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DIETER MORSZECK FOUNDATION

# Relief flights highlight bizav's heart

by Curt Epstein

In what is becoming an unfortunately all-too-frequent drill, business and general aviation operators were ready to assist the shattered islands of Grand Bahama and Abaco in the Northern Bahamas as soon as it was safe to do so in the wake of Hurricane Dorian. In the immediate aftermath of the storm, NBAA activated HERO, its humanitarian emergency response operator program, a database of business aircraft operators who have pledged their aid to transport emergency supplies and other needs. Their basic contact information was presented to the organizations that were beginning to coordinate and mobilize the relief efforts. Likewise, business aviation emergency response group AERO-bridge alerted its membership, as industry organizations in Florida and beyond began establishing supply donation drop points at local airports.

But as the storm moved on, the scores of pilots wishing to conduct relief flights—either carrying vitally-needed supplies or aid workers—faced little to no solid information about what airports were available, the permission policies from the Bahamian Civil Aviation Authority and National Emergency Management Agency, and air traffic control in the chaotic skies around the islands.

Mark Zee, founder of International Ops-Group, started a page on Facebook, which served as a clearinghouse for any operational information gleaned by pilots, regarding any announced governmental procedures and protocols, also offering twice-daily reports on the status of the affected airports in Freeport, Treasure Cay, Marsh Harbour, and Sandy Point, as well as Nassau, which served as a strategic coordination point for aircraft delivering supplies, and carrying evacuees fleeing the devastation on the Northern Islands. The Odyssey Aviation FBO at Lynden Pindling International Airport was designated as a base of operations by the Bahamian government and its National Emergency Management

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Read Our **SPECIAL REPORT**

## New Business Jets

The business jet market is already crowded—with more than 40 entrants—and new models must offer superior value propositions across a broad spectrum if they are to succeed.

› page 30

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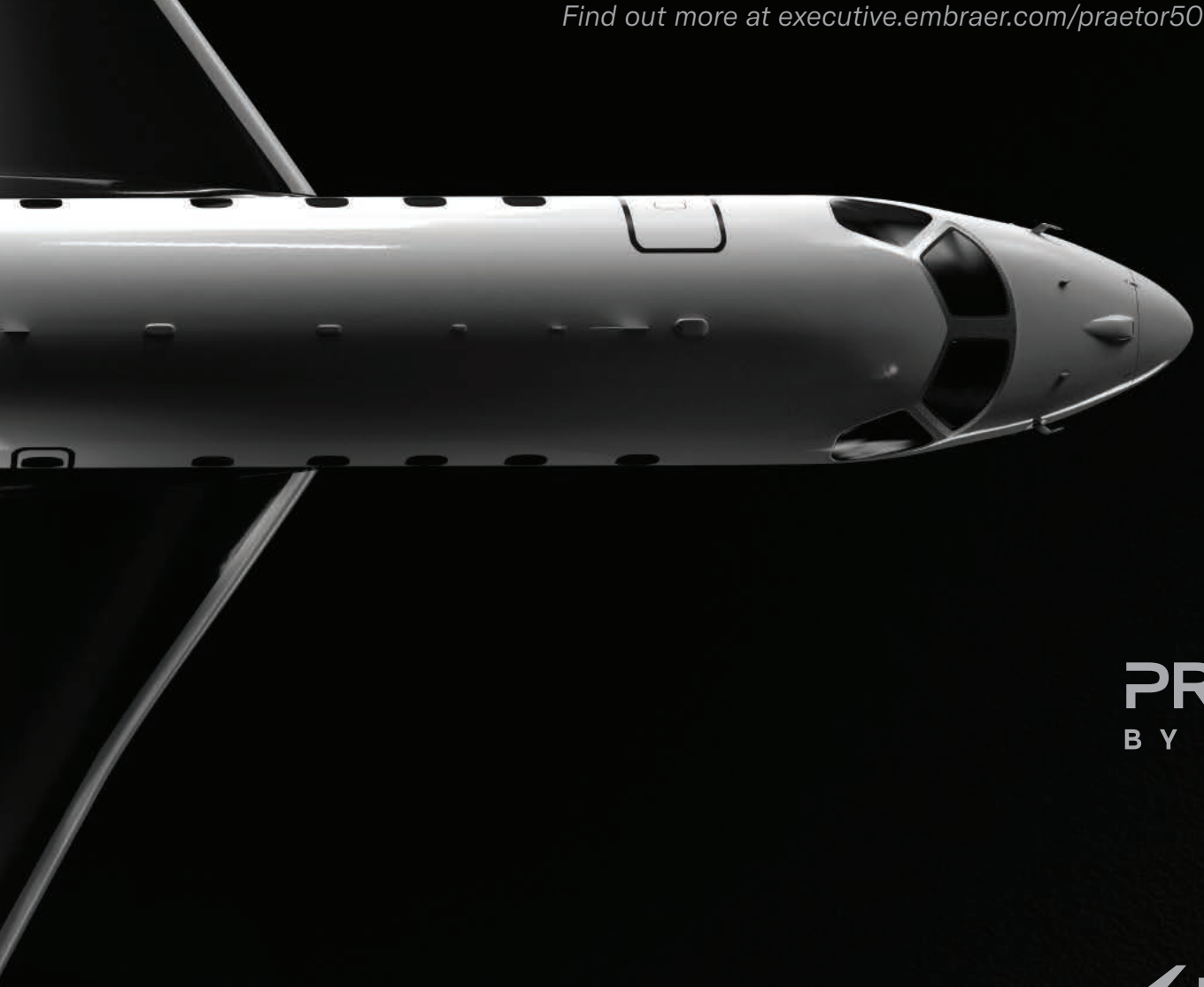

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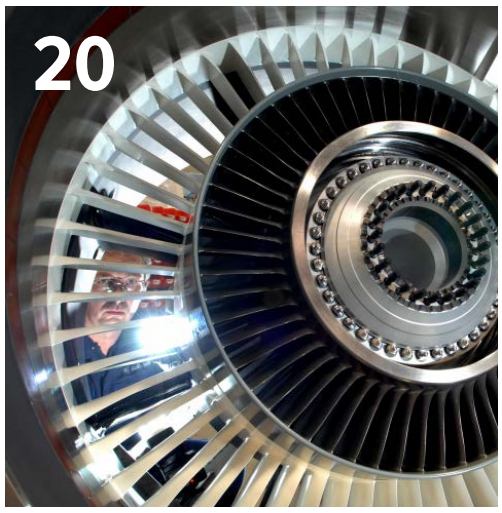
# INSIDE this issue







## ANALYSIS

**AIN** examines the actual vulnerability of CAN bus avionics in civilian aircraft and investigates what it says about the industry's ability to address serious cyber threats.

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## As We Go To Press

### ONE AVIATION RECEIVES COURT OK FOR BANKRUPTCY EXIT PLAN

After many fits and starts over the past 11 months, Albuquerque, New Mexico-based One Aviation received confirmation from the U.S. bankruptcy court on September 18 for its plans to exit Chapter 11 before year-end under ownership by Chinese-backed investors Citiking International. The ruling calls for One Aviation to exit bankruptcy upon the plan's effective date, on or before December 1. However, the company will also need to secure approval from the U.S. Committee on Foreign Investment in the United States (CFIUS) for One Aviation to be acquired by Citiking—a decision separate from the bankruptcy court's jurisdiction. Approval of the reorganization plan came with support from secured and unsecured creditors in One Aviation operating units Eclipse Aerospace and Kestrel Aircraft, following a bit of gamesmanship by Citiking earlier this year that compelled some previously-reticent parties to sign onto its amended reorganization plan.

### DOT WATCHDOG: GENAV BEHIND ON ADS-B EQUIPAGE

Industry-wide equipage for ADS-B Out jumped 69 percent between May 1, 2018, and June 1, 2019, but general aviation is lagging behind business and commercial aviation, the Department of Transportation Inspector General (DOT IG) reported. As of June 1, 73,421 commercial and general aviation aircraft were in compliance with the ADS-B-Out mandate, the DOT IG found. Overall, 76 percent of commercial aircraft were equipped, while only 44 percent of general aviation aircraft were. Though 63 percent of business jets and turboprops were ADS-B compliant as of June 1, only 40 percent of piston operators were.

### NEW FSI COURSE FOCUSES ON THWARTING KIDNAPPING

FlightSafety International has launched a new course aimed at helping corporate aircraft passengers and crews traveling abroad from becoming kidnap victims. The course comprises 15 modules designed to prevent successful attacks, and it wraps up with a field exercise in which attendees attempt to thwart a simulated kidnapping or attack, as well as learn to discover technical surveillance devices.

### HONEYWELL MARKS 100,000TH APU MILESTONE

Honeywell has rolled off the production line its 100,000th auxiliary power unit (APU), which also happens to be its 15,000th 131-9 model, its most popular APU flying today. "In 1950, Honeywell's first APU took to the skies. Currently, more than 36,000 of them are in service on aircraft ranging from business, commercial, regional and military fixed-wing airplanes, and rotorcraft. Of those, more than 13,000 are the model 131-9 and are primarily found on Boeing 737 and Airbus A320 airliners. Honeywell introduced the model 131-9 in 1995. It will soon introduce a new unit to provide on-ground power to turboprops and small to midsize jets.

### MRO INSIDER ADDING AOG SERVICE FUNCTIONALITY TO APP

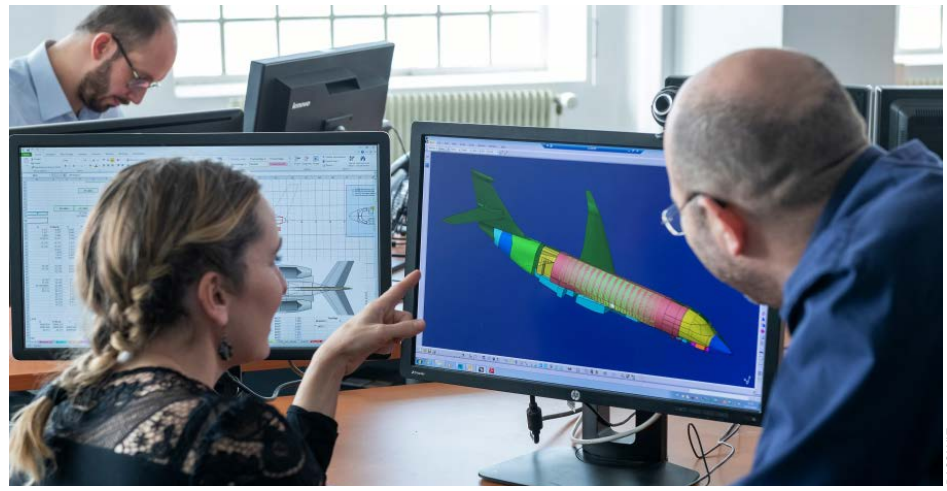
Maintenance price quote platform provider MRO Insider will give attendees at NBAA-BACE later this month a sneak peek of its new AOG service functionality for its mobile application for smartphone, tablet, or desktop computer. Through the app, users will be able to simplify the AOG process by entering their aircraft's location. Service providers will then quickly respond to them with their hourly rate, ETA to aircraft, and other information. This will be presented along with any client reviews or ratings and the facility's repair authorization and drug program paperwork. MRO Insider co-founder Andy Nixon said this will allow users to streamline searches for qualified maintenance providers on just one platform.

### SAFRAN, BOEING JOINTLY INVEST IN BATTERY SPECIALIST EPS

Boeing and Safran announced a joint investment in energy storage specialist Electric Power Systems (EPS). The undisclosed investment will help Utah-based EPS to develop a highly automated industrial base capable of producing aviation-grade batteries at far higher rates than is possible today. It will also support work to reduce the cost of the batteries, making them more viable for electric aircraft. France-based Safran is actively involved in a number of electric vertical takeoff and landing (eVTOL) aircraft, while Boeing's HorizonX division is supporting the development of the new Personal Air Vehicle and Cargo Air Vehicle by subsidiary company Aurora Flight Sciences. EPS is already providing energy storage units for the Bell Nexus eVTOL. It is also supporting Bye Aerospace's electrically powered eFlyer.

### FOUR USAF GLOBAL JETS CROSS 100K FLIGHT-HOUR MILESTONE

Four Bombardier Globals in special-mission configuration for the U.S. Air Force have collectively flown 100,000 hours, the Canadian airframer said. The aircraft—a Global Express, two Global Express XRSs, and a Global 6000—have regularly flown more than 18 hours a day for months at a time over the course of their missions. Designated by the Air Force as E-11A, the aircraft were developed and modified by Bombardier Specialized Aircraft in Wichita.



DASSAULT

The business aviation industry may have only recently recovered from the recession of 2008, but OEMs must continue looking forward, and new models are in the works, speculates one analyst.

# Wave of new business jets appears waiting in wings

by Kerry Lynch

The business jet market appears primed for several new aircraft unveilings, a key business aviation market analyst believes, suggesting that Gulfstream, Honda Aircraft, and others may "soon be taking the wraps off new planes." Manufacturers have remained quiet about their plans, but new products are an important path for manufacturers to remain competitive and more efficient, said Brian Foley of Brian Foley Associates. He added these announcements could come as soon as this month's NBAA annual convention.

Foley believes Gulfstream has a couple of significant motivators to moving forward with a successor of its G650ER ultra-long-range flagship. From an operational standpoint, Gulfstream "hasn't historically allowed any competitor's product to have a meaningful edge for long," Foley said. But Bombardier's new Global 7500 has a 7,700-nm range, 200-nm more than the G650ER. Past practices suggest that Gulfstream would announce a new model to "steal back the range crown," he surmised, adding that while "so few would ever benefit from an increase to this practically non-stop-to-anywhere capability...sometimes it's more about branding than a usable improvement in mission capability."

But to Foley, even more important is the fact that the G650ER manufacturing techniques are less efficient compared with that of Gulfstream's newest models, the G500 and G600, which can be built in fewer hours and with fewer parts.

"By ditching the old G650ER and replacing it with a longer-range derivative of the new G600, the company stands to improve margins while optimizing commonality with G500/G600 parts and tooling," he said.

Bombardier "doubled-down" on its business jet unit with the exit from a number of other business lines, he said. This suggests the business jet pipeline will remain active at the Montreal-headquartered manufacturer, Foley said, and expressed the belief that the company's "middle-size" aircraft lines, the Challenger 350 and 650 "are both overdue for other than incremental improvements."

Noting that its heritage stretches back to the 1970s, "the Challenger 650 is arguably most due for a makeover," he said, suggesting an outright replacement would mark a bolder move.

At the light end of the market, Foley points to the recent 82,000-sq-ft facility expansion at Honda Aircraft, saying it "telegraphs a new announcement forthcoming" particularly since Honda Aircraft right now is a one-product company. "Manufacturers need to have a family of aircraft to have a meaningful market presence and step-up products for their existing customers."

Further, he said, Honda has been seeking engineers with expertise in wing, fuselage, and systems design—"all indicative of an active in-house Skunkworks."

After the experience involving the cancellation of the Falcon 5X, Foley anticipates that new products from Dassault will be derived from the 6X wing and replace the older generation Falcon 900 and 2000 lines. "As with Gulfstream, having designs based on a modern airframe lowers labor time, parts cost, and provides tooling commonality."

Foley is less optimistic about a near-term announcement from Embraer, given recent updates to the Legacy 450 and 500 with the Praetor line. Embraer is still settling from the upcoming sale of a majority stake of the commercial division to Boeing, he added, saying this "would seemingly keep any business jet announcements at bay for now."

As for Textron Aviation, Foley suggests the Wichita manufacturer "has its hands full" with the Citation Longitude, SkyCourier, and Denali. "If there were to be pending new announcements it could be enhancements to the decade-old Citation CJ4 and XLS+: call them the CJ4+ and XLS++." ■

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# Alaska forum spotlights challenges

by Kerry Lynch

Citing concerns that more than 200 Part 135 crashes in Alaska have collectively resulted in some 80 fatalities since 2008, NTSB chairman Robert Sumwalt is stressing a need to improve training, risk management, use of technology, and aviation infrastructure in the state to improve overall safety.

Sumwalt last month moderated a day-long session with more than two dozen industry, NTSB, and FAA officials to delve into those topics and develop solutions to reverse the Part 135 accident trends in the state. Pointing to statics that more than 80 percent of Alaska is not accessible by roads, Sumwalt said, "Not only is aviation essential to Alaska but so is Part 135. It's essential to Alaska...We're concerned about Part 135 safety in Alaska."

He acknowledged that Alaska faces unique challenges with rugged terrain and often-changing weather patterns, but added, "We cannot accept those factors as an excuse. Yes, Alaska is different in many aspects. But it is no different in terms of the consequences of a tragic plane crash."

### Collaborative and Non-Punitive Action

Dana Schulze, director of aviation safety for the NTSB, added the Safety Board wants to spur collaborative discussions that dig into root causes and develop solutions that can be adopted by all operations. "Everybody has limited resources, and we recognize in the 135 community that all of the solutions need to be scalable for size and complexity of operations," she said. "The message is there are a lot of things that can be done even with a small operation. Everyone can focus on safety as a priority." Also important, she added, is that the approach remain non-punitive to encourage people to come forward.

Statistics have shown controlled flight into terrain (CFIT), loss of control in flight, midair collision, and unintended encounter with IMC account for the majority of Part 135 fatal accidents in Alaska, she said. A deeper look into those causes reveal that CFIT training is inadequate and needs to be improved, Schulze noted. Also, she pointed to a need for operational monitoring through programs such as flight-data monitoring, as well as the implementation of safety management systems (SMS). These "will really help move the needle on safety," she said.

As far as training, it is particularly a challenge as multiple operators participating in last month's forum confirmed that turnover among Part 135 pilots in Alaska averages about 40 percent annually. As pilots turn over, new pilots need scenario-based training to better familiarize themselves with their specific operations, experts agreed.

"We've found that CFIT training is conducted, but it is really not yielding the effectiveness that we would hope," Schulze said and cited a need to better highlight operational procedures, terrain awareness warning technologies, and weather risk management in that training.

This training does not need to occur in the most advanced simulator. Raymond Weber, associate professor in the Aviation Technology Division at the University of Alaska, Associate Professor, said his research has found that the fidelity of the simulator wasn't as critical to decision-making training as the ability to train in the simulators in the first place—and have the ability to take scenarios to the conclusion. Research showed that students who flew into poor weather, got lost, and experienced CFIT in a simulator were far more cautious in subsequent exercises, Weber said.

Along with CFIT, midair collisions have been problematic in Alaska, said Richard McSpadden, executive director of the Aircraft Owners and Pilots Association Air Safety Institute, citing research showing those incidents involving general aviation have been as much as 25 percent to 30 percent higher in Alaska. He pointed to a number of factors playing into this, such as lack of supporting infrastructure, weather, and training. There is not a single "silver bullet" answer, but McSpadden highlighted knowledge, training, proficiency, and reliable equipment as among components to help improve overall safety.

### Risk-management Efforts

As for risk management, Max Tidwell, v-p of safety and security for Alaska Airlines, outlined the benefits his airline has experienced from flight-data monitoring, seeing improvements in areas such as pilot deviations and approach procedures.

A flight-data monitoring program just needs to be something that operators can use to keep their finger on what's going on, including smaller operators, said Sumwalt, emphasizing the need to gather data that can highlight trends.

He also stressed the underlying business case for SMS, which he defined as a "business approach to safety...it gives us a structure to manage safety."

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## Alaska's Medallion program shutters

The Medallion Foundation, which was established in 2001 to foster aviation safety in Alaska, closed its doors on September 15, citing funding shortfalls and concerns that its programs are poised to create potential liability issues for participants. Originally funded largely through government grants thanks to the late Alaskan Sen. Ted Stevens, the Medallion Foundation hosted a range of safety programs for Alaska fixed- and rotary-wing aircraft operators and cruise ships.

One of its key aviation programs had been its voluntary Shield Program designed to help incorporate safety management systems and focus on key cornerstones, including avoiding controlled-flight-into-terrain, operational control, maintenance and ground services, safety culture, and internal evaluation. Medallion also provided audits, an aviation safety action program (ASAP), crew-resource management training, and a range of other training courses, including with simulators and trainers stationed throughout Alaska.

Executive director Jerry Rock confirmed the plan to cease operations and sell or dispose of the simulators by the middle of last month, saying, "The FAA continues to make reductions to our budget and use Medallion as more of an enforcement tool. The [board of directors] made a hard decision in choosing not to allow that to happen."

Rock specifically said it received $300,000 less than was originally committed to funding. The cruise ship industry, which uses Medallion for safety audits and passenger video safety briefings, isn't "happy" with the decision.

Aside from funding, a key concern Rock cited was the FAA "for the first time ever is going to make Medallion report monthly any issues we find at our carriers. Thus, if they know of a problem, by law they must investigate." Participating carriers hold themselves to higher standards, he said, adding, "If they are going to be accountable for issues during an audit that isn't regulatory, it creates a liability."

As far as safety issues, he pointed to the foundation's "TapRoot" program, which provides root-cause analysis and corrective actions to deal with those programs.

The decision to close down came in advance of the National Transportation Safety Board's (NTSB's) roundtable discussion on September 6 addressing Part 135 safety issues in Alaska. At the request of the board, Rock said, Medallion did not participate.

"With accidents at a 10-year high, it's not good that Medallion is closing down," Rock added.

The FAA did not comment on the move, but agency officials during the NTSB hearing said they were searching for new homes for the simulators that provided critical training to Alaskan operators. Meanwhile, operators at the hearing appealed for organizations to take over the key safety programs such as ASAP. **K.L.**

## News Briefs

### Dassault Reflects on Bumper Falcon Sales Since Flat 1H

Dassault Aviation CEO Eric Trappier said there has been a sudden, unexpected flourish of Falcon sales in July and August, following what was a "very flat" first half performance, selling only seven business jets in that six-month period. By August 31, the French manufacturer had sold 26 year-to-date, taking the backlog to 56 Falcons, with 23 delivered—"a book-to-bill of greater than one," he said. Overall, the company has a €19.2 billion ($21.04 billion) backlog, while it recorded €286 million ($313.3 million) first-half income on just over €3 billion ($3.29 billion) in sales, including Rafales and Falcons. Trappier said Falcon sales in most parts of the world were "a bit flat," the exception being the U.S.

### Jackson Hole Demos SAF

Jackson Hole Airport in Wyoming became the most recent location for business aviation operators to sample sustainable aviation fuel (SAF) early last month when Avfuel provided 7,300 gallons of the blended fuel to Jackson Hole Aviation, the airport-operated FBO. As demonstrated in events earlier this year such as at Van Nuys, California, in January and at several locations in the U.S. and Europe ahead of EBACE, SAF is a drop-in replacement for jet-A. "These demonstration-type days... prove the concept that the product exists, it is safe, and it provides a great benefit to the environment," said Keith Sawyer, the Ann Arbor, Michigan-based fuel provider's manager of alternative fuels. The shipment represented a reduction of two metric tons in the life-cycle $CO_2$ emissions.

### Textron Aviation Opens Australia Parts Warehouse

Textron Aviation has opened a 2,000-sq-ft aircraft parts warehouse in Melbourne, Australia. Co-located with Premiair Aviation Maintenance at Essendon Fields Airport (MEB), the new warehouse will hold up to 10,000 parts across the OEM's Beechcraft, Cessna, and Hawker product lines. Factory-direct parts, shipped locally from Essendon, can be purchased from the company online or through its local sales and support staff. Premiair Aviation Maintenance is Textron Aviation's new authorized service facility in Australia.

### Bell 505 Fleet Reaches 20,000 Hours

The Bell 505 Jet Ranger X fleet has surpassed more than 20,000 flight hours, marking the fastest-growing accumulation of flight hours of any current Bell commercial platform, the Fort Worth, Texas-based rotorcraft manufacturer announced. Bell has handed over 200 helicopters since the first delivery in 2017. "Logging more than 20,000 flight hours is very impressive for an aircraft in service less than three years," said Bell 505 and 429 program director LaShan Bonaparte.

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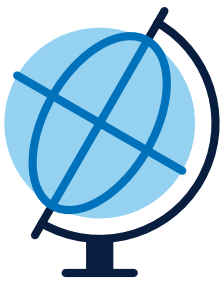
1. 

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# Industry calls for stronger penalties on illegal charter

by Charles Alcock

The British Business and General Aviation Association (BBGA) is calling for legal changes to strengthen deterrents for illegal charter and boost enforcement. "Fines are pointless and they are not being enforced," aviation attorney and BBGA council member Aoife O'Sullivan said at the Air Charter Expo conference at Biggin Hill Airport in September. "We need a change in the law. The [flight] cost-sharing concept is being openly flouted and we need a change to the [UK] Air Navigation Order to put a stop to this."

Dave Edwards, CEO of the Air Charter Association, told conference attendees that between 2005 and 2016 there were only 14 successful illegal charter prosecutions and fines for all of these total just £14,950 ($19,000). "That's barely 10 weeks' pay for a training captain," he complained.

Conference panelists—including European Business Aviation Association (EBAA) chief operations officer Robert Baltus and Ryan Waguespack, the v-p of aircraft management, charter services, and MROs with the U.S. National Air Transportation Association—acknowledged that regulatory agencies generally have inadequate resources to police illegal charter. They indicated that abuses are increasing, partly facilitated by online charter platforms and abuses of dry-lease arrangements.

