec. 9-10**—GAD World. Milan.

**Dec. 10**—ATW's Airline Industry Achievement Awards. Milan.

**Dec. 10-11**—CAPA Airline Leader Summit – World. Milan.

**Jan. 19, 2027**—Engine Leasing, Trading and Finance Americas. Scottsdale, Arizona.

**Jan. 20-21**—AeroEngines Americas. Scottsdale, Arizona.

## ADVERTISERS IN THIS ISSUE

Aviation Week

2026 Photo Contest ..... 4

Defense Market Analyzer ..... 31

Global Commercial Data Solutions ..... 51

Know. Predict. Connect. .... 3rd Cover

Market Briefings ..... 49

MRO Prospector ..... 45

Aviation Week Events

MRO Americas 2027 ..... 7

MRO Europe ..... 43

Israel Aerospace Industries ..... 4th Cover

Precinmac ..... 19

RTX ..... 2nd Cover

# Aerospace's Hidden Bottleneck

By Mesh Feigenbaum

**C**ommercial aerospace is entering a period of unprecedented rate ambition. Boeing and Airbus are targeting single-aisle production levels that rise from a 2018 baseline of roughly 101 aircraft per month to more than 170—a rate increase of more than 65% that no part of the forging infrastructure was designed to support. These goals reflect strong demand, but they also expose a structural constraint that has received far less attention: the global shortage of large hydraulic forging press capacity. This is the infrastructure that produces bulkheads and frames, wingbox components, landing gear beams and engine discs—the parts that make flight possible. And it is the infrastructure least prepared for the decade ahead.

The last stable year before the Boeing 737 MAX grounding and COVID-19 disruptions was 2018. Even then, global open capacity on large presses was at best 20%. The system was already operating near its practical limits with an aging fleet of machines that were never designed to support the rate increases now being pursued. That baseline matters because it shows that today's constraints are not the result of recent shocks. They are the continuation of a longstanding structural imbalance between demand and the forging base required to support it.

Geopolitics further narrows the usable portion of that base. Russia and China control 44-49% of total global capacity and an even larger share—64-74%—of the open capacity that is actually rate-increase-relevant. For the U.S. aerospace and defense industrial base, this is not an abstract concern. Neither country is a viable source for critical military components, and both are increasingly inaccessible for some commercial supply chains. If their capacity were to be completely removed from the equation, global available capacity would collapse to roughly 5% of the 2018 baseline. Even if all Russian and Chinese capacity were fully accessible, the world would still face a considerable shortfall.

The fragility of the existing fleet compounds the problem. With only a few dozen large hydraulic presses worldwide, outages have outsize consequences. One reminder came in 2008, when a major Western press suffered a sizable failure and required nearly four years to return to service fully. No company was at fault; the episode simply illustrated the reality of an aging, heavily utilized global fleet with limited redundancy. When a single machine can reshape supply chains for years, the system is operating without a safety net.

Adding new capacity is essential, but it is not fast. A

new large press facility typically requires 7-10 years to go from concept to meaningful output. The timeline reflects not only construction and equipment lead times but also the multiyear qualification cycles required for aerospace components. Even with decisive action, new capacity is unlikely to arrive before the early 2030s. That means the industry must navigate the second half of the decade with the infrastructure it has today, not the infrastructure it wishes it had.

The implications extend beyond commercial rate readiness. The same forging base that supports narrowbody production also supports U.S. defense programs. Airframe structures, landing gear components and engine rotating parts all draw from the same limited pool of press capacity. When that pool tightens, commercial and defense programs compete for the same scarce resources. The constraint is shared, and it is structural.

Emerging technologies like additive manufacturing and friction stir welding of thick-plate offer promise for some simple components. But they cannot replicate the metallurgical advantages of large press forgings—grain flow alignment, fatigue resistance and deformation-driven strength. For critical structural and engine components, these alternatives face steep qualification burdens, geometric limitations and performance shortfalls. They are not substitutes at scale. The forging bottleneck is real, and it cannot be bypassed.

Strengthening the forging base therefore requires a dual approach. In the near term, the most effective steps are those suppliers can take unilaterally and at lower cost: more rigorous planned maintenance, targeted refurbishment and modernization of the aging presses already in service. These actions reduce failure risk, increase uptime and expand usable capacity without the long timelines associated with new construction. But meeting late-decade demand will also require significant new capacity, and that might only be achievable through coordinated partnerships—OEMs, suppliers, government and technical experts working together to design, fund and qualify the next generation of state-of-the-art forging infrastructure.