According to O'Sullivan, the industry should focus efforts on better informing charter end users of the liabilities they could face in the event of an accident. "Many end users just don't know what they are getting themselves into; when they take on a dry-use aircraft they are taking [legal] control of it," she said. "Under UK law, this could result in a corporate manslaughter criminal prosecution [in the event of a fatal accident]."

James Moreton from insurance broker Hayward Aviation added that end users also need to be more aware that illegal charters can invalidate insurance coverage. He acknowledged that insurance companies could do more to raise awareness about the resulting liability issues.

Panelists advocated reporting illegal charter operators to tax authorities on the grounds that fines for non-payment of taxes could be far more punitive. They also argued that authorities could be urged to target pilots involved in illegal charter with a more meaningful threat to revoke licenses.

EBAA is in the process of setting up a platform to make it easier for legitimate businesses to report cases of illegal charter. Meanwhile, the UK industry is awaiting the final Air Accident Investigation Branch report into the Jan. 21, 2019, fatal crash of a Piper Malibu in which the pilot and professional soccer player Emiliano Sala were killed. This prompted the Air Charter Association to call for "urgent action" on illegal charter based on the findings of the preliminary report into the accident. ■

From left, test pilot Matt Stilts, Cessna chairman Dwane Wallace, commercial aircraft marketing v-p James Taylor, test co-pilot Jim LeSueur, military and twin division v-p and general manager Max Bleck, senior v-p of aircraft operations Bob Lair, United Aircraft Canada president Thor Stevenson, and Cessna president Del Roskam pose with the Citation 500 after its maiden flight in 1969.

# Textron Aviation marks 50 years of Citation bizjets

by Jerry Siebenmark

It was 50 years ago this week that the first Cessna Citation business jet made its maiden flight, Textron Aviation publicly noted yesterday. Since that flight, the Wichita-based manufacturer of Citation business jets has delivered more than 7,500 of them, with the fleet amassing more than 35 million flight hours.

Unveiled as a mockup at the National Business Aviation Association Convention in October 1968 in Houston, it was a year later, on Sept. 15, 1969, that the first FanJet 500—later renamed Citation 500—took off on its first test flight, which lasted an hour and 45 minutes, reached a speed of 225 knots and an altitude of 10,000 feet (weather prevented a planned climb to 20,000 feet). The type received its first certification—for Part 25—on September 10, 1971.

Today, the Citation family comprises seven models—the M2, CJ3+, CJ4, XLS+, Sovereign+, Latitude, and Longitude—with seating from seven to 12 passengers and range between 1,550 and 3,500 nm.

"The same vision that led to the creation of the original Citation 50 years ago still guides us today," said Textron Aviation CEO Ron Draper. "We are building on our history as an industry leader and investing in the future to continue to exceed customer expectations." ■

## NEWS note

**An aircraft sales website created by the International Aircraft Dealers Association (IADA) has seen more than $1.6 billion in sales of more than 235 preowned aircraft** in its first seven months of operation, the group announced.

"The sales of previously owned aircraft have actually exceeded our expectations for a startup website and the momentum is building," IADA executive director Wayne Starling said. "That's more than an aircraft a day seven days a week since beginning the site and we are getting spooled up for an even higher volume of aircraft sales going forward."

The website targets high-net-worth individuals and C-level executives with preowned business aircraft listed exclusively by IADA accredited broker-members. Currently, more than 500 aircraft are listed for sale on the site. ■

## News Briefs

### CAE, Directional Aviation Ink Training Deal

Training services provider and simulator manufacturer CAE has agreed to a 15-year deal with investment firm Directional Aviation Capital (DAC) to be the exclusive training services provider to six DAC-owned business aircraft operators, as well as acquire for $85 million a 50 percent stake in Simcom Holdings. The six DAC-owned companies under which CAE and Simcom will have an exclusive training agreement are Flexjet, Flight Options, Flairjet, Sirio, Nextant Aerospace, and Corporate Wings. Another part of the agreement calls for Simcom to purchase equipment from Montreal, Canada-based CAE, including five full-flight simulators.

### L.J. Aviation Opens New Base at PIT

Latrobe, Pennsylvania-based L.J. Aviation aircraft management and business jet charter company has opened a new base at Pittsburgh International Airport (PIT). Its new facility includes a reception area, private offices, lounge, and meeting rooms. It also has 36,000 sq ft of hangar area, complete with shop space, with 42-foot doors, and can accommodate business aircraft up to a BBJ or ACJ.

### Asset Insight Expands Free Access to Aircraft Data

Asset Insight announced in September that it has made available its direct operating cost (DOC) data for turbine-powered business aircraft free of charge through its eValues system. The company's DOC figures are based on real-time fuel costing, utilization, and maintenance expense for individual serial numbers in the active global fleet, compared with data from traditional sources that is typically updated monthly. Availability of DOC data follows Asset Insight's move in August to offer users free access to serial-number-specific market values accounting for actual modifications, hourly cost maintenance program coverage, and maintenance inspection completions, as well as current and projected values by make, model, and year of manufacture.

### Helo Fueling Error Could Cost Flight Crew $1M

Germany's Federal Police are seeking more than $1 million in damages from three helicopter crewmembers who refueled their Airbus EC135 with avgas instead of jet-A—twice, according to reports by German media outlets. While the helicopter managed to fly with the wrong fuel added to its tanks, the crew noted extensive engine damage immediately after the training mission and the engines had to be replaced. German law allows employers to recover financial damages from employees who perform negligently. The crew might find relief in past rulings by German courts, which have ruled in the past that damage awards may not impose undue hardship on defendants.

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VLADIMIR KARNOZOV

Attendees viewed 18 aircraft at Russia's RUBAE trade show, which ran in mid-September.

# Russian bizav learns to cope

by Vladimir Karnozov

Business aviation today faces many challenges in Russia, and the annual RUBAE trade show offers insight into how the industry is faring in the face of international tensions. About 10,000 attendees had been registered by RUBAE 2019 organizers before the three-day event in Moscow-Vnukovo airport closed on September 13. The organizers listed 63 firms as participants, including nine sponsors and partners without actual exhibits or booths, and 11 companies represented in the static display area only. The rest had their stands and booths inside a 5,000-sq-m hangar at the Vnukovo-3 business aviation center on the western side of the airport's runway.

Due to Western sanctions on Russia, fewer exhibitors at Vnukovo now dare to have public deal signings, run press briefings, or even talk to the media. That was one of the reasons the show organizers (VIPPORT company, a member in the larger group running the Vnukovo airport) asked the Russian United Business Aviation Association (RUBAA) to accept responsibility for the exhibition's schedule of conferences, briefings, and roundtables. This made RUBAE 2019's conference program somewhat more vivid, with focus not on news but rather education and promoting best practices in safety, air traffic management, market research and analysis, and other issues of interest to most of the foreign and local exhibitors.

Key Western manufacturers that keep coming to this show are Dassault Aviation, Leonardo Helicopters, Gulfstream Aerospace, Embraer, and Bombardier Business Aircraft. Their stands occupied about a third of the roofed space available. RusAero controls several service providers to business aviation in key Russian airports, together with three Moscow-based business jet operators Sirius Aero, Meridian, and RusJet had booths whose combined space came close to that of Dassault's stand, which, again, was the largest at the show.

The number of operable aircraft on display totaled 18 (compared with 20 last year). There were three helicopters (Russian Helicopters Ansat, Airbus H125M, and Leonardo A109), two turboprops (a Pilatus PC-12NG and a Piper PA-46-600TP), two bizliners (a Tupolev Tu-204-100V and Airbus ACJ319), and 11 business jets. Bombardier brought its Global 7500. Embraer flew in a Legacy 500 and a Phenom 300E, while Gulfstream showed a G650ER, a G600, and a G280. Dassault flew in a Falcon 8X and a 900LX; local operator Fort Aero added a Falcon 2000. Other domestic companies provided a Cessna 525 CitationJet I outfitted with winglets, and a Hawker 700A.

The largest Western exhibit was an ACJ319 operated by MJet GmbH; the aircraft was also on show in 2015 and 2016 thanks to Airbus Corporate Jets. At its 103-tonne maximum gross weight, the heaviest aircraft on display was side number RA-64014, a Tu-204-100V narrowbody passenger airliner recently converted into a VIP jet. Built in 1994, the airplane suffered an engine failure two years later, with debris causing serious damage to the empennage. After the airplane had been grounded for 14 years, a government-controlled bank bought it and returned it to the manufacturing plant Aviastar-SP for repairs and interior alteration. Restoration work began in 2016, following United Aircraft Corporation (UAC) receiving a Rouble 2.6 billion ($40.5 million) injection from the Kremlin. Interior specialist Vemina-Aviaprestige provided a luxurious VVIP cabin. It is now painted in colors closely reminiscent of those of Aeroflot but operated by RusJet on behalf of the owner, which is believed to be one of the top Russian banks. The aircraft now flies charter for the Ministry of Industry and Trade.

Tightening Western sanctions make the Kremlin rely more on indigenous products, as do those businessmen in the country who made their fortune based on close relations with the ruling elite. Hence RA-64014's story is likely to repeat itself many times. While it is not a perfect solution, it does ensure that the aircraft owners and users will not come under the sanctions hammer, as Gennady Timchenko did in with his Global 650, which was prepaid but never delivered. In their turn, Western manufacturers, who remain eager to sell into Russia, now prefer to keep silent on any new orders they manage to win, so as not to provoke the U.S. and E.U. to apply sanctions to those few businessmen in Russia who still earn enough to afford a business jet new from the factory. ■

## IBAC to highlight fuel, safety at ICAO event

Sustainable aviation fuels (SAF), proper implementation of market-based emissions measures, and turboprop and helicopter safety were set to top the agenda for the International Business Aviation Council (IBAC) for the International Civil Aviation Organization (ICAO) Assembly set to kick off late last month.

Scheduled from September 24 to October 4, the 40th gathering of the Assembly will draw participation from 193 member states, which will set priorities for the next three years. Representing the business aviation community, IBAC is bringing a delegation of representatives from at least five member associations, said IBAC director general Kurt Edwards.

The Assembly is expected to focus on global air navigation, safety, and security plans. Of priority to IBAC, Edwards said, will be the promotion of recent business aviation activities surrounding SAF. IBAC plans to stress its use as a key tool in mitigating carbon emissions and urge support for policies that would incentivize production and consumption, he said.

Along those lines, IBAC is joining broader aviation industry groups in stressing the importance of moving ahead with the Carbon Offsetting and Reductions Scheme for International Aviation (CORSIA) program as a global approach and avoiding double charging for emissions.

IBAC further plans to encourage ICAO to collect and share best practices on turboprop safety and helicopter air traffic management requirements to support growth in both areas. Other priorities are designed to ensure measures foster, instead of disadvantage, business aviation, he said, including a push for the assembly to proceed in a data-driven manner on supersonic noise and emissions standards. In addition, IBAC is monitoring possibilities for passenger information standards to ensure they account for differences with smaller operators. **K.L.**

## News Briefs

### TSA Backs Off Uniform Mandate for KCM

In a reversal, the TSA has delayed implementation of a recently announced requirement for crew entering through Known Crewmember (KCM) access points to wear their uniforms. But the agency has moved forward with planned increased Unpredictable Screening Procedures (USP) that involve randomly selecting crewmembers for screening through PreCheck. Following the announced uniform requirement, airline, flight attendant, and pilot representatives reached out to the TSA, expressing their concerns. Instead, the TSA will work with industry "to determine alternative or additional measures to mitigate risk to the KCM system pending further TSA review as part of an ongoing audit." KCM provides for expedited security processing for properly vetted and credentialed flight crews through specific access points. NATA's Compliance Services group administers KCM for charter and fractional operators. Nearly 400 operations participate in the NATA-run KCM program.

### Pilatus Delivers First South American PC-24

Pilatus Aircraft handed over its first PC-24 to a South American customer and marked its 40th delivery of the twinjet model during a late-August ceremony at its Broomfield, Colorado facility. Ignacio del Rio is operating his new PC-24 from his base in Santiago, Chile, where he also keeps a PC-12 NG turboprop single. "We are very pleased that Ignacio is staying within the Pilatus family with both his PC-12 NG and now his new PC-24 jet," said Thomas Bosshard, the president and CEO of U.S. subsidiary Pilatus Business Aircraft Ltd. Del Rio is using the PC-24 to support his agriculture and real estate businesses in Chile, Peru, and Colombia, allowing him to reduce trip times compared with those in his PC-12, Pilatus said.

### NBAA Committee To Tackle Emerging Tech Issues

NBAA has established a new committee to focus on a spectrum of emerging aviation technologies, from unmanned aircraft systems and electric propulsion to urban air mobility, unmanned traffic management, and commercial space, among others. The association is soliciting applications for membership in the Emerging Technologies Committee, adding it is, in particular, looking for participants with experience in developing these technologies, integrating them into the U.S. National Airspace System, supporting associated infrastructure, and training. NBAA is encouraging manufacturers, software developers, operators, and other interested organizations to apply. The committee will be tasked with developing insight to enable NBAA to better advocate on behalf of the industry on standards, rulemaking, and other policy initiatives.


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# Tire marks, 'weird sensation' noted in Citation overrun

by Rob Finfrock

A Cessna Citation Excel that overran the runway following a rejected takeoff from Oroville Municipal Airport (OVE) in Northern California didn't respond to pilot inputs and left behind a long trail of tire rubber, according to an NTSB preliminary report.

The pilot flying (PF) told investigators they had paused at the hold-short line to Runway 2 (6,020 feet x 100 feet) to update the aircraft's flight management system (FMS) with a "waypoint fix and departure change" before taking the runway and running the before takeoff checklist.

"Following completion of the checklist, they initiated takeoff and the [pilot not flying, PNF] called 'airspeed alive,' V1, and Vr," the NTSB noted. "The [PF] stated that 'it was just a weird sensation' as he pulled the yoke back and the airplane didn't lift off. The [PF] further stated that he pulled the yoke back a second time and noticed no movement of the nose."

The PNF then called for the abort, and the PF "applied full thrust reversers and maximum braking," read the preliminary report. "Subsequently, the airplane exited the departure end of the runway, impacted a ditch, and skidded across a grass-covered area, where a post-impact fire ensued."

All eight passengers and two crewmembers escaped without injury in the August 21 runway excursion. The aircraft came to rest approximately 1,990 feet from the pavement, its nose oriented roughly 40 degrees right of the runway centerline.

Investigators noted what they termed "tire transfer marks" extending from the Runway 2 hold-short line, continuing along the runway and to the wreckage site. A witness photo showed the airframe largely intact and resting level "on the underside of the fuselage and wings" before fire consumed it.

Surveillance video footage obtained from an FBO on the field showed the aircraft initially holding short of Runway 2 for nearly four minutes. "The airplane then taxied forward toward Runway 2, stopped, and remained stationary for about 18 seconds, until it began to taxi again onto the runway," the NTSB noted.

The aircraft remained stationary on the runway approximately 16 seconds before starting its takeoff roll, which the surveillance camera captured until the aircraft exited the frame 48 seconds later, at a point "about 730 ft beyond the departure end of Runway 2," investigators stated.

The 2003 C560XL, registered N91GY, was operating for Delta Private Jets on an IFR flight plan to Portland, Oregon. The Oroville accident was the second fiery runway excursion of a Citation jet in less than a week, following an August 15 overrun involving a Cessna Citation Latitude (C680A) on landing at Elizabethton Municipal Airport near Bristol, Tennessee. Retired race car driver Dale Earnhardt, Jr., his wife, infant daughter, a dog, and the two pilots emerged from that accident without serious injuries. ■


Universal Weather and Aviation is selling its UVair fueling business to World Fuel Services for $170 million. UVair serves business and general aviation customers at more than 5,000 locations worldwide.

## World Fuel Services to acquire UVair in $170M deal

World Fuel Services is acquiring Universal Weather and Aviation's UVair fuel business for $170 million, the companies announced on August 23. According to World Fuel, the deal is expected to close by year-end and will be funded through cash-on-hand and liquidity available through an existing unsecured credit facility.

Houston-based UVair serves business and general aviation customers at more than 5,000 locations worldwide. While Universal will retain its international trip planning services business, the UVair deal includes an agreement for Universal to work exclusively with World Fuel to supply fuel to its customers.

"This strategic acquisition…will further enhance our global business and general aviation fuel platform," said World Fuel chairman and CEO Michael Kasbar. "We look forward to welcoming UVair's fuel customers and providing them and Universal's international trip planning customers with access to our global fuel supply network."

"This sale of UVair will enable us to continue to invest and grow," said Universal chairman Greg Evans. "We will continue to invest in our digital platforms. We will also continue to expand our global footprint, grow our global concierge network, invest in and add new catering locations as Air Culinaire Worldwide continues to thrive, and build on our recently announced joint venture with Drivania to provide a truly global transportation solution." **C.T.**

## News Briefs

### Airman Security Threat Rules Apply to U.S. Citizens

New rulemaking updates current FAA security threat disqualification regulations and consolidates them under a single regulation. In sum, those regulations provide that no persons, including U.S. citizens, are eligible to hold an airman certificate, rating, or related authorization if the TSA notifies the FAA of an adverse security threat determination. The new rules go into effect on October 18. Heretofore, airman security regulations were promulgated under several different regulatory codes and, due to the wording and intent of previous rulemaking, did not cover U.S. citizens or U.S. nationals. This new rulemaking closes that gap by applying the security disqualification requirements to all FAA pilot certifications, regardless of citizenship status.

### Begin Planning Now for 2020 Olympics Bizav Ops

With the 2020 Tokyo Summer Games and Paralympics less than a year away, the Japan Civil Aviation Bureau (JCAB) has already released guidelines for non-scheduled flights and is beginning to accept slot applications for Chubu Centrair International Airport (RJGG/NGO) and Sendai Airport (RJSS/SDJ), Universal Weather & Aviation said. "We highly encourage you to make arrangements…as soon as your schedule is known," the company added. The 2020 Summer Games slots are scheduled from July 24 to Aug. 9, 2020, while the Paralympics slots will cover Aug. 25 to Sept. 6, 2020. Six airports will handle the slots—three Tokyo metro airports (Narita International, Haneda International, and Ibaraki ) and three specially designated airports (New Chitose, Sendai, and Chubu Centrair International).

### NBAA Directors Land at DOT Safety Committee

The Department of Transportation (DOT)'s newly created Safety Oversight and Certification Advisory Committee (SOCAC) will include representation from the business aviation industry. Honeywell director William Ayer and West Houston Airport president Shelley Lesikar DeZevallos, both of whom are also NBAA directors, were appointed to the committee.

### Argus Sees Ops Growth after Mixed First Half

Following mixed results in the first half, Argus is anticipating business aviation operations in the U.S. will continue to gain strength in the second half, it said in its 2019 Mid-year Business Aviation Review. In the first six months, business aviation turbine operations in the U.S., Canada, and the Caribbean were up 0.3 percent from 2018, while flight hours rose 0.7 percent. Charter operations ended down 2.2 percent in the first half, but the fractional segment logged a 6.2 percent gain. Part 91 saw a 0.7 percent improvement. Argus anticipates that business aviation will be up 2 percent year-over-year in the second half.

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# Citation Jet Pilots gather at annual confab | by Matt Thurber

The Citation Jet Pilots Association continues building on its success in attracting members and delivering safety information. At this year's CJP annual convention, held at the Broadmoor in Colorado Springs, Colorado, multiple records were broken, including registered attendees at 552, owner-members at 180, companions at 212, exhibitors 74, and more than 130 Citations flown to the event (including 124 at host FBO Cutter Aviation). "This was an amazing CJP annual convention," said CJP CEO Andrew Broom.

More than 130 Citations flew in to Colorado Springs for the latest meeting of the Citation Pilots Association, crowding the ramp at host FBO Cutter Aviation and other local FBOs.


At CJP 2019, a record number of pilots—62—received the Gold Standard Safety Award, up from 43 last year. The award recognizes members for going above and beyond minimum recurrent training and experience requirements, including flying more than 100 turbine hours in the past year, incorporating CJP Standard Operating Practices, either two 61.58 recurrent checks in a simulator or one sim check and six hours of dual instruction in a Citation or simulator, plus additional "broadening" training.

The CJP Association's more than 1,150 members fly more than 750 Citations and wield significant influence on the light-jet Citation market, a fact that is apparent in the support that Textron Aviation provides as a sponsor and by sending its top executives to the convention. Textron Aviation president and CEO Ron Draper responded to a CJP member who wondered whether his fellow members might be able to aggregate hundreds of orders and help design the next light Citation.

## Encouraging Words

Following the 2008 recession, Textron Aviation had to make some tough decisions and cut costs enormously. "At that time, we did not make the decision to invest heavily in the light jet," Draper said. "I think you're going to see that change in the future. I'm not announcing anything and I'm not promising. There's the light-jet market and then today with the addition of the King Air, that's the core of our business. The Latitude and Longitude are going to provide the financial returns that we need to then go back and invest in the future; in the core."

› continues on page 36

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Full-throttle opinion from former NTSB member John Goglia

# In case of Boeing 737 Max accidents, even the reviewers need scrutiny

I'm thinking a lot about what happened with the Boeing 737 Max. For one thing, 346 people died in two crashes less than six months apart in almost brand-new aircraft. For another, the crashes have led to the six-month—and growing—worldwide grounding of the aircraft. As far as I can recall, this is the longest grounding of a major aircraft type. It is critical to determine, as expeditiously as possible, what brought these aircraft down, both the immediate causes of the crashes and more indirect potential causes, like Boeing's design and manufacturing processes and the FAA's certification of the Boeing aircraft and its oversight of Boeing.

But what about Congress's role? Congress should not be immune to review; after all, it passed laws that authorize and even encourage extensive FAA delegations that are at the heart of much of the criticism, while approving budgets that limit FAA staffing and funding for oversight functions.

Given the loss of life and the short period between these two accidents, the crashes have spurred numerous questions about who did and didn't do what. As I write, investigations have spread from the countries responsible for the actual airline accident investigations—Indonesia in the case of the Lion Air Flight 610 accident and Ethiopia in the case of the Ethiopian Airlines Flight 302 disaster—to multiple investigations in the U.S. Of course, the NTSB, under international law, has the right to send an accredited representative to participate in the investigations, and it has. As the U.S. is the country of design and manufacture of the aircraft, the NTSB also has the right to appoint representatives from Boeing to assist it.

But in addition to the NTSB's participation in the probes, a wide variety of other investigations have already been announced, from the civil to the criminal. The Department of Transportation Office of Inspector General has been tasked with auditing the FAA to determine and evaluate "FAA's overall process for certifying the Boeing 737 Max series of aircraft." A federal grand jury convened by the U.S. Department of Justice in Washington, D.C. issued what the Wall Street Journal termed a "broad subpoena" to at least one person involved in the development of the Boeing aircraft.

And then there are the Congressional hearings. So far, hearings have been held by the Senate commerce subcommittee on aviation and space and the House Committee on Transportation and Infrastructure's aviation subcommittee. I'm sure more will follow. But so far the gist of these discussions, at least in part, seems to be to criticize the FAA for delegating certification tests and inspections to Boeing without exercising adequate oversight. One senator condemned this practice as putting "the fox in charge of the hen house." Another senator, chairing the hearing, condemned the close relationship between industry and the FAA as threatening to erode public confidence.

## Plenty of Blame To Go Around

Amidst all the finger-pointing at the FAA and Boeing (who I'm quite sure deserve their share of accountability), I happened to hear an exchange between a congresswoman and the deputy director of the FBI that had gone viral. That particular hearing had nothing to do with the Boeing 737 Max but it got me thinking about who had a role in the aircraft certification but wasn't being investigated by anyone, at least that I could find. In the exchange with the FBI, the congresswoman was asking why domestic terrorists weren't charged as terrorists when international terrorists were. As the FBI deputy explained, differences in the law allow one group of terrorists to be charged one way and not the other. At some point, the congresswoman responds that she's just trying to find out who is responsible, stating "maybe it's Congress."

Well, of course, it's Congress. Who else writes the laws? While the President signs bills into law and federal agencies are responsible for complying with them, the laws originate in Congress. So if Congress wants to make domestic terrorism a federal crime, write the law that does that. Similarly, if Congress wants to find out what happened with FAA delegation to Boeing and its oversight of that delegation, it needs to ask itself some hard questions. Or appoint an independent body to investigate it.

After all, since at least the Federal Aviation Act of 1958, Congress has legislatively authorized the FAA to delegate authority to private individuals in recognition of the need to leverage the FAA's limited staff. Over the years, the delegations have grown and expanded with Congress mandating in the 2003 FAA Reauthorization Act that the FAA submit to Congress "a plan for the development and oversight of a system for certification of design organizations to certify compliance with the requirements and minimum standards prescribed...for the type certification of aircraft, aircraft engines, propellers, or appliances." The FAA did that and over time, with pressure from the industry and a recognition of its own limited resources, the delegations and designations grew to include the Organization Designation Authorization (ODA) under which Boeing was delegated certification authorities for the Boeing 737 Max.

Apparently, Congress didn't think the FAA was delegating enough to ODA holders. Just before the first crash of the Boeing 737 Max in October 2018, Congress passed the 2018 FAA Reauthorization Act, which mandated further expansion of the ODA program, including (with some exceptions) "at the request of an ODA holder, eliminate all limitations specified in a procedures manual...that are low and medium risk as determined by a risk analysis using criteria established by the ODA Office and disclosed to the ODA holder."

While Congress wrote laws expanding FAA delegations to the private sector, it was also responsible for authorizing the FAA and funding it. Congress is surely aware that the FAA's certification and oversight mission covers everything aviation-related from unmanned aerial toys to manned aircraft, airlines, repair stations, aircraft manufacturers, pilots, and more. The FAA does this with a staff of 7,000 in the Aviation Safety Office according to its 2019-2028 workforce plan. Of those 7,000 employees, 1,341 are employed in the certification office and 5,012 in flight standards, with approximately 15 percent in non-technical support roles. That's not a lot of people for such an expansive mission.

At the same time that Congress is passing delegation laws and funding for the FAA, many of its members are also accepting campaign donations from aircraft manufacturers, such as Boeing, which clearly have an interest in pushing the FAA to delegate more and more authority to manufacturers with as little oversight as possible. In 2018, Boeing reportedly spent $18 million on lobbying efforts, including lobbying Congress on issues related to the 2018 FAA Reauthorization Act, with approximately 330 members of Congress reportedly receiving campaign funds.

So, if we're truly going to get to the bottom of what went wrong with the Boeing 737 Max, someone has to ask Congress some tough questions. ■

*The opinions expressed in this column are those of the author and not necessarily endorsed by* ***AIN****.*

John Goglia is a safety consultant.
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## FAA: time for pilots to brush up on weather analysis

The FAA Safety Team reminded general aviation pilots in an advisory August 26 that while they may have access to myriad weather information sources today, understanding how to get that information, interpret it, and use it for flight planning is paramount to safe flying. While tests for most pilot certificates cover weather theory and use of weather products, "it takes continuous study and experience to develop your skill in evaluating and applying weather data to a specific flight," FAA explained.

There are a few steps pilots should consider before a flight. One is to consider how weather could affect the flight, such as turbulence and visibility. Are you proficient enough in weather analysis to safely overcome such conditions? Is your airplane's performance equally up to the challenge? An older airplane without weather avoidance technology will limit the weather flying abilities of even the most skilled pilot. Likewise, an airplane loaded with all the latest weather technology isn't going to provide much help to a pilot with novice weather-flying experience.

"One way to 'self-check' your decision [regardless of your experience] is to ask yourself if the flight has any chance of appearing in the next day's newspaper," FAA noted. "If the result of the evaluation process leaves you in any doubt, then you need to develop safe alternatives."

The FAA also suggests as part of the preflight weather planning process that pilots also think about:

» **Escape routes—**Identify where you can find good weather that's within reach of your airplane's range and endurance, including the time it will take and the direction to turn. It also recommends pilots plan for an alternative airport for each 25 to 30 nm segment of their route should the weather turn to IMC.

» **Reserve fuel—**Plan to have more fuel than what a legal fuel reserve calls for. "Having plenty of fuel also spares you the worry (and distraction) of fearing fuel exhaustion when weather has already increased your cockpit workload," the FAA added.

» **Terrain avoidance**—Know just how low you can go while avoiding trees, mountains, or structures along the route.

Lastly, the FAA recommends pilots fly regularly with an instructor who will challenge them on their weather flying knowledge. **J.S.**

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# Product Support Survey

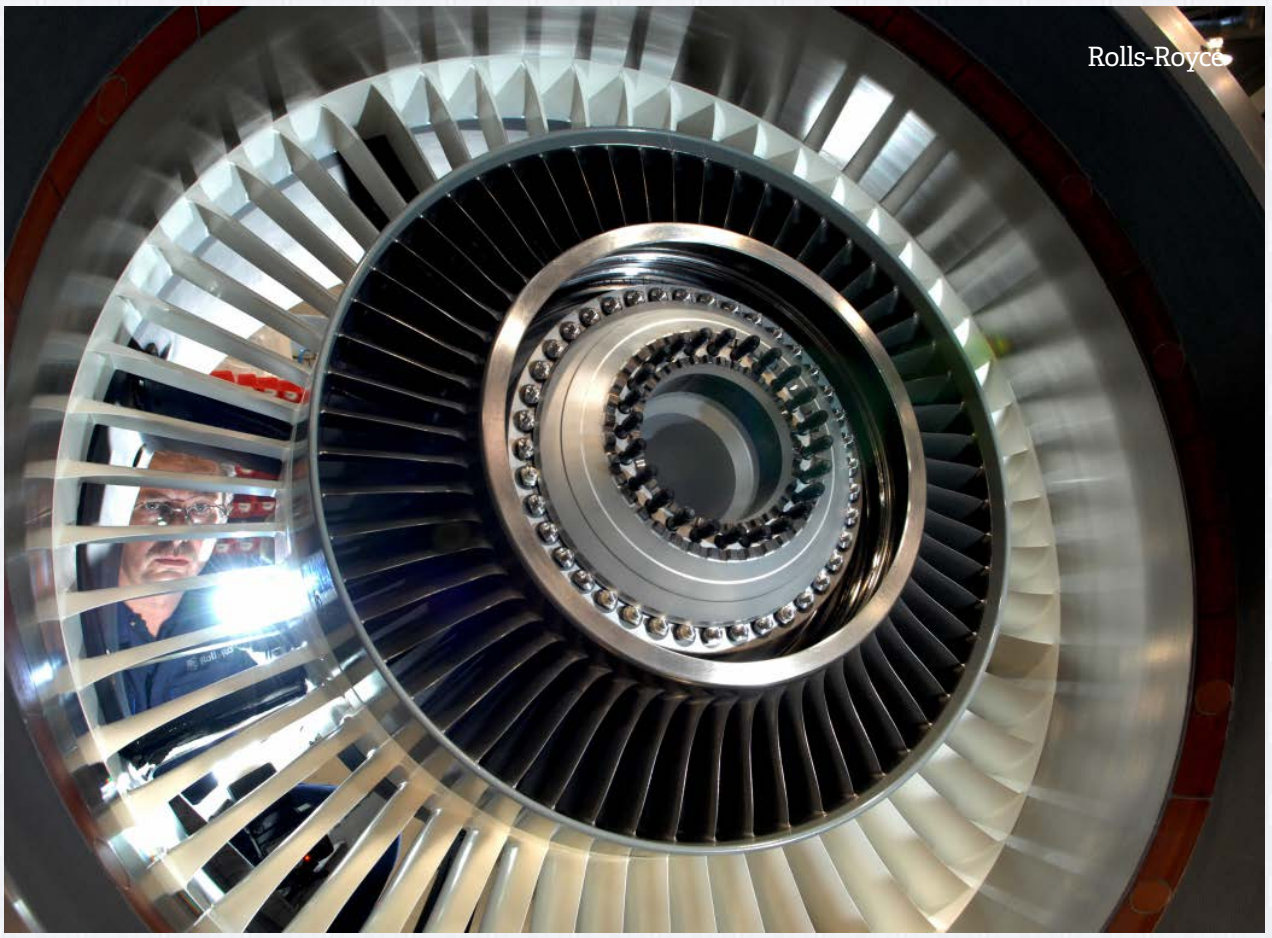
by Matt Thurber

Rolls-Royce and Williams International took first place for the turbofan segment in this year's **AIN** Engine Product Support Survey with a tied Overall Average of 8.2 (out of a possible 10). Williams retains its first-place status from last year, whle Roll-Royce climbed from last year's second place. In second place this year are GE and Pratt & Whitney Canada at 8.0.

Honeywell came in third place with an Overall Average of 7.9, followed by CFE in fourth place at 7.8.

On the turboprop/turboshaft side, Honeywell kept its first-place lead from last year, with an 8.4 Overall Average. Pratt & Whitney Canada came in second place, rated at 7.6, followed by Safran at 7.4.

In almost every case, Overall Average scores reflect a drop from last year's ratings, ranging from 0.3 to 0.1. Safran's rating of 7.4 remains the same as last year.


Rolls-Royce

## Survey Rules and Methodology

As with AIN Publications' previous annual Product Support Surveys, the objective this year was to obtain from the users of business jets, pressurized turboprop airplanes, and turbine-powered helicopters statistically valid information about the product support provided by engine manufacturers over the last year and to report this information to our readers. The goal is to encourage continuous improvement in powerplant product support throughout the industry.

This survey was conducted via a dedicated website, created by **AIN** from the ground up to provide improved ease of use and to encourage greater reader participation. **AIN** emailed qualified readers a link to the survey website and also sent a postcard invitation with login credentials to the survey website.

The survey website was open from May 1 to June 7. Respondents were asked to rate the engines they use. Respondents were also asked to rate, on a scale from 1 to 10, the quality of service they received during the previous 12 months in the following categories:

- **Factory Service Centers**–cost estimates versus actual time, on-time performance, scheduling ease, service experience.
- **Authorized Service Centers**–same as above.
- **Parts Availability**–in stock versus back order, shipping time.
- **Cost of Parts**–value for price paid.
- **AOG Response**–speed, accuracy, cost.
- **Warranty Fulfillment**–ease of paperwork, extent of coverage.
- **Technical Manuals**–ease of use, formats available, timeliness of updating.
- **Cost-per-Hour Programs**–cost versus benefits, ease of administration.
- **Technical Reps**–response time, knowledge, effectiveness.
- **Overall Engine Reliability**–how the product's reliability and quality stack up against the competition.

Respondents were also asked to recognize individuals who have provided them with exceptional product support and service.

The 2019 AIN Product Support Survey results for aircraft appeared in the August issue. Flight-deck avionics and cabin electronics were featured last month. ■

## ROLLS-ROYCE

### The Results

Rolls-Royce's Tay engine, which powers the hundreds of Gulfstream GIVs and G450s that were built, garnered an Overall Average of 8.3 from **AIN** readers, putting it in second place in the turbofan segment. The AE3007 came in right after the Tay, with an 8.2 and third place, tied with Williams International's FJ44. Top ratings for the two Rolls-Royce engines include for the Tay, Factory Service Centers (8.6), Authorized Service Centers (8.8), Parts Availability (8.4), AOG Response (8.7), Warranty Fulfillment (9.2), and the highest rating for Overall Engine Reliability (9.4, tied with GE's CF34). The AE3007 received a top rating for Cost of Parts (7.8). Rolls-Royce's BR series came in fourth place, tied with GE's CF34 with a rating of 8.1.

### The Improvements

"Rolls-Royce is entirely dedicated to our business aviation customer base," said Alan Mangels, v-p of sales and marketing. "Everything we do is admitting and recognizing that the customer is a different animal than other customers. In the market we deal with—the higher end of business aviation—people can fly anywhere, and we need to be there step-by-step should they need it. The infrastructure that goes into that is incredible and quite costly, but it's what we need to do to support our customer base."

At its Birmingham, UK headquarters, Rolls-Royce opened a new Aircraft Availability Center in July, staffed by a team dedicated to helping keep customers' aircraft flying.

At last year's NBAA show, Rolls-Royce introduced a significant change to its CorporateCare maintenance coverage program, CorporateCore Enhanced. The improvements stemmed from meetings with Rolls-Royce's Corporate Customer Council, according to Andy Robinson, senior v-p of service for business aviation. "They helped us define our service excellence strategy," he said, "and shaped CorporateCare Enhanced. That's a big part in how it's becoming so successful." Since launching, Roll-Royce has signed up more than 200 CorporateCare Enhanced customers, on top of the 2,200-plus regular CorporateCare clients.

The difference between the two programs is that CorporateCare Enhanced fills in some gaps in coverage, such as troubleshooting and labor costs. Typical customers for the new program include BR710 and BR725 operators, and when the new Pearl 15 enters service on the Bombardier Global 5500 and 6500, Rolls-Royce expects most buyers will opt for CorporateCare Enhanced. On that engine, said Mangels. "we are the OEM for all nacelle components and the thrust reverser and nose cone. It's the right thing to do, to make this part of the CorporateCare service package. Any type of event under the engine and nacelle, we cover. That includes troubleshooting and corrosion."

› Rolls-Royce continued

Another element of CorporateCare Enhanced is the new Proactive Maintenance Planning Tool, which helps identify opportunities to add improvements and modifications during a planned maintenance visit.

The Pearl 15 will feature new capabilities for vibration and health monitoring, including the ability to monitor LRU (line-replaceable unit) health and two-way communications via satcom for remote monitoring and re-configuring monitored parameters, of which more than 10,000 can be monitored. This will help Rolls-Royce respond to problems faster and avoid events that cause downtime.

Rolls-Royce has added a new spares store in Beijing for China-based CorporateCare customers. The company has also added on-wing service technicians in Europe and Asia as well as grown its service center network to 78 (with plans for more later this year).

One of the criticisms from customers has been the quality of technical publications. "Rolls-Royce is taking this seriously," said Robinson, and the company introduced a new technical publications platform at the last Customer Council meeting. "Feedback is that it's a game changer," he said. "In the past it's fair to say that technical publications were designed around the engineer working in the shop as opposed to the customer in the field," he explained. The new publications focus more on improving the customer experience.

Later this year, Rolls-Royce expects to launch its new business aviation customer web-portal. Users will be able to "view information on their fleet, engine health, review their CorporateCare account, buy parts, and eventually pay bills and order services."

**2019 Overall Average Ratings of Engine Manufacturers**

| | Overall Average 2019 | Overall Average 2018 | Ratings Change from 2018 to 2019 |
|---|---|---|---|
| **Turbofan** | | | |
| Rolls-Royce | 8.2 | 8.3 | -0.1 |
| Williams | 8.2 | 8.4 | -0.2 |
| GE Aviation | 8.0 | 8.2 | -0.2 |
| Pratt & Whitney Canada | 8.0 | 8.2 | -0.2 |
| Honeywell | 7.9 | 8.0 | -0.1 |
| CFE | 7.8 | 7.9 | -0.1 |
| **Turboprop/Turboshaft** | | | |
| Honeywell | 8.4 | 8.7 | -0.3 |
| Pratt & Whitney Canada | 7.6 | 7.7 | -0.1 |
| Safran Helicopter Engines | 7.4 | 7.4 | 0.0 |

Companies listed in order of 2019 overall average. Ties listed alphabetically by manufacturer.

## WILLIAMS INTERNATIONAL

### The Results

Williams International's FJ44 achieved a third-place ranking this year with an 8.2 Overall Average, down slightly from last year's 8.3 and second place. The company received its highest ratings, a 9.1, for Technical Reps, and for Cost Per Hour Programs (8.3).

› continues on next page

**2019 Overall Average Ratings by Individual Engine**

| | | Overall Average 2019 | Overall Average 2018 | Ratings Change from 2018 to 2019 | Factory Service Centers | Auth. Service Centers | Parts Availability | Cost of Parts | AOG Response | Warranty Fulfillment | Technical Manuals | Technical Reps | Cost per Hour Programs | Overall Engine Reliability |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Turbofan** | | | | | | | | | | | | | | |
| Pratt & Whitney Canada | PW600 series | **8.5** | 8.2 | 0.3 | 8.0 | 8.5 | **8.4** | 7.3 | 8.6 | **9.2** | **8.6** | 8.9 | 7.8 | 9.2 |
| Rolls-Royce | Tay | 8.3 | 8.2 | 0.1 | **8.6** | **8.8** | **8.4** | 6.3 | **8.7** | **9.2** | 7.6 | 8.8 | 7.0 | 9.4 |
| Rolls-Royce | AE3007 | 8.2 | **8.5** | -0.3 | 8.1 | 7.8 | 8.2 | **7.8** | 8.4 | 8.5 | 7.7 | 8.4 | 7.5 | 9.1 |
| Williams | FJ44 | 8.2 | 8.3 | -0.1 | 8.1 | 8.2 | 8.0 | 6.4 | 8.2 | 8.7 | 8.4 | 9.1 | **8.3** | 8.7 |
| GE Aviation | CF34 | 8.1 | 8.3 | -0.2 | 7.6 | 7.6 | 8.1 | 7.0 | 8.2 | 8.4 | 7.6 | 8.4 | 8.0 | **9.4** |
| Rolls-Royce | BR700 series | 8.1 | 8.2 | -0.1 | 8.4 | 8.5 | 8.2 | 6.7 | 8.5 | 8.5 | 7.4 | 8.7 | 7.1 | 9.3 |
| Honeywell | TFE731 | 8.0 | 8.0 | -0.0 | 7.7 | 8.3 | 8.0 | 7.1 | 8.5 | 8.6 | 8.0 | 8.4 | 6.3 | 8.8 |
| Pratt & Whitney Canada | PW300 series | 8.0 | 8.2 | -0.2 | 7.7 | 8.4 | 8.2 | 6.9 | 8.4 | 8.7 | 7.9 | 8.1 | 7.3 | 8.7 |
| Pratt & Whitney Canada | PW500 series | 7.9 | 8.2 | -0.3 | 6.8 | 7.7 | 7.8 | 6.9 | 8.0 | 7.9 | 8.4 | 8.6 | 7.2 | 9.1 |
| CFE | CFE738 | 7.8 | 7.9 | -0.1 | 7.1 | 7.4 | 8.1 | 7.0 | 7.8 | 7.5 | 8.4 | 8.4 | 7.6 | 9.2 |
| Honeywell | HTF7000 | 7.8 | 8.1 | -0.3 | 7.1 | 8.3 | 7.0 | 7.1 | 8.0 | 8.1 | 7.5 | 7.8 | 7.4 | 8.8 |
| Pratt & Whitney Canada | JT15D | 7.8 | 7.7 | 0.1 | 7.5 | 7.8 | 8.2 | 6.2 | 7.8 | 7.5 | 8.0 | 7.6 | 7.4 | 9.1 |
| **Turboprop/Turboshaft** | | | | | | | | | | | | | | |
| Honeywell | TPE331 turboprop | **8.4** | **8.8** | -0.4 | **8.5** | **9.1** | **8.4** | 6.3 | **8.4** | **9.0** | **8.5** | **9.0** | **8.6** | **9.5** |
| Pratt & Whitney Canada | PT6A turboprop | 7.7 | 7.8 | -0.1 | 6.6 | 7.2 | 8.0 | 6.3 | 7.8 | 7.5 | 8.2 | 8.1 | 7.3 | 9.3 |
| Pratt & Whitney Canada | PT6T/B/C turboshaft | 7.7 | 7.5 | 0.2 | **8.5** | 7.8 | 7.1 | 6.4 | 7.7 | 8.5 | 8.0 | 8.0 | 7.1 | 8.6 |
| Pratt & Whitney Canada | PW200 series turboshaft | 7.2 | 7.7 | -0.5 | 7.5 | 5.9 | 6.7 | **6.5** | 6.9 | 7.7 | 7.0 | 7.4 | 6.9 | 8.4 |
| Safran Helicopter Engines | Arriel | 7.2 | 7.4 | 0.0 | 7.3 | 7.8 | 7.2 | 5.9 | 6.5 | 7.3 | 7.3 | 8.2 | 6.6 | 7.5 |

Companies listed in order of 2019 overall average. Ties listed alphabetically by manufacturer.

› Williams International continued

### The Improvements

The number of Williams International engines now exceeds 6,000 FJ44s and FJ33s that have flown more than 14 million hours. A high percentage of those owners are enrolled in the Williams Total Assurance Program (TAP) Blue program, which also covers foreign object damage, eliminating the need for operators to try to seek engine coverage from their insurance provider. Williams International welcomes operators not enrolled in TAP Blue to join the program or to upgrade from older programs.

In its effort "to monitor maintenance requirements to find areas to make ownership easier and more economical," the company said, "Some routine periodic inspection requirements were eliminated, which lowers overall cost to owners." For TAP customers operating the FJ44-3A, Williams extended hot-section inspection intervals, which also helps lower costs and increases aircraft availability.

Another new effort is Williams International's new customer app, available for iOS or Android devices, which gives operators the ability to contact Williams and find authorized service centers and to schedule maintenance.

Williams


GE Aviation

## GE AVIATION

### The Results

GE's CF34 ranked in fourth place with an 8.1 Overall Average, down 0.2 from last year's second-place finish. The CF34 received the highest rating for Overall Engine Reliability (9.4).

### The Improvements

With entry into service of the Passport turbofan powering Bombardier's Global 7500, GE Aviation has added resources to its global service and support network. This also benefits operators flying Challenger business jets powered by GE's CF34.

"We've got a great customer support organization around the world from our partnered service centers and mobile repair teams," said Jim Stoker, general manager for business and general aviation support for GE Aviation. "We've been beefing up our personnel, focusing on critical areas that we believe are going to have a higher concentration of Global 7500 business jets. That's Asia, the Middle East, Australia, as well as the big regions like Europe and the U.S. Over the last two years, our team has completed a significant number of simulations of potential service-event scenarios," he said. "We have stress-tested the entire process. We're ready for our customers."

In April, GE Aviation added a new authorized service center for the Passport and CF34-3, Bombardier's Tianjin, China facility, bringing the support network to nearly 40 service centers. Eight Bombardier service centers are members of the GE Aviation network, serving customers in China, England, Singapore, and the U.S. Bombardier's line station network in Europe and U.S. mobile repair fleet also have service agreements with GE. For mobile service outside the U.S., GE and Lufthansa Technik Aero Alzey have a maintenance support agreement that covers Passport and CF34 customers. In the U.S., GE's Strother, Kansas mobile repair team supports customers in the Americas.

GE's OnPoint service program is available for Passport operators, covering the entire propulsion system, and "GE has made good traction signing Global 7500 customers up to its OnPoint program," the company said. "Our OnPoint customers get the benefit of the most advanced engine on the market, as well as a support network around the world to give them peace of mind," Stoker said.

## PRATT & WHITNEY CANADA

### The Results

**AIN** readers gave top ratings to support for Pratt &Whitney Canada's PW600 series, with an 8.5 Overall Average moving the PW600 into first place, up 0.3 from last year's third-place. **AIN** readers gave P&WC's PW600 support top marks for Parts Availability (8.4), Warranty Fulfillment (9.2), and Technical Manuals (8.6).

The PW300 series shared fifth place with Honeywell's TFE731 with an 8.0 rating, while the PW500 series scored 7.9.

In the Turboprop/Turboshaft segment, P&WC's PT6A and PT6T/B/C engines shared a 7.7 Overall Average for second place, followed by the PW200 series in third place. The PT6T/B/C received top marks for factory service centers (8.5).

### The Improvements

P&WC's work during the past year to improve product support covers a range of activities, from expanding the service network to improving service solutions and new customer experience capabilities.

In February, the P&WC service network added Manitoba, Canada-based Portage Aircraft Maintenance as a designated maintenance facility (DMF)

› continues on page 24


Pratt & Whitney

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# Part 3: Engines

› Continued from page 22

› Pratt & Whitney Canada continued

for agricultural operators flying PT6A-powered aircraft. To support Leonardo AW139s in China, the engine manufacturer added a new DMF, Citic Offshore Helicopter. As DMFs, these facilities and others like it provide line maintenance and mobile repairs. P&WC opened a new PT6A and PW200 overhaul shop in Belo Horizonte, Brazil. In addition to overhauls, the facility will also provide hot-section inspections and accessory repair and overhaul to support agricultural, helicopter, and general aviation operators in Brazil. P&WC is planning to add another DMF by the end of this year.

On the service solutions side, P&WC has doubled the calendar time on its Certified Pre-Owned program for PT6A and helicopter engines from one year or 500 hours to two years or 500 hours, according to the company.

For the P&WC Fleet Service Plan (FSP), which applies to operators with two to five helicopters, three new optional add-on packages are now available. According to P&WC, "FSP helps our customers grow from single aircraft, retaining the simplicity of ESP [Eagle Service Plan] with the personalization of FMP [Fleet Management Plan]."

P&WC has added three new services to its ESP, designed to help improve aircraft availability, including a much more sensitive oil analysis technology that enables analysts "to detect deterioration of oil-wetted parts—at times hundreds of hours in advance of a potential issue." Operators who take advantage of P&WC's FAST engine health monitoring service can also share engine information more quickly via P&WC's 3G global engine connectivity solution. The third service is new flyaway kits equipped with commonly needed parts that operators can keep on hand to speed resolution of engine issues.

The new "Know My PT6" app, available for iOS and Android devices, extends the information in the Know Your PT6 booklet that P&WC publishes, all to improve PT6 operators' customer experience. The app includes all the content from the booklet plus adds Service Information Letter excerpts that are relevant for the operator, access to P&WC's customer portal, a way to contact the Customer First Centre quickly, and location and contact information for authorized service centers and parts distributors on an interactive world map. Other useful features include news alerts, videos such as a second engine rigging series for Cessna Caravan pilots, owners, and mechanics, a library of "helpful insights" from the Airtime customer blog, and "descriptions and schematics of design features, engine controls, and operational and maintenance recommendations."

## HONEYWELL

### The Results

On the turboprop side, Honeywell's TFE331 came in first place, with an Overall Average of 8.4. The TFE331 received top ratings in almost every category, including Factory Service Centers (8.5), Authorized Service Centers (9.1), Parts Availability (8.4), AOG Response (8.4), Warranty Fulfillment (9.0), Technical Manuals (8.5), Technical Reps (9.0), Cost Per Hour Programs (8.6), and Overall Engine Reliability (9.5).

Honeywell's TFE731 earned the same 8.0 Overall Average rating as last year, putting it in fifth place. The HTF7000 saw a drop in its Overall Average rating, to 7.8 from last year's 8.1.