Commercial and defense ambitions now rise or fall because of the same bottleneck: large hydraulic forging press capacity. 🌐

*Mesh Feigenbaum is a partner in Engineered Metal Tech and Engineered Aero Metals and has more than 40 years of experience in the aerospace industry.*



**“COMMERCIAL AND DEFENSE AMBITIONS RISE OR FALL BECAUSE OF THE SAME BOTTLENECK: HYDRAULIC FORGING PRESS CAPACITY.”**





# Know. Predict. Connect.

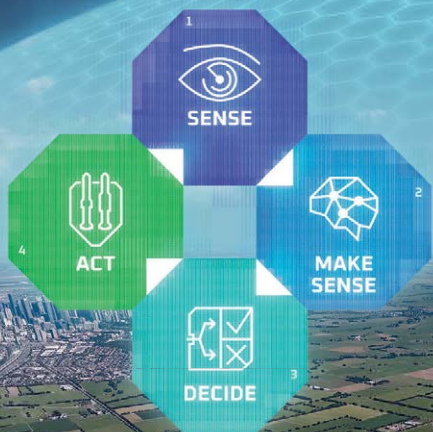
Partnering with Aviation Week provides you with resources to **know** business-critical information, **predict** where opportunities can be found, and **connect** with people to build your business.

Our mission is to help you succeed with trusted and actionable content, forward-looking analysis and data, valuable face-to-face experiences, and much more.

**Let's grow your business.**

[aviationweek.com/productsservices](http://aviationweek.com/productsservices)

**AVIATION  
WEEK**  
by informa...



# IAI's IAMD

## Coordinated Threats Demand Integrated Defence

Modern air and missile threats are evolving into coordinated, multi-domain attacks involving ballistic missiles, cruise missiles, and UAVs. Mitigating these threats requires more than standalone systems - it requires one integrated national defence architecture. IAI's combat-proven Integrated Air & Missile Defence (IAMD) solutions combine multi-domain sensors, AI-enabled data fusion, command and control, Soft-Kill and Hard-Kill capabilities into a seamless operational kill chain. Sense. Make Sense. Decide. Act.

Delivering decisive operational advantage, resilient national protection, and mission continuity when it matters most. With multiple European customers, in-region production, and fast delivery timelines, IAI strengthens security of supply and national resilience across Europe. **From space, air, land, and sea, our integrated multi-sensor, multi-effector systems are built to counter multi-threat attacks.**

[www.iai.co.il](http://www.iai.co.il) • [iai-mth-sms@iai.co.il](mailto:iai-mth-sms@iai.co.il)

Meet us at

**Eurosatory 2026**



Discover More



## **Digital Edition Copyright Notice**

The content contained in this digital edition ("Digital Material"), as well as its selection and arrangement, is owned by Informa and its affiliated companies, licensors, and suppliers, and is protected by their respective copyright, trademark and other proprietary rights.

Upon payment of the subscription price, if applicable, you are hereby authorized to view, download, copy, and print Digital Material solely for your own personal, non-commercial use, provided that by doing any of the foregoing, you acknowledge that (i) you do not and will not acquire any ownership rights of any kind in the Digital Material or any portion thereof, (ii) you must preserve all copyright and other proprietary notices included in any downloaded Digital Material, and (iii) you must comply in all respects with the use restrictions set forth below and in the Informa Privacy Policy and the Informa Terms of Use (the "Use Restrictions"), each of which is hereby incorporated by reference. Any use not in accordance with, and any failure to comply fully with, the Use Restrictions is expressly prohibited by law, and may result in severe civil and criminal penalties. Violators will be prosecuted to the maximum possible extent.

You may not modify, publish, license, transmit (including by way of email, facsimile or other electronic means), transfer, sell, reproduce (including by copying or posting on any network computer), create derivative works from, display, store, or in any way exploit, broadcast, disseminate or distribute, in any format or media of any kind, any of the Digital Material, in whole or in part, without the express prior written consent of Informa. To request content for commercial use or Informa's approval of any other restricted activity described above, please contact the Reprints Department at (877) 652-5295. Without in any way limiting the foregoing, you may not use spiders, robots, data mining techniques or other automated techniques to catalog, download or otherwise reproduce, store or distribute any Digital Material.

NEITHER Informa NOR ANY THIRD PARTY CONTENT PROVIDER OR THEIR AGENTS SHALL BE LIABLE FOR ANY ACT, DIRECT OR INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR ACCESS TO ANY DIGITAL MATERIAL, AND/OR ANY INFORMATION CONTAINED THEREIN.