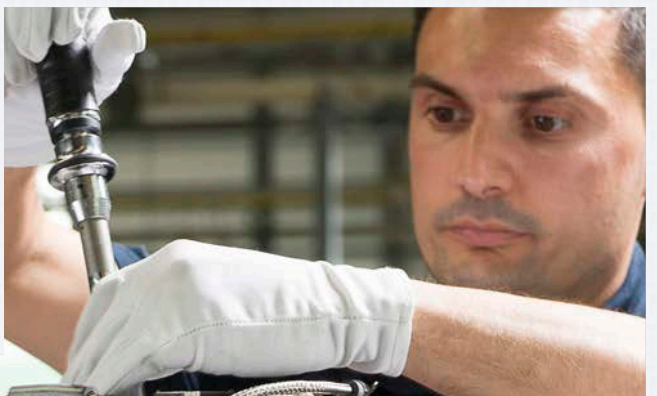
### The Improvements

During the past year, Honeywell has added local support for operators of its engines to deliver more personalized support. This includes hiring more field service engineers and customer support managers who spend time visiting local operators. Customers can quickly find their regional reps using Honeywell's Direct Access app, which is available in iOS and Android versions.

At its operator conference, Honeywell consulted with operators of its engines to help improve the agenda and format. The company also added in-depth technical breakout sessions and a live help desk during the conference to help customers troubleshoot and solve engine problems while on-site.

For operators who require a rental engine, Honeywell is helping lower the time needed for engine installation. To accomplish this, Honeywell said it has "expanded engine inspections and is rolling out digital logbooks using blockchain technology that will provide secure, up-to-date access to engine maintenance information."


Honeywell



## SAFRAN HELICOPTER ENGINES

### The Results

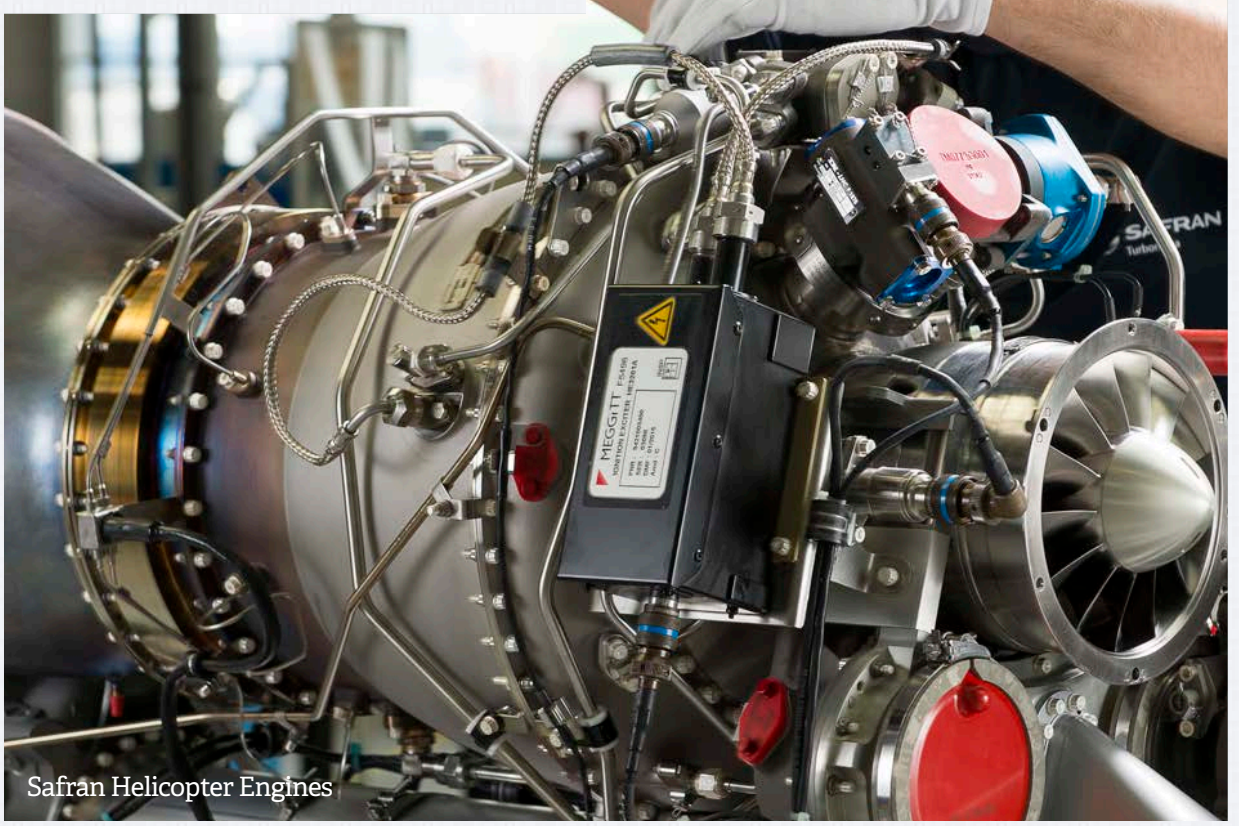
The Safran Arriel turboshaft ranked third place with a 7.2 Overall Average, tying for third with P&WC's PW200 series.

### The Improvements

Safran Helicopter Engines offers its Support-By-the-Hour (SBH) program for helicopter engine maintenance services, and now customers can use the Online SBH to access program information online. SBH provides operators with "predictability, flexibility, and cost control," according to Safran.

Some of the features in Online SBH include easier and faster reporting of flight hours as well as capability for monitoring data history, "thanks to an intuitive graphics analysis tool."

Rollout of Online SBH began this year, but Safran said, "Its availability may vary depending on users' geographical location and organization compatibility."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# Putting the CAN bus hack into context

by James Careless

On July 30, 2019, the U.S. Homeland Security Cybersecurity and Infrastructure Security Agency (CISA) released ICS-ALERT-19-211-01 about the hackability of CAN bus avionics networks in civilian aircraft. Some larger aircraft use CAN bus, such as the Airbus A380, which uses the technology for entertainment systems but not for vital avionics. As for the flight deck, some avionics available for experimental and certified light airplanes use CAN bus.

"An attacker with physical access to the aircraft could attach a device to an avionics CAN bus that could be used to inject false data, resulting in incorrect readings in avionic equipment," said CISA. "The researchers have outlined that engine telemetry readings, compass and attitude data, altitude, airspeeds, and angle of attack could all be manipulated to provide false measurements to the pilot. The researchers have further outlined that a pilot relying on instrument readings would be unable to distinguish between false and legitimate readings, which could result in loss of control of the affected aircraft."

Faced with this threat, "CISA recommends aircraft owners restrict access to planes to the best of their abilities," said the ICS Alert. "Manufacturers of aircraft should review implementation of CAN bus networks to compensate for the physical attack vector."

The "public report of insecure implementation of CAN bus networks" that motivated CISA to issue this alert came from the software security firm Rapid7, led by the company's senior security consultant Patrick Kiley. He outlined his concerns online in the July 30, 2019 Rapid7 blog entry, Investigating and Reversing Avionics CAN Bus Systems. CISA issued its ICS Alert based on Kiley's research the same day.

The fact that CISA acted on Kiley's research at lightning speed (unusual in itself for a federal agency) suggests that the CAN bus hacking vulnerability is one that needs to be taken seriously. At the same time, Kiley's reasons for doing this research (discussed at length with **AIN**), the mainstream media's trumpeting of this hack's existence, and the aviation industry's reluctance to speak candidly on this topic have arguably made the CAN bus vulnerability a bigger issue than it deserves to be.

This article's mission is to put the CAN bus vulnerability in context; both to make sense of the actual vulnerability and to see what it says about the aerospace industry's ability to deal with serious cyber threats.

## CAN Bus Vulnerability

Patrick Kiley is a security analyst, a "white hat" (good guy) hacker, and an engineer building his own Rutan-derived Cozy MK IV experimental amateur-built airplane. While doing so, Kiley learned that some homebuilt airplanes use the CAN bus network architecture found in modern computer-heavy cars and trucks.

The good side of using CAN bus is that its two-wire shared avionics network "was really easy to hook up," Kiley told **AIN**. The downside: "I knew CAN bus had zero security built-in, so I decided to investigate whether any security research has been done."

He couldn't find any, so Kiley launched a research project at Rapid7 to see how vulnerable an aircraft running on CAN bus is to hacking. A link to his full research paper, Investigating CAN Bus Network Integrity in Avionics Systems, is available in the Rapid7 blog entry. Kiley's CAN bus paper was prepared in part for the DEF CON 27 hackers' convention in Las Vegas August 8-11, 2019.

Here's the CAN bus vulnerability as laid out in Kiley's research paper: "A single CAN bus network uses a shared medium, which means that all nodes (i.e. avionics devices) on the network see all individual messages on the network. Unfortunately, from a security perspective, CAN bus nodes do not natively enforce the trust models and authentication schemes common in other networking applications. Therefore, any device placed onto a CAN bus that manipulates the voltages of the High and Low wires can send any message using any arbitration ID and expect it to be acted upon by the device on the bus expecting a message from that particular arbitration ID."

In plain English, a hacker can attach an external microprocessor-driven device to the CAN bus network within the aircraft and then use that device to send false readings to the avionics connected to it. According to Kiley, the external device can be programmed to start sending false readings when the aircraft achieves a certain altitude, airspeed, or any other metric shared by the aircraft's avionics across the CAN bus network.

Connecting the external device to the CAN bus network is easy. "You just need to tap two wires, using a Raspberry PI microcomputer with a CAN adapter, an Arduino, or a Carloop," said Kiley. (A Carloop is an automotive diagnostic device that plugs into a car's OBD II port under the dash. It is the same port used by car mechanics to read trouble codes when the "check engine" light comes on. "Nothing needs to be disabled," he said, "you just need to access the wires."

Since Carloops are available in 3G/LTE models that connect directly to cellphone networks, a hacked aircraft could be controlled from a distance, with the hacker able to see the aircraft's avionics readings in real time, provided the airplane is within reach of the cellphone network.

"The scenario would work like this," said Kiley: "Build a 3G/LTE Carloop device. Attach that device to the CAN+ and CAN- connectors of the Carloop, using vampire taps. Have that Carloop establish a connection to a server under the control of the adversary. Use that server to send commands to the Carloop, thereby controlling the CAN bus of the aircraft."

Senior security consultant Patrick Kiley

> **"An attacker with physical access to the aircraft could attach a device to an avionics CAN bus that could be used to inject false data, resulting in incorrect readings in avionic equipment"**
>
> – CISA

## Reality Check

Two conditions—physical access to the aircraft and its use of the CAN bus architecture—are important limits to the risks associated with the CAN bus hack, especially as relate to business aircreaft. This explains the exasperation expressed by National Business Aviation Association spokesman Dan Hubbard, when faced with the many frantic general media stories on this subject, such as this one from the Associated Press: "US issues hacking security alert for small planes." Even if an intruder manages to break into a secured hangar and access the aircraft's CAN bus network, he said, "it is never sitting out

› continues on page 38

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# Near SSBJ anniversary, TsAGI shows revamped model

by Vladimir Karnozov


VLADIMIR KARNOZOV

A scale SSBJ model, labeled "TsAGI 100" to commemorate TsAGi's 100th anniversary since establishment on December 1, 1918, made an appearance at Russia's MAKS 2019 show.

A scale model of a future supersonic business jet (SSBJ) took center stage at the stand of TsAGI, the Russian acronym for Central Aerohydrodynamic Institute, at the MAKS 2019 airshow in Moscow in late August. While bearing some resemblance to earlier models showcased two years ago, such as a gull-like shape of the wing, it differs in having a wider forward fuselage to house a passenger cabin.

In addition, the empennage of two vertical and two horizontal surfaces has been replaced by a V-like tail, while tunnels for air intakes leading to a pair of rear-mounted engines are longer. Sweep angles of both inner and outer wing sections have also been reduced, and the wing-to-fuselage attachment is extended by means of forward, rather than backward, sweep of the wing's trailing edge.

Explaining these and other changes, TsAGI said, "Reducing sonic boom remains the key issue that keeps in the focus of attention for scientists from all over the world. The optimized layout of the future aircraft model on display at MAKS 2019 shall provide a lower level of the sonic boom and of the noise footprint on the ground, as well as higher fuel efficiency. The [aforementioned] model comes with an unusual shape of the wing: that featuring a characteristic V-like geometry and variable thickness along the wing-to-fuselage attachment. The air intakes leading to engines are positioned on top of the rear fuselage."

The company also addressed some issues to do with load-bearing structure and materials for future supersonics. A wide application of polymeric composites and metal-composite structures promises to reduce the SSBJ's weight, it explained.

There is no information on a powerplant except for mentioning "use of liquid hydrogen as fuel for gas-turbine engines" being studied for application to "supersonic long-range flights" in a booklet at TsAGI's booth at MAKS.

Shortly after MAKS closed, minister Denis Manturov said investments already made into SSBJ development amount to 1.4 billion roubles ($21.1 million). The ongoing effort is being led by TsAGI and six other scientific research establishments. He gave seating capacity at 16 to 19 and cruise speed at 2,000 to 3,000 kilometers per hour (1,090 to 1,620 knots).

Detailed specifications will be worked out in the 2020 to 2022 timeframe, along with construction of a technology demonstrator. Documentation for serial aircraft is expected to be developed between 2022 and 2026. Much investment is needed into powerplants because no existing engines appear suitable for the Russian SSBJ. Rough estimates render a deliverable SSBJ to be twice as expensive compared to subsonic business jets of similar seating capacity, Manturov said.

### Technical Development

Also at MAKS 2019, TsAGI demonstrated a mockup of a load-bearing structure intended for the forward section of an SSBJ airframe. Main structural members are made of composite materials, while outer and inner skins are made of "advanced non-metallic materials."

TsAGI made a special point that this mockup employs parts made by additive manufacturing. It further notes that the mockup represents "a hybrid metal-and-composite forward section of the airframe" and "features a non-conventional load-bearing structure with implementation of modern engineering decisions arising from bionic principles." Such structures are also applicable to prospective long- and medium-haul passenger jets, the company said.

Another exhibit at MAKS was described as "a multi-walled composite panel of integral nature." It consists of two outer skins, longitudinal walls, and lightweight filling. This exhibit is "a specimen for production" as "an element in load-bearing structure for high-loaded sections of the airframe." Apart from stiffness and strength, such elements provide high resistance to impact, good thermal insulation, and noise-reduction qualities, as required for supersonic jets.

On August 26, TsAGI held a ceremony at the town of Zhukovsky, where TsAGI is located. As part of the event, a surviving example of the Tu-144 first-gen supersonic transport was placed as a memorial. Academician Sergei Chernyshev, the head of science at the institute, said: "The Tu-144 is a legend and an interesting page in TsAGi's history. We commenced studies into supersonic transports even before the Tu-144 launch and have never stopped working on the theme since then. Today, we do this work with other priorities and standards in mind. As part of the ongoing effort, we work on some technical issues related to tough ecological requirements."

Earlier this year, speaking on the occasion of the 50th anniversary of the Tu-144's first flight, TsAGI general director Cyril Sypalo said the institute works with Tupolev on "a project not less challenging than the Tu-144 was"—development of second-generation supersonic transports. "It may well turn out that what we do today would prove a task more difficult...as we are moving from the technology demonstration phase to actual creation of a commercially viable means of transportation. Of particular interest is a supersonic business jet project being executed jointly by Tupolev and TsAGI."

Sypalo further said that, under orders from Russia's ministry for industry and trade, the two companies are to work out "compromise technologies" that balance a required level of sonic boom versus cost, as well as operational performance of a future supersonic aircraft. Last year, the aforementioned ministry forecast that, at a unit cost between $100 and $120 million, the demand for next-gen supersonic transports would come to 30 aircraft in Russia and "many more" outside the country. It added that the research and development effort could take seven to eight years. ■


## New schedule and specifications revealed for Russian's VRT500 light helicopter

Russian Helicopters intends to fly a development prototype of the VRT500 light rotorcraft in late 2020, a year behind the original plan, and start series production at the corporation's UUAZ plant in Ulan-Ude in 2023, some two years later than the previous schedule. The manufacturer hopes for a production run between 700 and 1,000, competing with the Bell 505 and Robinson R66.

The development effort is led by Moscow headquartered VR-Technologies (also referred to as Vrtech.aero), which used to be an independent company but is now a full member of Russian Helicopters. At MAKS 2019 in August, the design house exhibited a refined full-scale mockup.

The mockup was unveiled at HeliRussia 2018, and since then the gross weight has increased by 140 pounds, to 3,640 pounds, and payload in the cabin by 10 pounds, to 1,610, while that on the sling jumped to 2,000 pounds. Its structural weight is given at 2,030 pounds and flight endurance at 348 minutes. The VRT500 will be able to cruise 465 nm at a speed of 130 knots (against 124 previously) with a pilot and five passengers. The occupants will sit in a cabin measuring 187 cu ft in volume with 46.61 sq ft of floor space.

Speaking to **AIN** at MAKS 2019, VR-Technologies stressed that the coaxial rotor design developed for the VRT500, already tested in wind tunnels and on test benches, provides for optimal performance in urban environments when used for passenger-carrying and medical evacuation duties, the two key areas for the new helicopter's application. The rotor is 8.4 meters in diameter, using a total of six blades made of carbon-fiber.

Absence of a tail rotor provides for safer landings and risk-free loading and unloading operations. Sliding doors at the rear ease the placing of patients on stretchers inside the cabin, a major advantage in medical evacuation operations in confined-space situations often encountered in big cities.

Surprisingly, the developer has not selected the engine yet. This makes it difficult to meet target dates for the VRT500 flight-test program. Taking account of the tightening regime of U.S. and EU sanctions, it is now more likely to come from indigenous manufacturers rather than Safran as VR-Technologies had hoped for.

The requirement for takeoff power for a single-engine design falls between 500 and 600 shp, but with a lack of local designs in that class, the developer might need to rework the initial design for application of the 800-shp Klimov VK800. **V.K.**

# Initial proposal already highlighting difficulties of supersonic comeback

by Kerry Lynch

While just the first step in a long process required before new civil supersonic operations can become a reality, the FAA's recently released notice of proposed rulemaking on special flight authorizations already is showing the complexities and difficulties of reversing the decades-long ban.

The FAA in June issued a notice of proposed rulemaking (NPRM) to provide for a procedure to request authorization under Part 91 for supersonic flights over the U.S. for testing and development of aircraft. Current regulations prohibit all over-land supersonic civil flights in the U.S.

Released at the behest of Congress, that NPRM is intended to provide a "user-friendly" application that consolidates requirements, such as specifics on flights, reasons speeds greater than Mach 1 would be necessary, reasons why the testing could not be accomplished over the ocean, and details on conditions to ensure that no measurable sonic boom overpressure will reach the surface.

## Industry Concerns

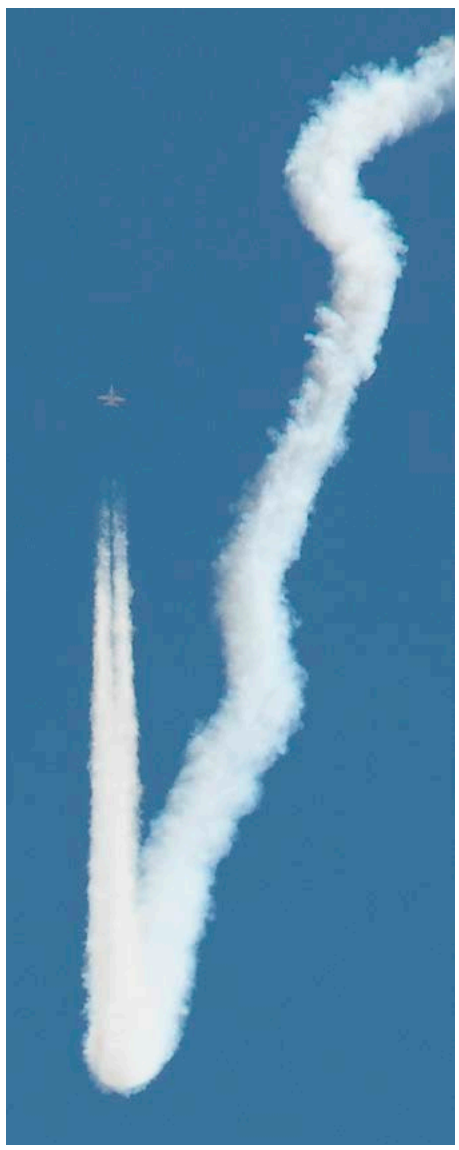
This NPRM has been lauded by the industry as an important and necessary step forward to the development and eventual operation of a new generation of civil supersonic aircraft. Yet at the same time, those industry groups have expressed concerns ranging from the possibility that the NPRM establishes a de facto ban on supersonic testing to a call for further protections for other operators. And, the NPRM is already coalescing the beginning of significant opposition from a range of environmental groups.

From the industry standpoint, most recognize the need for rulemaking and the possibilities for a new generation of flight. "Breaking the sound barrier not only exemplifies the essence of flight, but its imminent routine occurrence in commercial and non-commercial flying also represents a new potential market in the aviation industry," the Aircraft Owners and Pilots Association (AOPA) said in comments on the NPRM. "As the interest in this flight regime increases, so does the need for policies and procedures that integrate these emergent operators with existing general aviation flights in a safe and efficient manner."

"The business aviation community is often an early adopter of new technologies, driving innovation and change. Members of this community are striving to be the first to market, and we are leading efforts at ICAO [the International Civil Aviation Organization] to develop international standards for supersonic transport," NBAA added in its comments. "This proposed rule to modernize flight-test authorizations for supersonic aircraft is an important first step toward enabling the next generation of environmentally responsible supersonic aircraft."

NBAA joined with manufacturing representatives including the General Aviation Manufacturers Association (GAMA) and the Aerospace Industries Association (AIA) in emphasizing the need for new supersonic aircraft designs to be environmentally responsible to fulfill the vision of new possibilities for travel. "We are advocating for a modern regulatory framework that delivers a balance between protecting against significant impacts on people and the environment and fostering an ecosystem where new technologies can thrive," GAMA and AIA said in joint comments.

To that end, all three associations agreed to two basic tenets: the FAA should prohibit routine flights at supersonic speeds over land until technologies provide for acceptable levels of noise exposure, and manufacturers need to incorporate technologies that minimize landing and takeoff noise.



The contrail of a supersonic NASA F/A-18 during testing. The industry contends that the agency's testing will provide the data needed to support over-land supersonic flights at responsible levels.

On the first point, the associations stressed, "The industry has no intention of creating aircraft that cause loud sonic booms over populations, and it supports appropriate rules to prevent this from happening." However, they also noted that technologies exist to enable supersonic speeds without an audible boom on the ground and added that NASA research will provide necessary data to support responsible supersonic speeds.

On the second tenet, the manufacturers acknowledged the differences in performance characteristics—and accompanying noise—in supersonic designs but pledged that manufacturers "are committed to ensuring these aircraft are no louder than aircraft that currently operate around airports today." They pointed to the "huge advances" made in modern technology, estimating that the latest commercial aircraft models are 85 percent more fuel-efficient and 75 percent quieter than the first generation of jetliners. "We expect to see similar improvements in supersonic aircraft performance over time."

These tenets were fully endorsed by manufacturers such as GE Aviation, the engine partner on Aerion's AS2 supersonic business jet project. "Our responsibility goes beyond producing propulsion systems that power aircraft with acceptable noise levels, but that aircraft powered by our propulsion systems are compatible with the aviation industry's ambitious carbon reduction goals," GE Aviation added. "Manufacturers are already committed to producing the most fuel-efficient supersonic aircraft that are technologically feasible."

The manufacturing community also stressed the need to be able to move forward with testing. "For manufacturers, testing at supersonic speeds will allow them to better understand the environmental impacts supersonic flight will have and inform decisions on the future design and operation of aircraft," GAMA and AIA said.

However, at the same time, several manufacturers joined GAMA and AIA expressing concern that the NPRM, as written would serve as a barrier to development. Most of those commenters, also including GE Aviation, Aerion, and Boom, were particularly worried that the NPRM describes restrictive terms of "no sonic boom overpressure" and "no measurable sonic boom overpressure" as the implied standard for supersonic test flight over land. The associations called the terms "absolute prohibitions" and said they "would be unduly restrictive and ones that an applicant would be unable to guarantee on a test flight."

To achieve the intent of the NPRM, GAMA and AIA suggested that the FAA instead ensure that such flights would have no significant impact on the environment or communities. The associations asked the FAA to use the same approach as used in other forms of transportation, including subsonic aircraft, under the National Environmental Policy Act.

"We believe that transportation impacts on communities and the environment should not be assessed differently because of the source of those impacts," the associations said. "We believe that the sonic booms associated with a small number of supersonic test flights in an appropriate test area should not be considered as creating a significant impact on the environment." The terms "no sonic boom overpressure" and "no measurable sonic boom overpressure" ignore that it is possible for a sonic boom to occur without it being audible on the ground, they added.

Aerion echoed the sentiment that "no measurable sonic boom overpressure" over land "would effectively create a ban on all supersonic flight" and agreed it should be replaced "with a reasonable standard based on currently available sonic boom prediction and control technology." The Reno, Nevada-based developer of the AS2 further reiterated that the same standards should apply to other forms of transportation.

The overpressure measurement "goes far beyond what is required under the National Environmental Policy Act [NEPA]" and is unnecessary, added Boom Technology, a developer of a commercial passenger supersonic jet. "The FAA has the tools to determine whether such a condition is consistent with the level of environmental protection required."

The manufacturing groups had several other specific concerns on the language from flexibility on testing sites, use of over-water testing, and stipulations on explaining why the tests could not be conducted over water, among others.

As for operators, AOPA had a different concern: ensuring safety and efficiency at lower altitudes. The FAA should consider how supersonic aircraft characteristics affect other aircraft; how see-and-avoid will take place; and the importance of the NEPA when adjudicating and approving applications, the association said.

"It is critical that both the wake characteristics of airframes and the requisite air traffic separation standards are identified so that, in conjunction with the efficiency impact, the disruption or cost to other operators can be accurately determined," AOPA said. "It is crucial that the operation is both efficient and seamless."

AOPA is particularly concerned that pilots operating under VFR above 10,000 feet msl might not have the ability to see and avoid supersonic aircraft flying at supersonic speeds. "Given that danger, we believe that the FAA should study whether subsonic speeds below Flight Level 180 (FL180) should be required," the association said, adding that the FAA "should scrutinize any

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# New business jets: 2019 edition

by Mark Huber

If you build it (better), they will come. That seems to be the message the new-business-jet marketplace is sending OEMs. According to data from the General Aviation Manufacturers Association (GAMA), business jet shipments increased by 12.5 percent in the first half of 2019 compared to the year-ago period. That increase is driven in large part by deliveries of new models plowing new niche market territory and/or offering superior value propositions. Such comparatively new models include the Gulfstream G500, Pilatus PC-24, and Cirrus SF50 Vision. Concurrently, the used jet market is softening, according to business aviation data company JetNet, with average days of used jets on the market increasing to 297, a jump of 28, and the preowned inventory edging up to 9.5 percent, though still within traditional "sellers' market" territory.

However, against the optimism surrounding new jet sales, global business capital expenditures (capex) are falling in key business jet markets, including North America, Europe, and Asia-Pacific. London-based consultancy S&P Global reports that "the share of cash flow directed to capex versus other uses is at its lowest ebb since 2007."

And almost everyone remembers what happened to the new business jet sales market in the wake of the 2008 worldwide recession: deliveries fell precipitously and never really recovered. They have averaged around 700 per year in the ensuing years. Business aviation analyst Brian Foley thinks that number could dive to as low as 550 should another recession hit, and that likely will end the production runs of some of the 41 models of bizjets currently in production. This suggests two things: 1.) Most OEMs will continue to focus greater resources on the large- and ultra-large-cabin market, as they see the typical customers for those aircraft—large fractional and charter operators, governments, Fortune 100 corporations, and ultra-high-net-worth individuals—as the most insulated from global economic gyrations, and; 2.) For new models to succeed, they must offer superior value propositions across a broad spectrum that includes utility, range, comfort, connectivity, convenience, operating and maintenance economics, and safety.

In some cases satisfying the second requirement has already generated a new niche of aircraft, such as the aforementioned Pilatus PC-24 and the Cirrus SF50. In others, it means something as basic as speed with Mach 0.9 to Mach 0.925 high cruise speeds now the new benchmark for the large-cabin crowd, while supersonic ambitions continue to slowly gain traction. One thing that will not satisfy the requirement: offering new upholstery schemes, paint, tweaked avionics, or faster Wi-Fi and expecting those upgrades to carry an existing model's sales very far into the future. Those days appear to be over.

## THE SUPERSONICS

The march to a civil supersonic business aircraft made some progress this year as the FAA issued a notice of proposed rulemaking (NPRM) this summer which would enable supersonic flight testing. Still, the various supersonic developers seem years away from fielding prototype aircraft.

### AERION AS2

Price: $120 million
Passengers: 12
Range: 5,000+ nm

Over the last decade, Aerion has announced partnerships with several major aerospace entities, including Airbus, Lockheed Martin, Spirit Aerosystems, and GE. Now it's Boeing's turn. In February the two companies announced that Boeing had made a "significant investment," which sources told **AIN** at the time amounted to acquiring 40 percent of Aerion for "several hundred million" dollars and taking seats on the company's board. Under the agreement, Boeing will provide engineering, manufacturing, flight-test resources, and "strategic vertical content" for the AS2.

Since its founding 16 years ago, Aerion has acquired 22 patents but has yet to produce a flying prototype. The company now says that will happen in 2023.

Aerion introduced its AS2 12-passenger business jet design in 2014. The company unveiled the AS2's GE Affinity engine design in 2018. The AS2 features a supersonic natural laminar-flow wing, a range of at least 5,000 nm, and a cabin cross-section nearly the size of a Gulfstream G550's. The 30-foot-long cabin, which is 17 feet shorter than the G550's, will feature a two-lounge layout, galley, and both forward and aft lavatories, plus a baggage compartment accessible in flight. Mtow is 121,000 pounds and the fuselage is 170 feet long. Balanced field length is 7,500 feet at mtow, but that is reduced to 6,000 at weights of less than 100,000 pounds. Flying at the lighter weight reduces range by approximately 20 percent. Maximum speed is Mach 1.6; however, the aircraft is designed to cruise efficiently at Mach 0.95 to comply with existing supersonic overflight bans.

To date, Flexjet is the only publicly announced customer, signing a letter of intent in 2015 to acquire 20 AS2s with plans to offer them to its Global Lease customers.

### HYPERMACH SONICSTAR

Price: $220 million
Passengers: 32
Range: 8,300 nm

This revised design proposes a top speed of Mach 5.5, a range of 8,300 nm, seating for 32 passengers, and a unit price of $220 million. First flight is now planned for 2025 with a certification target of 2028. A prototype of the aircraft's 76,000-pound-thrust H-Magjet 5500 hybrid turbofan ramjet engines could be tested by year-end.

### SPIKE AEROSPACE S-512

Price: $80-$100 million
Passengers: 18
Range: 6,200 nm

Spike Aerospace is currently building a subscale demonstration aircraft. The company has developed partnerships with Siemens, Quartus, Aernnova, Greenpoint, BRPH, and others. The S-512 would seat up to 18 passengers, with a range of 6,200 nm and a cruise speed of Mach 1.6. Spike is looking for a low- to medium-bypass-ratio engine producing about 20,000 pounds of thrust at sea level.


The company continues to search for additional funding for the $1 billion program and estimates a market for 600 aircraft between 2020 and 2030. Spike's goal is to bring an aircraft to market by 2022.

### BOOM SUPERSONIC OVERTURE

Price: $200 million
Passengers: 55-75
Range: 4,500 nm

Boom Supersonic had revised and renamed its $200 million tri-jet supersonic design. Now called "Overture," the aircraft is designed to accommodate 55-75 passengers in airline configuration, have a long-range cruise speed of Mach 2.2, and an unrefueled range of 4,500 nm. To date, the company has raised more than $140 million in seed money and employs 150.

It is currently building a one-third scale technology demonstration aircraft, the XB-1 "Baby Boom," powered by three General Electric J85-15s with variable-geometry

intake and exhaust, Honeywell avionics, Tencate carbon-fiber prepreg, and Stratasys 3D-printed components. The scale aircraft will be used to evaluate the larger aircraft's delta-wing, carbon-fiber fuselage design.

This year, Boom began announcing a series of commercial partnerships including with Dassault Systemes for use of its 3DExperience platform design tool and Hoar Program Management for assistance in manufacturing-site location selection. Boom holds orders for 30 aircraft from Japan Airlines and Virgin Group.

### UAC SUPERSONIC BUSINESS JET

Russia's United Aircraft Corporation (UAC) has ditched plans to develop the military's Tu-160 supersonic bomber into a business aircraft and has embarked on a research program aimed at developing a clean-sheet design. The program is in its initial design stages and spent a modest $22 million to date. Plans at this point call for a 16- to 19-passenger aircraft capable of speeds up to Mach 2.5. Range and price are unknown at this point. UAC says a production prototype could be flying by 2026.

## BIZLINERS

### AIRBUS CORPORATE JETS

Price with mid-range cabin completion:
ACJ320neo, $95 million;
ACJ319neo $85 million
Passengers (typical): ACJ320neo, 25; ACJ319neo, 19
Range: ACJ320neo, 6,000 nm;ACJ319neo, 6,750 nm


Airbus Corporate Jets has begun deliveries of its new "neo" (new engine option) family of narrowbody ACJs, the ACJ320neo and the ACJ319neo to completion centers. More efficient engines and wingtip "Sharklets" enable significant improvements in rate of climb, range, and payload for both aircraft, while at the same time cutting specific fuel consumption, emissions, and noise.

Airbus opted to offer customers two new-generation, fuel-efficient engine choices: the first is the Leap-1A from CFM International and the other is the Pratt & Whitney PW1100G geared turbofan. Both neo models offer fly-by-wire controls, advanced avionics, and significant range improvements over their legacy predecessors.

The ACJ320neo can transport 25 passengers more than 6,000 nm, a big jump from the 4,300-nm, eight-passenger range of the ACJ320. The ACJ319neo cabin is commonly configured for 19 passengers and the aircraft has a range of 6,750 nm—more than 600 nm better than the legacy ACJ319, with eight passengers. The cabins on the ACJ320neo and ACJ319neo are about 12 feet wide; the former is about 90 feet long, while the latter is 78 feet long. According to Airbus Corporate Jets, orders and commitments for ACJ319neo and ACJ320neo now total 15.

### AIRBUS ACJ350-900 XWB

Price: $254 million, plus interior
Maximum Range: 11,100 nm (with 25 passengers)

Designed to serve the needs of the rarified few, this widebody twinjet airliner is being made available as an "Airbus Corporate Jet" (ACJ). Top speed is Mach 0.89. Maximum takeoff weight is close to 600,000 pounds. Takeoff distance at maximum weight is 8,770 feet.

The cabin measures nearly 170 feet long, more than 18 feet wide, and eight feet tall, yielding more than 3,000 sq ft of floor space. Airbus is introducing a new Easyfit streamlined process for outfitting the cabin interior that utilizes the cabin wall attachment points. The company also has floated a few interior design ideas, including a grand entryway; above-deck crew rest areas; forward and mid-cabin gourmet galleys; a forward master stateroom suite with bedroom, bathroom with shower and private office; a mid-cabin lounge; an oversized circular dining table with seating for 10; three junior staterooms with shared bathroom and shower; and an aft cabin media room/theater with a dozen reclining seats and a large flat-screen monitor mounted to the aft bulkhead.Airbus

### ACJ330NEO

Price: $300 million +
Passengers: 25+
Range: 9,400 nm

The new VIP variant of the Airbus A330neo widebody jetliner will be able to fly 25 passengers 9,400 nm enabling nonstop flights from Europe to Australia. The A330neo will be powered by the new generation Rolls-Royce Trent 7000 engines and incorporate a new high-span wing and wingtip Sharklets similar to those on the A350 XWB. The improvements deliver a 12 percent fuel burn reduction compared to a standard A330 and deliver payload and range improvements. Other new ACJ330neo features include an onboard airport navigation system, runway overrun prevention system, and LED exterior lights.


### BOEING BBJ MAX FAMILY

Price (completed): $100+ million
Passengers: 8-25 (typical)
Range: 6,255 to 7,000 nm

Well-publicized problems with the Boeing 737 Max have halted deliveries of the aircraft for now. The BBJ Max is the BBJ version of Boeing's new 737 Max family. Boeing Business Jets delivered its first BBJ Max—a Max 8—late last year.

Boeing announced in 2013 that it would build executive versions of the 737 Max fitted with CFM Leap 1-B engines. The aircraft are offered in three variants based on the legacy BBJ1, BBJ2, and BBJ3, respectively. The models have almost the same cabin sizes as their predecessors but significantly more range and, in the case of the BBJ Max 7, more luggage space. The BBJ Max 7 is 6 feet, 4 inches longer than the BBJ1 with a range of 7,000 nm (four passengers), a significant improvement over the BBJ1, but only requiring seven auxiliary belly tanks as opposed to nine on the BBJ1, and freeing up more cargo space. The BBJ Max 8 has a range of 6,325 nm, a 14.6 percent improvement over the BBJ2. The BBJ Max 9 offers a 6,255-nm range, 16.2 percent more than the BBJ3.


The new aircraft are 14 percent more fuel-efficient than current-production single-aisle BBJs, thanks to new-design winglets and the new engines, which are mounted farther forward and higher on the wing and attached by new and more aerodynamic pylons. The Max also gets a more aerodynamic vertical stabilizer. To provide adequate ground clearance for the larger engines, the landing gear was lengthened so the airplane will stand a little taller on the tarmac. The Max employs limited fly-by-wire controls, mainly to the wing spoilers.

Maintenance on the Max will be easier than on legacy BBJs, as fault data, once collected by instruments in the forward equipment bay, is now available for technicians and pilots on the cockpit display screens. The Max also holds more maintenance data on its enhanced onboard network system and network file server, doubling the amount of maintenance information available during flight and transmitting it live to ground stations so issues can be quickly resolved in flight or shortly after the airplane lands.

## LARGE-CABIN, LONG-RANGE

### BOMBARDIER GLOBAL 7500

Passengers: up to 19
Range: 7,700 nm
Price: $73 million

The new Bombardier Global 7500 uses the same fuselage cross-section as its legacy predecessors (6 feet, 3 inches tall and 8 feet, 2 inches wide) but stretches it by 11 feet to provide 2,637 cu ft of cabin space. Virtually everything else about the aircraft is new including the larger cabin windows, proprietary Nuage passenger seats, and GE


Aviation Passport engines. The engines are based on the guts of the high-efficiency CFM Leap models being developed for new-generation Airbuses and Boeings. Among the technologies incorporated into the engines are a 52-inch titanium "blisk," a single piece combining the fan blades and disk that is more aerodynamically efficient, saves weight, and reduces vibration.

The 7500 also features full fly-by-wire flight controls with sidesticks; a new, thin, high-speed wing; and the Bombardier Global Vision flight deck. The latter is based on Collins Pro Line Fusion avionics, with the latest safety features and head-up display. Top speed is Mach 0.925.

The hyper-quiet cabin is divided into three- or four-zone layouts. The forward galley can be equipped with multiple ovens including a double convection/microwave and a convection/steam model. The redesigned crew rest areas are larger. The aft lav can be fitted with a steam shower and the capacious 195-cubic-foot baggage hold can be accessed from the cabin at any altitude. The 7500 comes standard with Bombardier's Wave satcom (the Honeywell JetWave system that runs on Inmarsat's ka-band satellite network). Entry into service of the aircraft began late last year.

## GULFSTREAM G600

Passengers: up to 19
Range: 6,500 nm
Price: $58 million

Deliveries of Gulfstream's new 6,500-nm, large-cabin jet began earlier this year. It features full fly-by-wire flight controls, modern avionics, a noticeably wider cabin than legacy models such as the G450 and G550, and engines that are 15 to 20 percent more fuel-efficient than legacy large-cabin aircraft. Power for the aircraft comes from Pratt & Whitney Canada's new PW815GA powerplants that have the same core technology used in the company's geared turbofan airliner engines. They have a 10,000-hour time-between-overhaul (TBO) and no mid-life-inspection requirement.

The G600's cabin cross-section measures 91 inches wide and 74 inches tall—about seven inches wider and two inches taller than cabins in the G450 and G550—and the cabin can be configured for up to 19 passengers with four separate living zones as well as an optional crew rest area. The G600 also features a new passenger single-seat design with all seat controls located on the inboard armrests and pockets sculpted into the interior arms for more hip room. Cabin noise level is extremely quiet—less than 50 dBA—and cabin altitude is 4,850 feet at 51,000 feet with100 percent fresh air circulation. The aircraft offers the same enlarged oval windows that are on the G650, forward and aft lavatories, plus a full-size galley that can be located either forward or aft. The 195-cubic-foot baggage hold is accessible in flight through the aft lavatory.

The flight deck features fly-by-wire controls, active-control sidesticks, and the new touch-screen-controlled Symmetry avionics suite, which is driven by Honeywell's Primus Epic platform. The G600's overhead flight deck panels feature three touch-screens instead of the fixed switches and buttons on earlier Gulfstream models.


MARK WAGNER

## BOMBARDIER GLOBAL 6500/5500

Price: 5500, $46.4 million
6500, $54.3 million
Passengers: up to 19
Range: 5,700 nm 5500, 6,600 nm 6500

In May 2018, Bombardier took the wraps off the new Global 5500 and 6500. The models are fresh takes on the legacy Global 5000 and 6000 and they indeed use those aircraft's fuselage cross-sections. But they feature new engines, wings, interiors, and avionics and offer reduced fuel burn and emissions as well as increased range and passenger comfort.

The new Globals are the launch vehicles for the Rolls-Royce Pearl 15 engine (15,125 pounds of thrust), which discharges 48 percent less smoke and 20 percent less nitrous oxide, is two decibels quieter, burns 7 percent less fuel, and has 9 percent more thrust than the BR710 engines on the earlier Globals. The latest Globals feature a "re-profiled" wing and other aerodynamic cleanups that Bombardier says will combine with the new engines to boost fuel efficiency by up to 13 percent compared with the legacy Globals. In addition, maximum cruise speed will increase from Mach 0.89 to Mach 0.90 and the airplanes will have longer legs than their predecessors: maximum range on the Global 5500 is 5,700 nm (500 more than on the Global 5000) and 6,600 nm on the Global 6500 (600 more than on the Global 6000).

The new airplanes will feature Collins's Venue cabin-management and 4K entertainment system and Ka-band satellite connectivity. Bombardier plans to equip the 5500 and 6500 with combined vision system, which overlays infrared enhanced vision with synthetic vision imagery on the Collins head-up display. The cabins can be configured to typically seat 12 to 17 and are available with many custom options, including steam ovens in the galley, newly styled cabinets and countertops, and a stand-up shower in the aft lav.

## DASSAULT FALCON 6X

Price: $47 million
Passengers: up to 16
Range: 5,500 nm

Dassault completed the critical design review of the twinjet Falcon 6X earlier this year and the company says it remains on track for entry into service by 2022. The 6X has the largest cross-section of a purpose-designed business jet: 8 feet 6 inches wide, 6 feet 6 inches high, and 40.4 feet long. Like most Falcons, the 6X will blend good short-field and long-range capabilities, able to use runways as short as 3,000 feet while being able to deliver a maximum range of 5,500 nm with a top speed of Mach 0.90.

The 6X will be powered by a pair of 13,000- to 14,000-pound-thrust Pratt & Whitney Canada (PWC) PW812D high-efficiency engines and feature an all-new Honeywell Epic-based EASy III flight deck with the FalconEye combined vision head-up display technology for low-visibility operations. The new wing is designed to mitigate turbulence and is equipped with flaperons, leading-edge slats, and trailing edge flaps that enable lower speed and steeper approaches. All aerodynamic control surfaces are linked to a next-generation fly-by-wire flight control system.

The 6X was designed with product support in mind. It will use the Falcon Broadcast data-sharing system paired with artificial intelligence to enable analysts to anticipate the aircraft's maintenance needs before customers call with problems.

# LARGE-CABIN

## CESSNA CITATION HEMISPHERE

Price: $35 million
Passengers: up to 19
Range: 4,500 nm

For the second time in a decade, Textron has pulled the plug on its large-cabin ambitions. In 2009, it canceled the Cessna Citation Columbus program and now it appears that the Citation Hemisphere has been sent into deep freeze. Rather than a recession, this time it's ongoing performance shortcomings with the Safran Silvercrest engine that is the impetus for scuttling Cessna's entry into the "bigs." Textron suspended the Cessna Citation Hemisphere

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program last year and officially shelved it this summer.

The Hemisphere was designed to have a top cruise speed of around Mach 0.90, a flat-floor, multi-zone cabin with a 102-inch diameter, and "class-leading operating costs and performance." Textron CEO Scott Donnelly said that the company had no choice other than halting the program as the Silvercrest engine was the only one available that could "meet the performance point" of the aircraft. Donnelly held out the possibility that the program could be restarted at some future date, but for now, Textron appears to be eschewing the already very crowded large-cabin market.

## SUPER-MIDSIZE AND MIDSIZE

### EMBRAER PRAETOR 600/500

**600**
Price: $20.995 million
Passengers: 8-12
Range: 4,018 nm (4 passengers)
**500**
Price: $16.995 million
Passengers: 7-9
Range: 3,340 nm (4 passengers)

Embraer has retooled its midsize and super-midsize cabin offerings with new interiors, more fuel capacity, new winglets, increased engine thrust, and updated avionics. Both aircraft offer a 5,800-foot cabin altitude and a six-foot-high flat-floor cabin. The cabin of the 600 is three and a half feet longer than the 500's. The new "Bossa Nova" interiors in both models feature redesigned seat stitching, carbon-fiber accents, and a minimum of visible switchology. The latter is largely thanks to an upper tech panel, which displays flight information and provides cabin-management-system (CMS) features for Honeywell's Ovation Select system. Gogo Vision inflight entertainment is optional with the addition of the Gogo Avance L5 air-to-ground connectivity system. Both models offer a new global airborne connectivity option with the Viasat Ka-band satcom and IPTV.

The Collins Pro Line Fusion avionics in both aircraft have new capabilities, including a Multiscan radar that adds vertical weather and predictive windshear, cockpit display of ADS-B In traffic, and a synthetic vision guidance system (SVGS) that enables approaches to lower minimums. Embraer's enhanced vision system, the Collins HGS-3500 compact head-up display, and a Honeywell inertial reference system are optional on both aircraft.

Both models also feature larger winglets and additional fuel capacity to boost range; the 500 carries 950 pounds more fuel while the 600 can tank 2,928 pounds more thanks in part to two lower fuselage-mounted fuel tanks. The additional fuel helps boost the range in the 500 by 350 nm and in the 600 by nearly 900 nm. With the extra weight comes the need for more pavement; fully loaded, the 500 requires 4,222 feet of runway for takeoff while the heftier 600 needs 4,717 feet.

DAVID McINTOSH

### CESSNA CITATION LONGITUDE

Price: $26.9 million
Passengers: 8-12
Range: 3,500 nm

Cessna's long-awaited entrant into the crowded super-midsize derby received FAA provisional type certification late last year. Textron Aviation is positioning the Longitude as a superior value proposition—in both acquisition and life cycle—the main reason it eschews expensive systems like full fly-by-wire flight controls. (It has limited fly by wire for the rudder, spoilers, and brakes—"brake by wire"). The Longitude features Garmin's G5000 touchscreen-controlled avionics (similar to the system in the new midsize Citation Latitude) with optional head-up display and enhanced vision systems, a fast cruise speed of 476 knots, and a full-fuel payload of 1,600 pounds. The aircraft will be equipped with the LinxUs system to provide real-time maintenance monitoring and solutions, including when it is airborne. It also has more mechanic-friendly maintenance access ports than past models.


CY CYR

The aircraft shares the midsize Citation Latitude's flat-floor cabin cross-section—six feet tall and more than six feet wide—making it the narrowest in class. Cabin length is 25 feet. A variety of configurations will be available, with passenger seating for up to 12, although eight to nine will be typical. Other options include a full forward galley and an aft lav with vacuum flushing toilet. The 112-cubic-foot baggage compartment will be accessible in flight.

The stock galley features a sink with potable water, ice drawers, and ample stowage; items such as convection and microwave ovens are extra-cost options. Natural light throughout the cabin comes from 14 large windows. LED lighting is controlled via a wireless cabin-management system that also delivers a menu of information/entertainment choices, such as SiriusXM radio and moving maps. Passengers can operate the system via onboard touchscreens, controllers, or smart devices (with a downloaded app). Iridium satcom is standard. Customer deliveries of the aircraft should begin later this year. Late last year fractional provider NetJets signed an agreement with Textron Aviation to option up to 175 Longitudes.

## LIGHT JETS

### LEARJET 75 LIBERTY

Price: $9.9 million
Passengers: 6
Range: 2,080 nm

In July Bombardier announced that it would offer an updated version of its Learjet 75 model called the Liberty. Two passenger seats, a variety of standard equipment including the auxiliary power unit (APU), and $3 million

MARK WAGNER

are subtracted from the former 75 in an effort to reposition the aircraft to better compete with $9 million to $10 million light jet offerings from Cessna and Embraer. The aft-facing seats in the forward section of the cabin are replaced by fold-down ottomans and fold-out tables creating what Bombardier calls an "executive suite" with more legroom.

Gogo 4G airborne connectivity is standard throughout the aircraft as is the Bombardier Vision flight deck, with updated Garmin G5000 avionics. Deliveries are expected to begin in 2020.

### HONDAJET ELITE

Price: $5.25 million
Passengers: 5-6
Range: 1,437 nm

Refinements made on this upgraded HondaJet include updated avionics, aerodynamic clean-ups, and interior improvements that result in more range, shorter runway requirements, and a quieter cabin. The avionics updates to the Garmin G3000 system include faster processors and stability and underspeed protection. More fuel capacity combined with trimming 100 pounds from the old aircraft have increased range by more than 200 nm while adding nearly 200 pounds of payload capacity (overall, the aircraft's max takeoff weight is up 100 pounds due to the extra fuel). Aerodynamic clean-ups include an extended horizontal stabilizer, tighter hinge gaps, and elimination of the vortex generators. A new perforated engine inlet design reduces noise in both the cabin and outside of the aircraft.


DAVID McINTOSH

Inside the cabin, the belted lav seat is now certified for takeoff and landing, adding extra passenger capacity for those who opt to take the aircraft with the optional forward galley in place of the side-facing single passenger seat opposite the entry door. Customers now also have a wider selection of interior fabric and aircraft paint choices as well as the option of ordering the speakerless, transducer-based Bongiovi audio system with signal processing that provides surround-sound even when wearing headphones. Deliveries of the Elite began last year. Through August, Honda had delivered 130 aircraft overall.

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## SYBERJET SJ30I AND SJ30X

Price: $8.5 million
Passengers: 4-5
Range: 2,500 nm+

MSC Aerospace is still working two new versions of the SJ30 light twinjet: the SJ30i will feature an upgraded "Sybervision" avionics suite featuring the Honeywell Primus Apex 2.0 system with 12-inch displays and a new interior. The avionics and interior are lighter than their progenitors and take an estimated 200 pounds out of the airplane. A follow-on aircraft, the SJ30x, will feature uprated Williams International FJ44-3AP-25 engines and is expected to provide a variety of performance benefits including higher cruise speed at altitude, faster climbs, more payload, and better high and hot performance. It will also feature single-point refueling.

The SJ30 program began in the late 1980s and the airplane, the SJ30-2, finally received FAA certification in 2005. Since then, the company has had several different corporate owners and only eight examples of the Mach 0.83, 2,500 nm, seven-seat jet were produced. The aircraft holds three world records for speed and distance. It is designed with a 30-degree swept wing for high speed and efficient cruising and with leading-edge slats and flaps that are optimized for low-speed flight. The SJ30 has a maximum altitude of 49,000 feet, maintains a sea level cabin to 41,000 feet, and is approved for single-pilot operations.

## ECLIPSE EA700

Price: $3.6 million
Passengers: 4-5
Range: 1,470 nm

The future of this program remains unknown as the company is currently being restructured under bankruptcy proceedings. Limited test flying had been conducted of the EA700's wing design mated to an Eclipse 500 fuselage. Compared to the Eclipse 500/550 series, the 700 features Garmin G3000 avionics, a four-foot-longer wingspan, a 14-inch fuselage stretch and a longer horizontal stabilizer, increased speed and range, and better high/hot performance. The fuselage stretch increases baggage volume by 31 percent and cabin volume by 7 percent.

The 700 woud be powered by Williams FJ33 engines. Maximum cruise speed increases to 383 knots.

## SINGLE-ENGINE JETS

## FLARIS LAR1

Price: $2.2 million
Passengers: 3-4
Range: 1,400 nm

Nearly six years after it was announced and after multiple schedule slippages, the Polish Flaris LAR1 single-engine personal jet made its first flight on April 5 at Babimost Airport in Zielona Gora. Testing is currently underway on the aircraft's ballistic parachute and whole aircraft airbag system that cushions the bottom of the fuselage after parachute deployment. The $2.2 million five-seat jet is powered by a single 1,900-pound-thrust Williams FJ33-5A turbofan, has a targeted top speed of 380 knots, stall speed of 62 knots, estimated maximum range of 1,400 nm, and ceiling of 45,000 feet.

MARK WAGNER

Flaris features rear-hinged main cabin doors reminiscent of 1960s Lincoln Continental cars, detachable wings and stabilizers, a fuselage fuel tank, electric deicing, an in-the-nose whole-aircraft ballistic parachute, and Garmin G600 avionics. The aircraft is being built by Metal-Master and is partially funded by the European Union.

## STRATOS 716X

Passengers: 4-5


Construction is continuing on the first Stratos 716X proof-of-concept kit aircraft. The new Model 716X features seating for six and is larger and wider than the 714, with a fuselage that is 31 inches longer and two inches wider than that of the 714. It will be powered by a 3,000-pound-thrust Pratt & Whitney Canada JT15D-5 turbofan and feature an electronic engine control. The 716X's instrument panel will feature a variety of Garmin products, including dual G3X displays, GTN 750 GPS/com, and integrated autopilot. In addition, the jet will have air conditioning, a fully automated pressurization system, custom switch panels, and several Mid-Continent products, including a Standby Attitude Module with backup battery, and a pressurization monitor.

The company's goal is to sell three kits per year for now and eventually to put the aircraft into certified production four to five years in the future. Stratos says the average kit will take 2,500 hours to build.

While Stratos has not formally released price and performance data, it is expected to be close to that of the 714 which was designed to cruise at 400 knots with a range of 1,500 nm. ■

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# Citation Pilots gather

Safety was, as always, a major topic of discussion at CJP 2019, especially in light of the high number of recent accidents involving Citations (but few, if any, of which appear to involve CJP members).

Textron Aviation senior safety investigator Peter Basile reviewed 2018 Citation accidents and the lessons learned relating to communication, weather, landing performance, personal minimums, situational awareness, stalls, and more. He candidly summarized an incident with a company Latitude during a proficiency training flight last November, where the nose gear failed to extend. The result was a service letter to fix a problem with the roller assembly that guides the nose gear doors on the gear trunnion, for the Latitude, Sovereign, and X models, illustrating how Textron Aviation responds quickly to problems discovered in the field. "If we find something specific to our product," he said, "we make those fixes."

The case study of a trim runaway in a CJ1 in 2003 served to illustrate the danger of failing to perform the emergency checklist, although luckily the pilot and passenger survived the off-airport ditching into a cove. "This was the one and only incident [like this] that we've had," Basile said. Redesigning a printed circuit board that had a subtle failure eliminated the probability of this occurring again, but if the pilot had done the full checklist and pulled the trim circuit breaker, he would have been able to regain full control.

CJP introduced a new video in its "What Good Looks Like" video series, once again starring David Miller, a Mustang owner and chair emeritus of the CJP Safety & Education Foundation, playing the clueless pilot. In this video, shot in a Mustang simulator, Miller was distracted by a conversation with his passenger "wife" about his "annoying sister-in-law," while executing a vertical speed climb. Of course, it's not hard to imagine what happened as the autopilot tried to maintain the climb and the Mustang slowed down and stalled. There are now 12 videos in the series, available for anyone to view for free on the CJP website.

In a real case discussed after the video, a CJ2+ pilot in the UK in 2013 stalled during a climb to FL430 in vertical speed mode, while trying to look something up on his iPad. The accident board's animation of the resulting upset showed the CJ2+ rolling six times, pointing nearly vertically down, and pulling 4.8 g, which wrinkled the wings. Luckily, the pilot was able to land.

"We discourage vertical speed mode above 30,000 feet," said Neal Singer, a designated pilot examiner and safety consultant who works closely with CJP. If pilots prefer not to use flight-level-change mode while climbing, because it is "too wavy," he said, then simply use the autopilot's pitch mode for a smooth climb.

At CJP 2019, the association introduced a new publication, the Citation Inflight Guide, which outlines best practices for any Citation pilot. CJP also publishes online its Standard Operating Practices series for all of the light Citations, organized by avionics types and also covering legacy Citations. ■

A drone's-eye view of the Citation lineup in Colorado.


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## CAN hack context

on the dining table in the cabin" ready to be hacked. In fact, the CAN bus network wires are incorporated into inaccessible areas of the airframe, and the bus wires are not labeled, "attach hacking vampire taps here."

These facts lead to a third limit: A CAN bus hacker would have to be a savvy computer programmer, plus familiar with computer and avionics systems, to succeed. This eliminates casual hackers from the mix, reducing the threat, though not removing it entirely.

These limits explain why General Aviation Manufacturers Association v-p of operations Jens Hennig isn't overly concerned about the CAN bus vulnerability. "Nobody views the risk around that as being very high," he said.

> **"Manufacturers of aircraft should review implementation of CAN bus networks to compensate for the physical attack vector."**
> – CISA

Patrick Kiley himself has never presented the CAN bus vulnerability as a serious likelihood, just as a risk that exists and needs to be managed, the way CISA did when it issued its CAN bus alert.

"After we published my article and during DEF CON, I spoke to a few individuals who informed me of a standard that will greatly enhance the current CAN security model," Kiley said. "The organization is called AUTOSAR [a worldwide industry group working on automotive open architecture], and the standard is a specification of secure onboard communication [SECOC]."

### CAN or Not?

The Aircraft Electronics Association is well aware of the issues raised by the ICS alert. Ric Peri, the association's v-p of industry and government affairs, told **AIN**, "The systems that they tested and based their research and subsequent report on are for experimental aircraft, LSA, or entry-level certified GA [bridging technology]." He acknowledged that "the CAN bus is used throughout aviation at varying levels," but "the link [as many have reported] to all of GA is not realistic nor accurate. As the certitude of aircraft and systems increases, so does the cybersecurity oversight and controls. As you can see from the 2017 research on CAN bus in vehicles, it is not the CAN bus itself but rather the architecture of the system which is technically being reported. Low-cost systems are more vulnerable than higher cost, more sophisticated systems. This is true in computers, automobiles, as well as aircraft. I believe that the media is doing more to encourage hackers to 'break' our cybersecurity measures every time we report that we have controls in place. Nothing is foolproof and the more we talk about it not being a problem, the more this becomes a challenge for those who dabble in this arena."

Based on the available facts, the CAN bus vulnerability is judged to be a real but difficult-to-execute threat against aircraft. And heeding CISA's advice to keep aircraft properly secured and monitored is a reasonable response to this vulnerability; as is keeping an eye out for any signs of tampering within an aircraft on an ongoing basis. ■

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VLADIMIR KARNOZOV

The A350XWB on September 1 at the Ramenskoye aerodrome where MAKS 2019 was held.

# Customer experience key for ACJ350XWB | by Vladimir Karnozov

Airbus Corporate Jets has established "an outfitters advisory board" to work more closely with five OEM-approved completion centers "to ensure total quality" while allowing the selected partners "to sell many fancy things" to their customers. "This is a good area to work in the coming years" especially in relation to the next-generation airplanes with airframes made of composite materials, ACJ president Benoit Defforge told journalists at the Russian Business Aviation Exhibition 2019, which opened on September 11 at Moscow-Vnukovo airport.

The board began functioning three months ago in the wake of allegedly negative experiences that completions outfitters have had with the Boeing 787. "They sold 14 aircraft," he said, "and only four are flying. Their outfitters are in the middle of a difficult situation they had not anticipated. We shall be a wiser team...with the ACJ350."

Especially for the type, Airbus has put together the EasyFit package developed to optimize installing a custom interior. "It was a good solution, and it is working," Defforge said.

"Compared to the B-brand, we have a very different approach," he explained. "It is not good enough to just sell a green aircraft. We consider that it is our responsibility to be with our customers all along, including creation of the cabin. It does mean we oblige our customer to go for a turnkey [process], with the airframer also providing the cabin. In fact, it is not about a turnkey solution, but customer care. We are working with the five outfitters to be sure that the way they are working with the customers is in line with the philosophy and the vision we have of quality."

Historically, Airbus came to the market for VIP conversions of next-gen widebody jets later than Boeing. Having sold 80 ACJs based on the A300/310 and A330/340 platforms, the European manufacturer has found it difficult to introduce the newer models. The ACJ330neo went on offer in 2017 and still has no buyers. Although an A380 was sold to a Saudi prince, it never transformed, as originally planned, into the "Flying Palace." While acknowledging that "the ACJ380 did not happen," Defforge maintains "the demand for very large business jets is still quite important in the oil-rich countries" despite a decline in the region's overall economy. The manufacturer continues to cultivate friendly relations with Middle East customers, "since the wealth is still there."

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## Nav Canada increases ATC user fees

Nav Canada, the company that operates the country's ATC system, is increasing its user fees to recover the costs of providing ADS-B surveillance data services in terminal areas and both domestic en route and North Atlantic oceanic airspace. These services have been provided on a no-cost trial basis since March. This is the first time in 15 years that customer service charges have increased.

The rate change will be implemented in two phases. The first phase, which took effect September 1, will recover the cost of domestic ADS-B services and represents an average increase of 0.8 percent on overall rate levels.

Phase two relates to recovering the cost of providing ADS-B surveillance within North Atlantic oceanic airspace. The flat-charge-per-flight fee structure, which reflects stakeholder input received in response to an earlier notice of proposed fee structure changes, will be retained, and the rate will be set, beginning Jan. 1, 2020, to C$155.03 ($116.55) per flight based on aircraft weight and by distance flown.

Nav Canada's customer service charges "remain among the lowest…compared to [those of] other air navigation service providers," the company said. **G.G.**

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In the widebody sector, the focus is now firmly on the ACJ350, which is able to fly 22-hour legs. After a nearly-three-year marketing campaign, the ACJ350 won its first orders earlier in 2019: one went to a private customer and three to the German government. The latter urges Airbus to try harder in the CIS. Of 30 ACJs placed so far in the region, 10 serve local administrations.

Not waiting for first delivery of a green ACJ350, set for next year, Airbus demonstrated an A350XWB operational prototype at the close of the MAKS 2019 show on September 1. The widebody offers 308 square meters (3,315 sq feet) of floor space, which the manufacturer considers an important factor in the ACJ350 sales campaign.

"It is human nature to desire a bigger house, apartment, or aircraft," ACJ commercial vice president Chadi Saade explained. "Russians are big and tall; that's why they want space. This is the mentality of the Russian customers and the rich people in the Middle East as well." Touching on cabin customization, he added, "I would not say the Russians are different," he went on. "It is more of a customer's taste, rather than functionality."

For Saade, it's important to view the needs of businessmen and career bureaucrats differently. From the standpoint of the interior, "airplanes intended for government officials make a completely different market, so they should meet other requirements." Often, they come with economy-class seats at the back for the entourage, "while businessmen rarely order their aircraft with that kind of interior."

Due to the poor Russian economy, "the market here is still difficult, so we can't say every businessman wants to buy an ACJ." And yet, Airbus tries to view the Russian market from a long-term perspective. "Commercial activities are still ongoing here. There must be a splash in orders, but I can't tell when it is going to take place." ■

More aircraft than ever were rolled in for ACE 2019 at London Biggin Hill Airport.

# ACE brings together brokers and operators

by Ian Shepard

The one-day Air Charter Expo (ACE 2019) at London Biggin Hill Airport wrapped up on September 17, having "broken all previous records," according to Simon Weston, chairman of co-organizer the Air Charter Association (ACA).

With 1,150 pre-registrations and an estimated 1,000 turning up, more than 20 business aircraft and more than 70 exhibitors, Weston was upbeat on the growing event and also on the 70-year-old association's growing influence—highlighting that illegal "gray" charter remains its number one issue. "Illegal charter continues to dominate," Weston told gathered brokers and operators, while announcing that ACA is about to launch a poster campaign at airports under the banner "Is Your Flight Legal?"

He also noted the recent rebranding of ACA which laid the foundations for going "more international" by creating links with other associations around the world. At ACE, ACA also held sessions focusing on illegal charter, introducing its new Broker Qualification Course, and discussing the relationships between brokers and operators—against a backdrop where some operators are going direct to clients.

In a session on "The Future of Brokering" that kicked off the day, delegates welcomed ACA's focus on training and standards, which is set to continue to grow, said Weston; and discussed the way the market has become crowded and the same requests are being handled by so many that operators struggle to cope. "The market hasn't grown but the number of brokers has grown exponentially," said Matthew Savage of Smart Aviation.

In his address, Weston suggested brokers and operators within the ACA membership were forming working groups to see how they could work more efficiently and, in the words of Neil Harvey of Hunt & Palmer, "keep more of the margins in the market" in the face of customers that are less loyal and who want to force prices as low as they can exploiting excessive competition. ■

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## NTSB forum

Air Methods has a robust SMS given the inherent risks with air ambulance operations, said Stacia Joyce, a senior pilot with Air Methods. "We do risk analysis for every flight we do. Asking those questions on every flight can be effective." But she added, "I don't think a lot of people know how to do it" and suggested that the FAA and NTSB provide information to help operators implement such systems.

On the equipment front, the benefits of ADS-B were highlighted, particularly with situational awareness. ADS-In-equipped aircraft get detailed weather products, also enabling pilots to get information to avoid CFIT with the terrain database and loss of control that could happen in poor weather.

"This is good for everybody. People are realizing the benefits," added Jens Hennig, v-p of operations for the General Aviation Manufacturers Association. But the rate of equipage is lower, given that there is little ADS-B airspace in Alaska, Hennig said.

Cost may be deterring equipage, given the lack of ADS-B coverage, said Darren Young, director of operations for Warbelow's/Air Artic. But his operation equipped its aircraft with ADS-B In and Out, primarily for traffic avoidance. "That's great for us but if we don't get others [equipped] then we won't be able to see them," he said. Even so, he added, "I could not live without it anymore."

However, Young also pushed for more ground stations for pilots who operate below 10,000 feet.

Further, a number of operators expressed concerns about regulations and lack of infrastructure, such as weather reporting that is keeping operations VFR. "We've been told that we need to do more IFR. We do want to do more IFR. We prefer IFR. If there are IFR capabilities out there we want to utilize them," Young said. "But without that infrastructure, we can't." In the mountain regions, he said the few approaches available often are unusable. ■


KC-390

# READY FOR THE MISSION

## EMBRAER DELIVERS THE FIRST KC-390 TO THE BRAZILIAN AIR FORCE

Embraer celebrates the first of 28 deliveries of the KC-390 to the Brazilian Air Force. At the same time, the Portuguese Government signed a contract for the acquisition of five airlifters to be operated by the Portuguese Air Force. This is a significant moment in the KC-390 program, marking, not only its Entry Into Service, but also the confirmation of the aircraft's export potential and operational effectiveness within NATO. This follows an exceptionally thorough campaign in which the aircraft accumulated more than 2,200 hours of flight testing in the most demanding environments, reinforced by thousands of engineering simulation hours. In the coming months the Brazilian Air Force will continue to incorporate additional KC-390 into service. Embraer also looks forward to seeing the aircraft recognized and accepted by other Armed Forces around the world as the natural choice in its field. The combination of 21st century, state-of-the-art advanced systems and proven engines, in conjunction with a worldwide sustainment alliance of reputable suppliers, makes the KC-390 the most reliable, easy to operate and efficient aircraft in its class.

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# Rosanvallon steps down; Betbeze steps in

by Ian Sheppard

Dassault Aviation appointed Thierry Betbeze the new CEO of Dassault Falcon Jet, its U.S. business aviation subsidiary. He will replace John Rosanvallon, who is stepping down after a 44-year career with the French OEM.

Rosanvallon, who will continue to serve as special senior advisor to Dassault Aviation chairman and CEO Eric Trappier during a transition period, led DFJ for the past 23 years from its Teterboro Airport base in New Jersey. In the role, he headed sales, marketing, and support activities for the Americas, successfully growing the Falcon fleet and brand recognition.

"John has built a record of success for the Falcon Jet business and our industry," said Trappier. "We are pleased we can continue tapping into the wealth of business jet market experience he has accumulated to help improve and expand the Falcon line in the future."

Thierry Betbeze has been appointed the new CEO of Dassault Falcon Jet.

Betbeze, who has been senior v-p of finance at DFJ since 2016, began his career at Dassault Aviation in 1984 as a cost accountant. He switched to export financing with responsibilities that included treasury and currency hedging before being promoted to senior v-p of finance in 2004.

"Thierry's appointment is the latest in a number of recent changes intended to reinforce our worldwide sales, marketing, and customer-support effort," said Trappier. "His extensive experience in international finance...will ensure the enduring success of the Falcon brand in today's demanding business aviation environment."

Rosanvallon joined Dassault Aviation in 1975 and four years later moved over to DFJ in Teterboro as assistant to the president. After 11 years back in France serving in various executive capacities within Dassault Aviation, he returned to Teterboro as senior v-p of sales and marketing with a mandate to consolidate worldwide Falcon commercial activities. He was appointed CEO of DFJ in 1996. ■

## NEWS note

**The National Air Transportation Association has formed a new committee that will focus on establishing best practices and standards for air charter brokers.** The new committee comes as the association continues to focus on combating illegal charter, in part through the education of consumers, operators, and brokers. "The association, through its Illegal Charter Task Force, is actively providing resources to charter brokers and other members of the air charter community to assist them in avoiding illegal charter," said a spokesman. ■

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# Unmanned stratospheric solar aircraft flies

by Mark Huber

Softbank unit HAPSMobile completed the first test flight of its unmanned Hawk30 solar-powered high-altitude platform system (HAPS) last month at NASA's California Armstrong Flight Research Center (AFRC). Hawk30 is designed to serve as a stratospheric telecommunications platform for delivering next-generation global connectivity.

"While this successful test flight represents just the first step, we're moving forward with tests in the stratosphere and long flight duration tests lasting several months up to half a year," said Junichi Miyakawa, CTO of SoftBank and HAPSMobile CEO. After operations at AFRC, Hawk30 will perform stratospheric test flights at the Hawaiian island of Lanai.

The Hawk30 has a wingspan of 256 feet and is equipped with wing-embedded solar panels that power electric motors driving 10 propellers. It flies at speeds of approximately 60 knots and is designed to stay airborne for months at a time.

Softbank intends to use HAPS to build stable internet networks unserved by telecommunications, including in mountainous terrain, remote islands, and developing countries. Hawk30 is designed to use a system that does not interfere with terrestrial base station networks. The technology will enable connectivity for drone operations, contribute to the adoption of the Internet of Things and 5G, and provide stable communications networks regardless of situations on the ground, such as natural disasters, the company said. HAPSMobile anticipates launching Hawk30 commercial service in 2023. ■

The Hawk30 solar-powered high-altitudeplatform system (HAPS) will serve as a stratospheric telecommunications solution that can stay airborne for months at a time.

## Airshare looks to new cities for shareowners

Fractional jet ownership company Airshare will expand into five new cities with the hiring of two new sales directors, Chris Mahon and Matt Hall, the Lenexa, Kansas-based firm announced on September 17. Airshare is looking to add fractional owners who reside in Chicago; Milwaukee; Indianapolis; Cincinnati; and Louisville, Kentucky.

"We've answered the demand from customers, and we're pleased to announce our commitment to meeting those needs," said Airshare chief executive John Owen. "Our Upper Midwest expansion allows us to aggressively grow our customer base with the most efficient fractional program in private aviation. The addition of these markets will greatly enhance the service we provide to our existing customers as well."

Most of Airshare's 12,000 annual flights operate to and from cities such as Dallas, Denver, Houston, Kansas City, and the Great Lakes region. In the past decade, the company has seen 200 percent growth. The expansion also positions Airshare for additional growth in the Northeast U.S.

"We plan to double the size of our revenue and customer base in the next three years, along with significantly growing our overall fleet," Owen added. AirShare's fractional fleet consists of 100 Embraer Phenom 100s and 300s, as well as 20 other types that make up its managed aircraft fleet. **J.S.**

# Volocopter unveils eVTOL for air-taxi ops | by Charles Alcock

Germany's Volocopter on August 21 unveiled the design for VoloCity, its first eVTOL aircraft to enter series production. The two-seat multicopter will be certified under the new SC-VTOL rules announced by the European Union Aviation Safety Agency (EASA) in July, and the manufacturer has said that it could take between two and five years to achieve type certification and service entry.

Volocopter intends to operate VoloCity aircraft itself in a new air-taxi model based on a flight-booking app that it is developing. The aircraft will be operated from ground facilities called VoloPorts. Working with UK-based Skyports, it is developing the first of these in Singapore, where it intends to conduct the first public VoloCity flight during the fourth quarter.

VoloCity is intended for short flights within largely urban areas, with a range of just 22 miles (35 km) and a cruise speed of 69 mph (110 km/h). Initially, flights will be piloted, but eventually Volocopter intends to introduce autonomous operations that would allow two passengers (and their baggage) to be carried. The company said that while the SC-VTOL rules can cover autonomous operations, it has decided not to set a firm timeline for making this transition. In September 2017, it demonstrated autonomous operations in Dubai with an earlier prototype.

## Pilot Cities Under Consideration

According to Volocopter, it is now in talks with several cities around the world to discuss proposals to start eVTOL on-demand air-taxi services. The company, which started developing the aircraft in 2011, has no intention of selling VoloCity directly to individuals or other operators.

VoloCity features design changes developed after more than 1,000 flight tests on earlier prototypes, including the 2X, which has been the focus of its engineering team since 2016. New features include further refinements to the aerodynamic design of the beams that house the aircraft's 18 rotors and a new stabilizer to increase lift and stability in flight. The new model also takes account of feedback gathered from several hundred prospective customers and the safety standards in the new SC-VTOL rules, including what the company said is a high level of redundancy in critical systems.

"With the VoloCity we will open the first commercial routes and bring urban air mobility to life," said Volocopter CEO Florian Reuter.

In addition to the planned flight trials in Singapore, Volocopter is working with Frankfurt International Airport operator Fraport in Germany to develop passenger handling and ground procedures that meet international regulations. ■

Volocopter's VoloCity eVTOL features design improvements based on flight testing of earlier prototypes.

› continued from page 29

# Challenges ahead for supersonics

over-land application for supersonic speeds below FL180 that do not include effective mitigations for see-and-avoid."

AOPA pointed to higher VFR weather minimums above 10,000 feet msl put in place for Class E airspace because of the additional distance required to see and avoid aircraft with speeds above 250 knots. "These differences in basic VFR weather minimums highlight not only the important relationship between a pilot's ability to conduct see-and-avoid but also illustrate why the 250-knot speed limit exists [below 10,000 feet in Class E airspace]."

Of particular concern is mitigations could be "one-sided," the association added. "We are troubled that there could be situations in which pilots will be faced with having to completely relinquish their responsibility for themselves and their passengers' safety to the pilot of another aircraft, especially one with whom they have no contact [visual or otherwise]."

Meanwhile, environmental groups do not see a path forward at all. The Center for Biological Diversity (CBD) filed comments signed by 27 other public health and environmentalist groups that began with the headline "Prevent Devastating Harms from Super-Polluting Supersonic Aircraft."

The groups are not persuaded by assurances from the aviation community that they have no plans to recreate the Concorde nor by GE Aviation's plans for a Stage 5-compliant engine that can run on biofuel.

"With existing technology, there is no way to advance 'safe and efficient operation of supersonic aircraft.' Supersonic aircraft would fuel the global climate crisis and threaten Americans with lasting damages from extreme air and noise pollution," said the groups, which include organizations such as Friends of the Earth, Sierra Club, National Resources Defense Council, and Nurse Alliance of SEIU Healthcare.

CBD had filed a white paper on the emerging aircraft designs—acknowledging unknowns in designs and materials, and in Boom's case, engine—primarily making estimates off a three-view drawing on Boom's website, but found that, conservatively, the aircraft would be unable to meet noise and emissions standards.

## Mitigation Efforts

The groups expressed concern supersonic operations will burn five to seven times the amount of fuel (on a per-passenger basis) as subsonic designs and international carbon dioxide emissions limits. "We are in a climate emergency. Given our limited carbon budget, limited time to act, and urgent need to slash greenhouse pollution from the aviation sector overall, allowing a new class of super-polluting aircraft to enter the sky would be madness. It is obviously inconsistent with the FAA's obligations to protect public health and welfare," they said.

Separately, CBD filed comments reiterating the warning of the environmental harm that could result from any testing and urging the FAA to impose a high threshold that involves significant environmental study for each application. "As the FAA grapples with the purported reemergence of civil supersonic aircraft, it must ensure that it takes the devastating environmental impact of these aircraft into account in all action it takes as a regulatory body."

The center worries that the FAA is mischaracterizing the extent of its obligations under NEPA. That policy obligates agencies to take a "hard look" at environmental impacts before deciding whether to pursue a particular federal action, the center said, contending that each application for a special flight authorization would necessitate an environmental assessment (EA) and environmental impact statement (EIS).

It fears that the FAA believes an EA would fulfill its duties. An EA might help the FAA determine whether the application has a finding of no significant impact or, conversely, a significant impact that requires an EIS, CBD explained.

But the center believes that the proposal itself underscores the environmental harm posed by supersonic flight. "Because sonic boom, no matter how 'quiet' or insignificant, trails an aircraft in supersonic flight along its entire route, impacts are not limited to land surrounding airports," the center said, adding, "Wildlife, domestic animals, and built structures and infrastructure are also affected by sonic boom. Exposure to aircraft noise over time is associated with increased risk of high blood pressure and heart disease for adults, and cognitive impairments in children."

A conclusion requiring anything less than a full EIS would be inconsistent with science and 50 years of FAA policy, CBD added.

The FAA should use the strictest possible standard, as well as lessons learned from NextGen procedures implementation, added a residents group outside San Francisco that calls themselves the Sunnyvale/Cupertino Airplane Noise Group. Of chief concern was their experience of the implementation of NextGen procedures in the San Francisco Bay Area Metroplex. "Since the implementation of NextGen, our cities have experienced a problem with aircraft noise. The FAA should not compound this problem by adding supersonic aircraft to the mix while people across the country are still suffering from NextGen."

They made recommendations, such as no audible sonic boom at ground level, the same noise and fuel standards for subsonic and supersonic aircraft, and using the most stringent sonic boom criteria. They also urged the FAA to keep such operations out of metroplexes. ■

London to New York in three hours, 15 minutes is the target of Boom's Overture airliner. The prototype XB-1 "Baby Boom" (left) would conduct initial tests.

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# Wings Over Asia pioneers GA in Singapore

by Chen Chuanren

Singapore's Wings Over Asia (WOA) is pushing further in its ambition to be the leading general aviation provider in Southeast Asia and hopes to make flying more accessible to the masses. Speaking to **AIN** on the eve of its 10th anniversary, WOA managing director Ng Yeow Meng said one of WOA's key focuses for 2019 is to educate and engage the public about general aviation and step up its flight-training capabilities.

WOA has acquired a Piper Archer DX fitted with new Garmin GX1000 NXi avionics dedicated for flight training. It also organized an open house in late August for more than 300 public visitors, offering an opportunity for them to engage with pilots and airplane owners.

"From our past events, interested pilots and their families were surprised how accessible and safe flying is, and not reserved for the rich," Ng said.

WOA also runs an FBO and aircraft management business in Seletar Aerospace Park, with business and revenue increasing significantly over the last 10 years. It attained the IS-BAH Stage II registration earlier in the month, becoming the second company in Singapore to do so. Ng said about S$250,000 is invested annually to improve safety and processes.

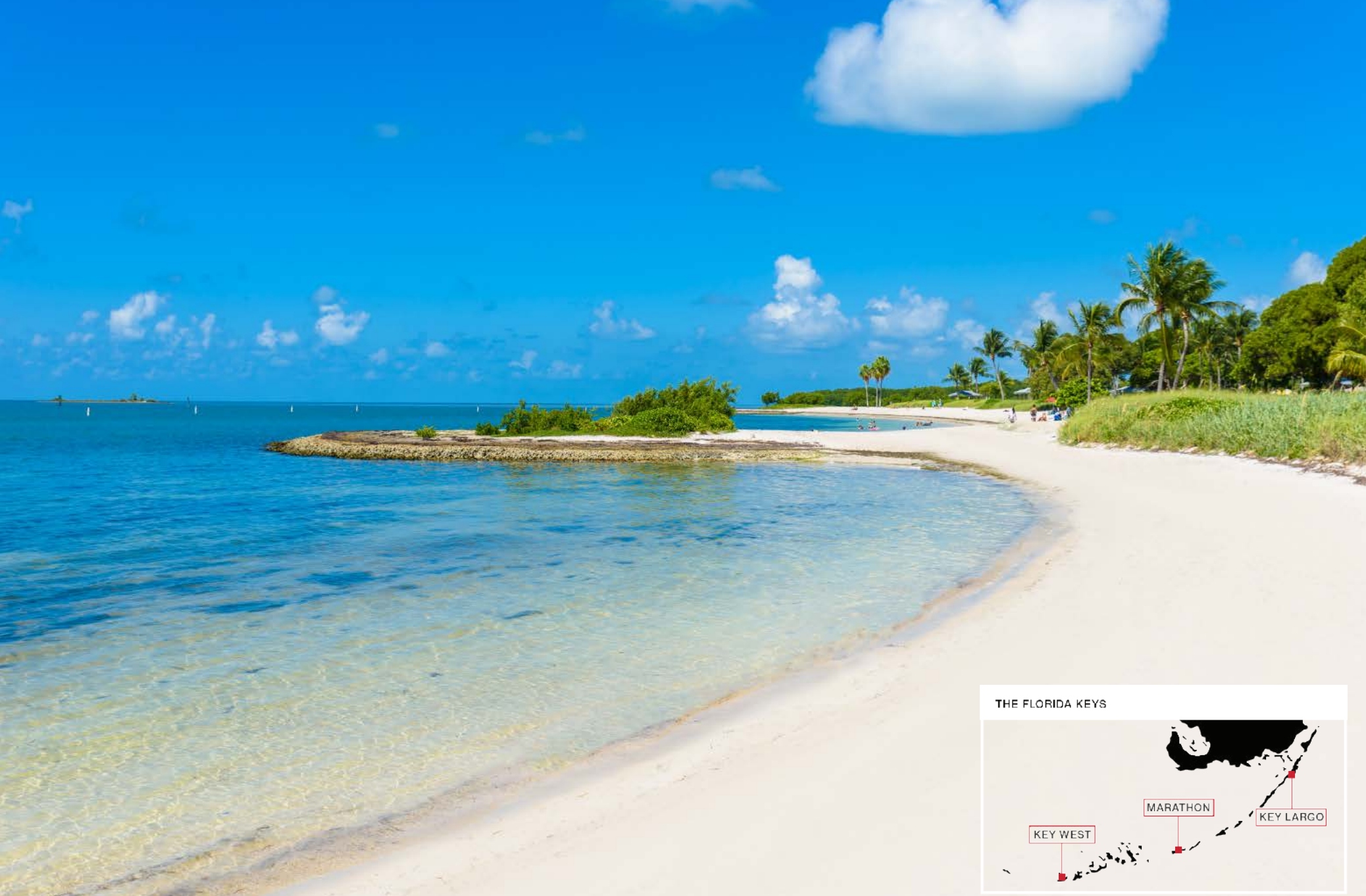
"We have grown from a small boutique FBO to handle general aviation aircraft in Southeast Asia to handling large jets from as far as the Middle East and China," he added. Ng said WOA is supporting the only HondaJet based in Singapore and hopes to further deepen its relationship with Honda Aircraft.

## Growth Plans

WOA is a dealer for Piper, Daher, Quest, Cirrus, and Diamond and has sold 25 aircraft over the past two years. This year alone, WOA managed to secure a deal for 15 Piper aircraft to Malaysia and Indonesia flight schools and two other aircraft for private owners, including a Cirrus Vision Jet. Its success in aircraft management saw its two hangars filled, requiring the company to rent hangar space from a neighboring partner.

WOA is the only company in Seletar Aerospace Park to handle aircraft less than six tonnes (13,228 pounds) and Ng said it could be challenging at times. "While the development of Seletar might have steered toward MRO, we have been adaptable and are in constant discussion with the Changi Airport Group and Civil Aviation Authority of Singapore to ensure we blend well in Seletar's environment," he said.

According to Ng, WOA has achieved beyond what it planned to achieve 10 years ago, with hopes to break the boundaries of general aviation across borders. Looking ahead, Ng hopes to invest and equip itself with the most modern airframes, avionics, and technology, while inspiring more future pilots. ■

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# Tamarack Aerospace looks ahead to bankruptcy exit, new winglet applications

by Rob Finfrock

With customer aircraft flying once again and new installations underway, Tamarack Aerospace aims to finish 2019 on much stronger footing. That includes exiting Chapter 11 bankruptcy and exploring new applications for the company's active load alleviation system (Atlas) winglet technology.

The year certainly began on a sour note for the Sandpoint, Idaho-based company, following implications of Atlas faults in several incidents that led to airworthiness directives from the European Union Aviation Safety Agency (EASA) and the FAA, and the months-long grounding of Textron Aviation Model 525, 525A, and 525B CitationJets equipped with Tamarack's winglets.

Company founder and CEO and Atlas inventor Nick Guida told **AIN** he felt like "a father seeing his kid thrown in jail over false accusations" when EASA issued its emergency AD in April. "Our team had spent many years and many millions of dollars to prove the design and safety of these winglets to certification authorities," he added. "That work was now under attack, and we had to prove our innocence."

Tamarack took particular exception to one pilot's claim, cited in the EASA directive, of immediate loss of control following an Atlas malfunction, a scenario Guida said was later proven false. "It drives engineers crazy when confronted with a situation driven by inaccurate data," he added.

In July, EASA and the FAA signed off on the return to service of Tamarack Atlas-equipped Citations, and the company almost immediately began new installations of the system.

### Service Bulletins Approved To Remedy ADs

The company had previously issued two service bulletins to address possible Tamarack Active Control Surfaces (TACS) asymmetry, including an April 2018 bulletin (SB1467) calling for mandatory replacement of a screw that could work free inside the actuator, bridge an electrical circuit, and drive TACS movement. A second bulletin issued in early 2019 (SB1475) called for installation of aerodynamic centering strips to force those surfaces to a neutral position in the event of such uncommanded asymmetries.

Tamarack made both bulletins mandatory following the EASA AD and maintained the two SBs resolved concerns raised by regulators. The company also vehemently denied that Atlas asymmetry could lead to irrecoverable loss of control.

Regulators ultimately approved installation of those service bulletins to resolve the ADs and return Atlas-equipped aircraft to service. EASA lifted its emergency action July 7, and the FAA issued an alternate means of compliance (AMOC) shortly after to essentially the same effect.

While that returned its customers' CJs to the skies, resolution of the ADs came after the groundings had already driven Tamarack into Chapter 11, halted sales of its winglets and forced several layoffs at the company. The situation also led Guida to return to the company he'd founded. "I'd been gone for a bit, but I came back as I felt we needed leadership in the world of ADs and certification," he said.

"It's hard to ignore the timing [of the directives], which bordered on a knee-jerk reaction in the [Boeing 737] Max aftermath," added chief engineer Jacob Klinginsmith, who was elevated to the role of Tamarack's president following the June bankruptcy filing. "However, we didn't panic. We faced the situation head-on and we maintained our business."

While the company is moving forward, one lingering question concerns the National Transportation Safety Board (NTSB) investigation into a fatal November 2018 crash of an Atlas-equipped CJ2+ shortly after takeoff from an Indiana airport. That aircraft had been fitted with Tamarack winglets shortly before the accident, including the revised TACs units under SB1467.

Unusually, the FAA directive specifically cited possible Atlas malfunction as a focus area in the NTSB investigation in addition to the incidents previously noted by EASA. "We have reached out to the Board and are now a party to that investigation," Klinginsmith said. "We're obviously troubled the [FAA] AD points to our winglets, and we feel it was inappropriate to make such a statement regarding an ongoing investigation."

"We're not in the know on where that investigation stands," Guida added, referring to himself and Klinginsmith, "but I do believe it would have been hard to get these ADs lifted if investigators believed [Atlas] was complicit in it."

### Rebuilding and Looking to the Future

With the installed fleet back in the air, Tamarack is now looking to rebuild its business and ultimately expand its offerings. The company completed its first post-AD Atlas installation in late July, and Klinginsmith noted several others in the pipeline. Installations in Sandpoint currently take approximately two weeks to complete—roughly double the timeframe versus when the company was fully staffed—and Tamarack hopes to complete the 100th Atlas installation before year-end.

Another part of Tamarack's growth strategy is to expand its existing network of 16 U.S. and international service providers that sell, install, and service Atlas winglets. Guida noted the company has also reached out to Textron Aviation, which opted last year to discontinue Atlas installations on new aircraft—a decision he emphasized was unrelated to the later ADs—and intends to reinvest in new platforms the company "put on the shelf to focus on the Citation."

Tamarack will also exhibit at this year's NBAA convention with the company emphasizing its path ahead. "Our message is that we're still here," Klinginsmith said. "We're not out of business, despite the negative connotations of bankruptcy, and we're moving forward."

The company's own customers are driving that path forward, with a group of Atlas-equipped Citation owners fronting part of the $1.95 million in debtor-in-possession financing the company secured in early August. "Our customers remain our biggest fans," Klinginsmith said. "They love our winglets, and it's really gratifying to see our products provide so much satisfaction to them."

Guida also remains grateful for customers' support. "Many of our operators fly Part 91 and are entrepreneurs, themselves, who've faced similar headaches in their own businesses," he said. "I've taken calls from many of them, and while they were obviously upset their planes were grounded, they'd call just to ask me, 'Nick, how are you doing through this?'" ■

HAPPY DESIGN STUDIO

Didier Wolff of Happy Design Studio was commissioned to design the livery for Olivier Dassault's new Falcon 900EX.

## Dassault family Falcon gets custom livery

Didier Wolff, founder of Happy Design Studio in France, has completed the exterior design of Olivier Dassault's Falcon 900EX for which he was commissioned. The design features a tri-color livery dubbed "Thermidor" that aims to pay homage to the family's heritage and the owner's embodiment of French values, according to the studio.

The grandson of Dassault Aviation founder Marcel Dassault, Olivier Dassault is a 1974 graduate of the French Air Force's École de l'air and a deputy in the French National Assembly. As a pilot, he has set a number of world speed records in a Dassault Falcon 50, 900, and 900EX.

Four subtle shades of gray paint stretch across the fuselage of Dassault's 900EX as well as a trilogy of blue, white, and red stripes that gradually thin toward the aircraft's radome. The words, "Faire face," are painted near the jet's engine intakes, which is the motto of French fighter pilot Georges Guynemer who was killed in action in 1917.

The livery was painted by OEM aircraft painter Satys at Paris Le Bourget under the supervision of Wolff and Dassault Falcon Service over five weeks and 2,600 man-hours. **J.S.**


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CBP officers conduct a routine interview with the pilot of a business aviation flight.

# NBAA works with Canada on preclearance options

by Kerry Lynch

As the U.S. moves to expand its customs preclearance options in Canada beyond commercial airlines to other modes of transportation, industry officials are hoping to work with government leaders on extending those services to business aviation. The U.S. recently announced that it planned to build on an existing agreement with Canada "to, for the first time, conduct full preclearance in the rail, ferry, and cruise ship environments."

However, business aviation is not yet part of those plans. NBAA has been working with industry leaders in Canada, as well as with airport and government officials and the U.S. Customs and Border Protection (CBP) on possibilities for business aviation. At least one large airport in Canada has expressed interest in participating, said NBAA v-p of regulatory and international affairs Doug Carr, although no timeline has been set for a pilot project.

"The reality is that it's harder than just one simple agreement," Carr said. "A question that has to be answered...[is] can an armed officer of the U.S. be granted authority to conduct work on non-U.S. parts of the airport? It's not a simple answer."

Issues such as the layout of the airport and where CBP can be present need to be ironed out. "It's really difficult because of these jurisdictional boundaries that have to be crossed," he added.

## Preclearance Options

CBP does provide preclearance in two locations for business aviation: in Aruba and Shannon, Ireland. While Aruba is not as frequently used, Shannon has become a success story, Carr said.

Shannon in early August celebrated its 10th anniversary of housing the services; on August 4, 2009, it became the first airport in Europe and the Middle East to offer U.S. preclearance. Initially, the services were offered for commercial passengers, but in 2010 that was extended to business aviation.

Those services were an outgrowth of a desire of the CBP at the time to ensure access to the U.S. by expanding the borders. Shannon was long a popular destination for fueling, particularly as a last stop before entering the U.S. Unlike some of the issues encountered in Canada, Shannon's airport layout, with a centralized approach, enabled bringing the services to the Irish destination.

It started slowly for business aviation, but "these days, the preclearance program in Shannon is nearly the perfect solution for operators returning to the U.S.," Carr said. In fact, CBP, working in concert with Shannon Airport, in June began an after-hours extension until 9 p.m.

Next on the plate at Shannon is a fully compliant catering program that eliminates the need to manage international garbage, Carr added. Currently, aircraft need to land at a facility that has an approved international garbage-handling program. There are only a couple hundred such facilities out of the thousands of airports that business aircraft might otherwise be able to access in the U.S., he said.

Carr is hopeful that this program might receive final approval later this year. Both the CBP and Shannon have been supportive of these efforts. Carr is hoping that the successes in Shannon might serve as a template to bring preclearance to other locations, not only in Canada, but also in Europe, the Middle East, and elsewhere.

Shannon officials "have really taken the lead in helping to bring value to that capability for our segment. Shannon has shown to be effective and used," he said. "There's a value in us looking at the broader benefit of what U.S. investment in this capability means."

Business aviation officials are hopeful that the lessons there will eventually resonate in Canada. "I think it's pretty clear that should preclearance for business aviation in Canada become a reality, it would be used a lot and would address some of the challenges we have domestically here with the drawing down service."

But this is an educational process, he added, "We've got to find a way for that dialog to take place with local jurisdictions. I'm sure weighing heavily is their comfort of having [armed] foreigners on their soil in places that they've never been allowed before." ■

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In late 2017, Zunum Aero, co-founded by a former Google executive, introduced its concept of a hybrid-electric aircraft.The 12-passenger V-tail now appears doomed to fly only in computer-generated renderings.

# Can a new generation of electric aircraft provide the spark to regenerate aviation?

by Charles Alcock

For more than a decade, the concept of the so-called More Electric Aircraft has been a key area of focus for technology development across the aerospace industry. Airframers and systems suppliers have been pushing for electrification of multiple aircraft functions to achieve savings in power and weight, replacing hydraulic and pneumatic power, while also simplifying maintenance and improving reliability.

More recently, though, aspirations have shifted to the advent of "all-electric aircraft" as concerns about the environmental sustainability of aviation, and a desire to exploit new business models, drive investment plans to develop aircraft entirely powered by electricity. Much of this effort is focused on the so-called eVTOL (electric vertical takeoff and landing) sector, involving anywhere between 150 to 200 new programs at various stages of development, ranging from pipe dreams to those within sniffing distance of achieving type certification. Many of these prospective aircraft are intended for the envisioned urban air mobility market and many of them are being designed to be operated autonomously, without a pilot.

## Fixed-wing Development

There are also plans for all-electric fixed-wing aircraft, some of which aspire to supporting mainstream air transport operations. However, given the widely acknowledged limitations of existing battery technology, many of the new developments are geared toward hybrid electric powerplant combinations in which fossil-fuel-driven engines generate electricity that is then used to drive rotors and fans.

Many of the electric aircraft evangelists are start-up companies, and many of these have a somewhat tenuous connection to the aerospace industry—often being worshippers at the altar of Silicon Valley, rather than that of the Wright Brothers. According to a January 2019 report from the Vertical Flight Society, the new eVTOL programs alone have already attracted more than $1 billion in fresh investment, with much of this coming from venture capitalists. Multiple reports project value of the market rapidly advancing north of $300 billion within 20 years.

The new eVTOL designs are a mix of airframe configurations, including multicopters (with up to two dozen sets of rotors), lift-and-cruise, tiltwing, and tiltrotors. Some companies are exploring the possibilities of using hydrogen fuel cells as an alternative to electrical power, although these plans are generally not very mature, at least for now.

At face value, Zunum Aero, the Washington-state-based start-up founded in 2013 by former Google executive Ashish Kumar and aerospace engineer Matt Knapp, is an ideal marriage of Silicon Valley verve and aviation savvy. The stars seemed to be aligning when it received significant launch investments from Boeing's HorizonX "innovation cell" and JetBlue Technology Ventures (a subsidiary of the U.S. airline group).

The goal had been to get its 12-seat ZA10 electric fixed-wing aircraft in service by 2022, with a first test flight anticipated in 2019. In May 2018, charter group JetSuite was announced as launch customer, having committed to 100 examples of the aircraft.

In the longer term, Zunum Aero has been laying plans for a family of aircraft carrying up to 50 passengers on sectors of up to around 700 miles by 2030. The company promised transformational operating costs of just eight cents per seat mile or $250 per flight hour.

But sometime around September 2018, both Boeing and JetBlue quietly pulled support for the program without explaining why. This triggered an increasingly urgent campaign to attract new financial backers and, as of early September, no such support had been lined up. Zunum Aero has declined to comment on how the timeline for its plans may be impacted by the apparent capital drought, but multiple media reports cite layoffs and other cost-cutting measures.

Zunum's plans to lead the electric aviation charge may yet come good. Even if they don't, there is clearly no shortage of other contenders and, apparently, other prospective investors still have a large appetite for getting a piece of the action.

Among start-ups, Germany's Volocopter and Lilium appear to be gathering significant momentum in the eVTOL sector—or at least, they have been more transparent than most about how their plans are progressing. Meanwhile, established aerospace giants are progressing their own plans on several fronts. Meanwhile, China's EHang has begun flight trials for both cargo- and passenger-carrying flights with its 116 and 216 models, and claims to have already logged more than 1,000 orders for what it calls Aerial Air Vehicles.


eVTOL demonstrators such as CityAirbus represent only one sector of the future of electric aircraft.

Airbus is in the advanced stages of flight testing its CityHawk and Vahana technology demonstrators and aims to be ready to confirm its plans to develop an eVTOL aircraft by the end of 2020. The European airframer has said it prefers to take time to address all aspects of what it will take to safely operate this new class of aircraft in urban environments, rather than rushing to be among the early market entrants. In its view, some start-up companies are succumbing to pressure from private investors to promise unrealistic timelines for getting aircraft certified and into operation.

Boeing's year-old NeXt division appears to be hedging its bets in the eVTOL market. The U.S. aerospace group's Aurora Flight Sciences unit has been developing its Passenger Air Vehicle, which made a first flight in January 2019. The prototype suffered a crash during its fifth flight on June 4, and, as of early September, had yet to confirm when flight testing would resume or how the development timeline might be affected. At the same time, Boeing has since announced a strategic partnership with start-up company Kitty Hawk to develop its Cora eVTOL aircraft.

Meanwhile, among the relatively conventional new generation of fixed wing designs, Bye Aerospace is making progress with its all-electric, two- and four-seat eFlyer aircraft. The company has started taking orders from charter operators, including Los Angeles-based Quantum Air, though terms of that order are unclear.

Eviation Aircraft is preparing to start flight testing its Alice electric pusher-prop prototype. The Israel-based company's financial foundations were significantly bolstered in August, when Singapore-based investment group Clermont acquired a 70 percent stake. And U.S.-based Part 135 operator Cape Air signed on with a purchase option for "double-digit" numbers of aircraft for short-haul regional services.

This barely scratches the surface of the somewhat unfathomable number of new electric aircraft programs. Most of the contenders are rich on ambition and imagination, but quite how they will weather aviation's unforgiving business environment is the big unknown.

At the Global Urban Air Summit held at Farnborough, UK on September 3-4, stakeholders from across the industry gathered to assess what it will take to make electric dreams come true. Sobering perspective was provided by a cross section of leading regulators who cautioned that not only will exacting certification standards need to be met, but also the sector faces challenges in winning public acceptance for air transport business models that will significantly stretch the boundaries of current convention. ■

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The Tempest mockup was displayed at the DSEI exposition last month in London, along with various existing stores, such as Meteor, Spear, and Spear EW, and new weapons concepts.

# Italy joins the Tempest team

by Beth Stevenson

Italy has become the newest member of the UK's Tempest sixth-generation fighter program, signing a government-to-government agreement to commit to the development of the aircraft, as well as electing to collaborate with British companies to garner industrial participation. This comes just two months after the Swedish government signed a similar agreement to contribute to the UK's efforts, representing the transition that Tempest has made from a British endeavor to a pan-European one.

Tempest's development is being organized on both government and industrial levels, the latter of which is under the so-called Team Tempest moniker. It involves the UK Ministry of Defence's Rapid Capabilities Office being teamed with BAE Systems, Leonardo UK, Rolls-Royce, and MBDA to develop the industrial and technological requirements for the program, and a statement of intent signing on September 11 will now lead to Leonardo Italy, Elettronica, Avio Aero, and MBDA Italy joining the cause. This followed the signing of an agreement between the two governments on the previous day, which will result in Italy helping the UK to define the requirements of this next-generation fighter.

Launched in July 2018 during the Farnborough Airshow, the Tempest program fulfils requirements outlined in the UK's Combat Air Strategy, an initiative that was released in parallel last year. During the launch, the British government and its associated industry communicated that while the project serves to bolster the domestic defense industry capabilities and showcase to the world—and more importantly Europe—that it could develop this alone, it also stressed that it would be seeking partners to participate in Tempest along the way.

No small feat, the project has already been allocated £2 billion ($2.48 billion) to develop the requirements, generating jobs across the UK and contributing to the government's prosperity agenda. The announcement regarding Italy's participation came during the Defence and Secutiry International (DSEI) exhibition in London, last month. UK defense secretary Ben Wallace praised the collaborative approach to the project.

"I'm pleased that we've signed a statement of intent with Italy who, alongside Sweden, will support joint working on the Tempest and our future combat air strategy," he said. "I'm looking forward to working with my Italian and Swedish counterparts, as well as others, to put the Tempest program into hyper-drive and take global Britain into the stratosphere."

Industrial partner MBDA also used DSEI to present further weapons options for Tempest, having already shown a range of deep strike weapons concepts at the Paris Air Show, which are envisioned for potential use by both the Tempest and the Franco-German-Spanish Next Generation Fighter. ■

## Denied F-35s, Turkey eyes Su-57

Ankara is considering buying Sukhoi jets and using Russian expertise in aerospace to complete its national aviation projects following the U.S. decision to eject Turkey from the F-35 program in the wake of S-400 SAM shipments earlier this summer. At Vladimir Putin's invitation, Turkey President Recep Tayyip Erdoğan visited the MAKS 2019 airshow on August 27 to inspect aircraft on display there.

Erdoğan became the first foreign leader to inspect the Su-57, which he did with defense minister Hulusi Akar and other members of his entourage. Their guides on the tour were Putin, Russian defense minister Sergei Shoigu, and United Aircraft CEO Yuri Slyusar. Surrounded by selected media members, he asked Putin whether Turkey can buy the Su-57 and received an affirmative answer. Erdoğan said, "We came here for more than just a sightseeing tour. We will make steps after learning about the final decision [from Washington on the F-35]." On another occasion, he said, "We want to proceed with the solidarity [with Russia] in many areas of the defense industry. This can be on passenger or fighter aircraft. We will continue with the spirit of solidarity."

In his turn, Putin said that Turkish pilots are invited to undertake familiarization and evaluation flights in the Su-30SM. This type is a two-seat multirole fighter, as opposed to the Su-57 and Su-35 that are available only in single-seat versions. "When discussing combat aviation, we spoke of cooperation on the Su-35 and also about some possible work even on our newest Su-57. In my view, our Turkish partners are interested in many things, not only to buy but also to produce jointly. We are ready to cooperate in certain directions."

The head of Russia's Federal Service for military-technical cooperation with foreign countries, Dmitry Shugayev, confirmed Turkey's interest in "either the Su-35 or Su-57." Foreign minister Mevlüt Çavuşoğlu said that Turkey would prefer to search for alternatives to the F-35, but would look for a new source to procure combat jets if the U.S. cancels F-35 shipments.

Russia's minister for industry and trade, Denis Manturov, added that preparations for Su-57 serial production at Sukhoi's KnAAPO plant in Komsomolsk-upon-Amur have been ongoing for several years and are about to be completed. **V.K.**

## UAE Air Force to get bizjet-based ISR aircraft

Two Bombardier Challenger 650 business jets are being converted to an intelligence, surveillance, and reconnaissance (ISR) configuration by a newly-formed company in the UAE. They will join the UAE Air Force, as will two Bombardier Global 6000s that have been undergoing a protracted conversion in the UK. The UAE AF has also ordered three Global 6000s via Saab, which is providing them as GlobalEye multi-surveillance jets capable of monitoring airborne, maritime, and ground-based activity.

The new company, Aquila Aerospace, which was formed early this year with majority Emirati ownership plus foreign interests, first unveiled the project at the IDEX show in Abu Dhabi. Aquila is based at Al Bateen airbase in Abu Dhabi, where it will shortly take delivery of the first "green" Challenger 650 airframe. The aircraft will be converted to carry an imaging synthetic aperture radar sensor, including moving target indicator (MTI) and inverse search and rescue (ISAR) modes, plus signals intelligence (SIGINT), and sensors. There will be four operator workstations inside.

The company says that it is the only special missions aircraft modification center in the Gulf region. A company official told **AIN** that it aims to provide "80 percent of the capability of other conversions, at a fraction of the price." He said that the UAE was keen to benefit from the transfer of skills in order to establish an indigenous capability.

A rendering of a Challenger 650 after conversion for ISR missions by UAE-based Aquila Aerospace.

That effort is codenamed Project Dolphin and is being conducted by Marshall Aerospace and Defence Group at Cambridge in the UK. The company won the contract in 2013, but the first aircraft was not delivered until later last year. The second Global 6000 is still at Cambridge. They have been fitted with a Collins Aerospace DB-110 long-range electro-optical (LOROP) camera and a SIGINT suite that is believed to have been supplied by QinetiQ. There are also defensive electronic warfare (EW) systems onboard, and maybe also offensive EW. The contract also includes ground stations. Marshall has conducted a long series of test flights from Cambridge, and also from the UK Ministry of Defence test base at Boscombe Down, and from Doncaster Airport.

Project Dolphin has a complex contracting structure that includes a company owned by an Israeli businessman, according to the Israeli newspaper Haaretz. Quoting documents, some of which were leaked to the media as the so-called "Paradise Papers" in 2017, Haaretz reported that total payments of nearly $850 million are involved. **C.P.**

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# Sustainable Aviation Fuel (SAF)
# The Expert Panel

Alternative fuels are slowly but surely working their way into fuel supplies worldwide and many of the turbine-powered aircraft that will fly to Las Vegas for NBAA-BACE will burn some amount of sustainable aviation fuel.

**AIN**'s forum will bring together a panel of industry experts to explain how this fuel is gaining ground, why it is good for engines and the environment, and how you can help move the needle on the use of sustainable aviation fuel in the aircraft that you operate.

## Wednesday, October 23, 2019 | 12:00 pm
## NBAA Annual Convention | Las Vegas, NV

Moderated by
**Matt Thurber**,
Editor-in-Chief
of AIN

**Charles Etter**
Environmental and Regulatory
Affairs, Technical Fellow
Gulfstream Aerospace Corporation

**Steve Csonka**
Executive Director
Commercial Aviation Alternative
Fuels Initiative (CAAFI)

**Keith R. Sawyer**
Manager of
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# Leonardo's missile defense could have a role in bizav

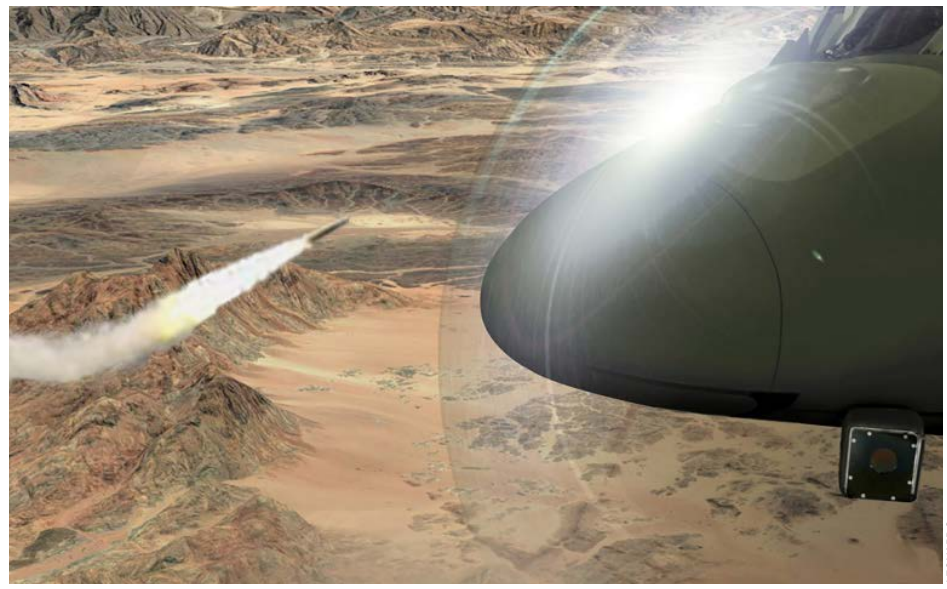
by Beth Stevenson and Mark Phelps

Leonardo recently carried out the first flight of its new Multiple Aperture Infra-Red (MAIR) missile defense system. It was installed on a testbed helicopter to demonstrate an initial ability to collect data during flight, but the company also believes the lightweight, easy-to-install system has promise for the business jet market.

Launched during the Paris Air Show in June, MAIR has since begun its flight-test campaign, which involved a round trip from La Spezia via Genova in Italy. The campaign will now ramp up to start testing the suite of modes in the distributed aperture sensor system. MAIR is also being made available for both manned and unmanned aircraft, including business jets, for which a plug-in configuration will be made available. According to Leonardo, MAIR will be production-ready in the first half of 2020 and delivery-ready by the end of that year.

Leveraging the company's experience in developing sensing and processing for infrared search and track (IRST) systems for the Eurofighter Typhoon and Gripen E fighters, MAIR consists of distributed IR apertures. When data from each is fused together it provides spherical coverage around the aircraft, which can aid with missile warning, hostile fire indication and imaging, and provide IRST capability. In missile-warning mode, MAIR can detect incoming missiles and determine whether or not they are hostile (as opposed to other heat sources), providing early warning with a low false alarm rate, according to Leonardo.

The prevalent threat from heat-seeking missiles is driving development of distributed-aperture 360-degree coverage capabilities for military applications, while the low integration demand this type of system has on an aircraft makes it suited to rotary-wing platforms—and other applications such as business jets—that have limited real estate available, said Leonardo. As technology evolves, this type of system is becoming more commonplace.



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Between four and six MAIR sensors are distributed around a platform for 360 degree missile-defense coverage.

Systems to protect commercial airliners (but adaptable for business jets) from missiles—notably shoulder-launched man-portable air defense systems (manpads)—are available, but their use is not widely reported, presumably on the theory that the less known about the technology and who has it, the more difficult it would be to defeat the defenses. U.S. government research into technology to protect commercial aircraft began shortly after the terrorist attacks of September 11, 2001, and the Department of Homeland Security (DHS) report to Congress on Phases I and II of that program was submitted in July 2006. After less than two weeks, DHS requested that the report be removed from online access.

With Leonardo's MAIR system, between four and six IR apertures can be mounted around the aircraft, each of which weighs only some two kilograms (4.4 pounds) and measure approximately 10 cm (four inches), so it is a light, form-fit system. Although MAIR itself is being tested onboard a helicopter at this stage and is suited to that type of platform, it is being pitched for fixed-wing applications as well, including for surveillance and transport types.

Another system that MAIR complements is Leonardo's Miysis DIRCM system, which can be cued to carry out countermeasures when sensors identify a threat. This response would involve directing a laser into the missile's seeker, which steers it away from the aircraft. Together, the systems provide a more comprehensive defensive aids suite, testing for which is ongoing, the company said. There was no direct mention of whether the Miysis DIRCM technology is similarly suitable for smaller platforms such as helicopters and business jets.

Additionally, the company is exploring different types of distributed-aperture systems as requirements evolve to welcome more modular and scalable offerings, including its Osprey active electronically scanned array radar. This includes up to three flat-aperture panels being integrated around an aircraft, the number of which is determined by space availability on the host platform, the mission set, and cost.

The first customer for Osprey was Norway for its AW101 search-and-rescue helicopters and it has also been selected for the U.S. Navy's Northrop Grumman MQ-4C Fire Scout unmanned rotorcraft. ■

## Drones find niche in wildlife management

Wildlife hazard management is an important element of operations for all airports, as operators want to avoid or mitigate the risk of accidents occurring from wildlife strikes. Thanks to the particular advancement of drone technology in recent years, the practice of wildlife hazard management is being enriched by the development of remote-controlled predator replicas that can descend from the sky and scatter pest birds. Some airports have tried to use replica predator drones as an experimental technique. Gary Searing, executive director of Birdstrike Committee Canada, notes that remote-control predator-like aircraft have been around for decades. "Their effectiveness depends upon the species of birds being dispersed and the skill of the operator," he said.

Drones are a fast-growing sector in aviation, being used for both commercial and recreational purposes. "Some commercial uses are directly useful for airport operations—for example, aerodrome ground lighting inspections—and promise gains in efficiency. Their use by airports as part of their overall wildlife hazard management plan is also a potential benefit of this new technology," said David Gamper, ACI World director of safety.

Appropriate use of the technology requires integration into the airport's approach to wildlife management. "Drones are being used experimentally to manage wildlife from the air and can maneuver over hazardous wildlife to harass, or just be used for surveillance purposes. All drone operations must comply with local/national regulations, and flight rules must be established for the operation of drones on and around each aerodrome. Drone operators should be certified to the degree that the law requires," said Gamper. "Drone technology will probably never replace the need for manned patrols and interventions but could assist with reducing the frequency of patrols. Coordination between the remote monitoring center and operators that might respond to wildlife sightings is required."

While they do provide benefits, drones are unlikely to become a "one-stop" solution to airport wildlife hazards. "Given the investment of time and money required to get permitted and proficient, drones are a specialized method suitable for specialized situations such as waterfowl on ponds or in flocks on fields. Certainly, people will use these devices on many species and in many situations, but I doubt it will become the 'go-to' method for most airport wildlife control," said Searing.

Wildlife hazard prevention specialist Mogens Hansen emphasizes that the use of drones at airports requires a strong focus on operational safety. "How can one ensure that all people at the airport can distinguish between the legal use of a drone and any illegal drones flying around the airport? Such a task requires a great deal of logistical and informative work," he observed. "Moreover, it must be the staff of the bird-control unit who have to deal with the drones. Operating drones against birds should not be a task for external parties lacking the overall expertise in bird control as required of bird controllers."

Model aircraft have been used to deter birds for years at military airfields. "There are many regulatory restrictions for use at civil airfields, but it is still possible to obtain a special permit to do so," said Searing. "Like any tool, it will have a specific role to play in the overall control program. It is not a panacea. What is new is that the incorporation of GPS into these devices can prevent them from encroaching on airport movement corridors."

As drone operations are forecast to surpass the number of manned aircraft operations in the future, developing rules, procedures, and regulations will create the conditions for safe drone operations. "To ensure the safe operation of a drone, especially in close proximity to aircraft and airports, there is a need for awareness and education of drone operators. There is also a need for the states to ensure that all drones operate within clearly defined and known limitations as well as for enforceable legal and/or administrative sanctions for using drones in an unsafe or dangerous manner," said Gamper. **M.P.**

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# Collins and SES launching LuxStream 25 Mbps satcom

by Matt Thurber

Vista Global is the launch customer for LuxStream, a new high-speed satellite communications system developed by Collins Aerospace that runs on Ku-band satellites operated by SES. Collins will provide airborne hardware and its ArincDirect unit will be the service provider for the broadband network operated by SES. Vista Global's VistaJet and XOJet fleets will carry LuxStream systems, with the first to be installed in VistaJet's 36 Bombardier Globals.

While some satcom hardware manufacturers don't provide the service to aircraft operators, Collins is making the systems, including the onboard router, and selling satellite airtime to operators. "It's important for us to bring that total solution together," said LeAnn Ridgeway, v-p and general manager of Information Management Services for Collins Aerospace. "Think about how complex these systems are getting, into true high-speed broadband, and there is so much more you can do with that. It fits more in our sweet spot and the complexities of these aircraft."

As the hardware manufacturer and service provider, Collins will be able to help customers set up their routers, move data on and off the airplane, and manage software applications that benefit from high-speed connectivity. "It's important to have that complex integration and all those working together," she said, adding that cybersecurity is an important component. "We have to do that all day long, and we feel like we're the right people to ensure [operators] have proper cybersecurity."

LeAnn Ridgeway, v-p and general manager of Information Management Services for Collins Aerospace

> **"Think about how complex these systems are getting, into true high-speed broadband, and there is so much more you can do with that."**

Network speeds on the SES systems will be up to 25 Mbps in the U.S. and 15 Mbps elsewhere, and passengers will be able to stream HD video and use multiple devices simultaneously. Coverage is global except for over polar regions.

The LuxStream hardware consists of an Astronics T-series tail-radome-mounted antenna, the Collins Cabin Router, and KuSAT-2000 satcom terminal. The terminal includes an antenna control and modem, block-up converter, and block-down converter. System weight, including antenna, is 48 pounds, plus three pounds for the router. The router will also provide access to ArincDirect applications that will help operators manage their LuxStream systems.

Collins Aerospace is targeting the aftermarket for LuxStream sales, primarily large-cabin jets such as Globals, Challengers, Falcons, and Gulfstreams. The company is continuing its relationship with Inmarsat and Honeywell to sell the JetConnex Ka-band satcom, according to Lupita Wilson, Collins' principal marketing manager for cabin systems.

SES operates more than 70 satellites in geostationary orbit and medium earth orbit. Its SES-15 Ku-band satellite became operational in January and covers the U.S., enabling the 25 Mbps service over the U.S.

The first supplemental type certificates, which will be developed by Collins dealers, will be for VistaJet Globals and also Gulfstream IVs and should be completed in the first quarter of 2020 when the LuxStream network goes live.

LuxStream's "system list price is in line with all high-throughput satcom terminals in the market," Wilson told **AIN**. Satcom airtime will be available on a flexible basis, but all customers will see the same network speeds. Customers will be able to purchase airtime per megabyte or for a fixed monthly rate. "Our pricing model was designed to provide operators options that best meet the aircraft's mission, whether it is utilized daily, weekly, or monthly...without sacrificing speed," she said.

"As first-generation satcom/cabin connectivity solutions are coming to their end of life, LuxStream has a very bright future," said Ridgeway. "New high-throughput satellites are coming, and it's time to switch out first-generation hardware and move to high-throughput. "Everybody is looking for a faster solution. We've got the right solution at the right time." ■

## Magpie vision-based guidance system set to support autonomous flight operations

Two Switzerland-based companies are preparing to launch a new vision-based guidance system for unmanned aerial vehicles (UAVs) that they say will mark a breakthrough in the use of artificial intelligence (AI) in autonomous aircraft operations. The new Magpie system jointly developed by Daedalean and UAVenture provides features such as safe landing advisories and visual navigation to sustain operations during GPS outages.

Magpie will soon be available to commercial UAV operators using UAVenture's existing AirRails flight control system. Daedalean also is using the technology for its planned AI-based autopilot intended to support autonomous operations of both new generation eVTOL aircraft and existing rotorcraft and fixed-wing aircraft. It intends to add computer vision and vision-based functions for its autopilot, which it says will eventually be the first certifiable autopilot to support autonomous aircraft operations to Eurocae's highest DAL-A standard.

According to Daedalean, the Magpie system "is the ideal demonstrator of the safety-certifiable neural networks that process vision, enabling the features that nowadays require the human pilot's eyes and visual cortex." The existing AirRails system relies on laser- and radar-based distance sensors for accurate landing or terrain following. The partners say this will be enhanced by adding visual sensors, which will bring benefits such as avoiding the need to pre-mark landing spots and the ability to operate in a natural environment and recognize dynamic obstacles on the ground.

Magpie, which has been in development and flight testing since February 2018, will provide real-time vision-based detection of emergency landing locations. It will also deliver vision-based navigation and attitude estimation in situations when GPS guidance is not available. The hardware weighs less than 500 grams (1 pound).

Separately, Daedalean has selected the Unigine 3D Engine virtual environment simulation platform to support of its AI autopilot. It will use the system to train neural networks to perform the visual cortex functions needed for the autopilot. According to Daedalean CEO Luuk van Dyke, this process would otherwise have required an unfeasible number of flights to train the neural networks to deal with every conceivable scenario. **C.A.**



## News Update

### Duncan Obtains SmartSky STC for Challenger 600 Series

Duncan Aviation received FAA approval for an STC permitting installation of SmartSky's Wi-Fi system on Bombardier Challenger 601, 604, 605, and 650 business jets. Certification coordinator Russ Kromberg worked with SmartSky's technical team on antenna placement to achieve the best connections and speeds inside the cabin.

The SmartSky system, using a mix of air-to-ground 4G LTE and 5G technologies, enables onboard users to hold in-flight conference calls, stream movies, and upload and download content during flight. Portions of the network should become available later this year.

### FAA Approves IEAG's STC for JetWave on Global Variants

The FAA has approved Innotech-Execaire Aviation Group's STC for installation of Honeywell's JetWave high-speed satcom hardware on the Bombardier Global Express, XRS, and 6000. It supplements an existing Transport Canada STC for installation of the system and radome on the Global variants, as well as radome installation on Global 5000s.

Follow-on approvals from the European Union Aviation Safety Agency are expected in the next few months.

### StandardAero Completes Viasat Satcom STC on Globals

MRO provider StandardAero secured supplemental type certification (STC) for installation of Viasat Ku, Ka, or Ku/Ka satcom equipment aboard Bombardier Global models. StandardAero's organization delegation authorization team in Springfield, Illinois, completed the STC.

Global communications provider Viasat in October 2018 named StandardAero the exclusive distributor of its high-speed connectivity package, including Ka-band and dual-band Ka-/Ku-band equipment for all Bombardier Global Express, XRS, 5000, and 6000 aircraft.

### FAA Approves Elliott's Standby Attitude Module STC

The FAA has approved Elliott Aviation's STC for Mid-Continent Instruments and Avionics' MD302 Standby Attitude Module (SAM) as part of its Garmin G5000 avionics upgrade for the Cessna Citation Excel and XLS. The STC also allows for installation of the Mid-Continent unit in Honeywell Primus 1000-equipped Excels and XLSs.

Mid-Continent's MD302 provides attitude, altitude, airspeed, and slip information during both normal operation or primary instrument failure. It fits in less panel space than a standard set of two-inch mechanical attitude, altitude, and airspeed indicators.

Elliott will offer it as an option in its future Excel/XLS G5000 installations. It currently has 17 of those installations scheduled.

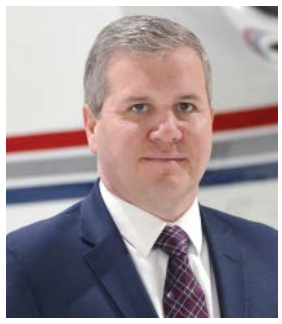
# AEA revamps jobs board in pursuit of talent

by Jerry Siebenmark

The Aircraft Electronics Association (AEA) has launched a revamped online jobs board for its members in an effort to attract and retain avionics technicians, as well as related and complementary positions. "The need for technical talent continues to be an issue for AEA member repair stations and manufacturers," AEA president and CEO Mike Adamson said. "The primary purpose of the new jobs board is to make it easier for AEA members to find their next avionics technician, quality manager, inspector, sales representative, or engineer."

Searchable by keyword, company name, geographic location, and type of position, the jobs board (aea.net/jobs) allows AEA member companies to post open positions free of charge for 30 days. For positions that remain unfilled following the first 30 days, member companies are allowed to re-post the position, also at no cost.

"I strongly believe that avionics is the most exciting field in aviation, as it combines high-tech with modern airframes, advanced propulsion systems, and NextGen communication, navigation, and connectivity solutions," Adamson added. "But with workforce retirements, competition from other high-tech industries, and a growing fleet, our industry is faced with the important challenge of recruiting and retaining the next generation of qualified aviation professionals." ■



AEA president and CEO Mike Adamson

**"The need for technical talent continues to be an issue for AEA member repair stations and manufacturers."**



## Duncan: 5,400 business aircraft to bust ADS-B deadline

With the FAA deadline drawing ever closer, almost a quarter of the U.S.-registered business jet fleet and nearly half of the country's turboprop fleet is not currently equipped with ADS-B, according to research released late last week by Duncan Aviation. The company's report—which is based on data from its proprietary customer database, the FAA, and other industry sources—states that 5,400 business aircraft likely won't be compliant by the Jan. 1, 2020 deadline.

Duncan said 23 percent of the U.S.-registered business jet fleet, or 3,384 aircraft, still don't comply. "At this rate, we anticipate that at least 1,660 business jets will not be in compliance when the calendar flips to January 1," said Duncan Aviation satellite operations manager Matt Nelson.

Meanwhile, the report says 49 percent of the U.S. business turboprop fleet is not yet in compliance and that more than 3,800 of them will still need ADS-B upgrades at the beginning of next year.

"I encourage operators who are not in compliance to consider investing in the upgrade yet this year," Nelson said. "Right now, we still have some availability at some of our satellite shops for ADS-B work and can turn aircraft in less than 10 days." Duncan Aviation said it holds or has access to 42 STCs for FAA-approved ADS-B equipment for more than 100 business aircraft models. **C.T.**

# Embraer delivers first E195-E2 to Azul

by Gregory Polek

First delivery of the Embraer E195-E2 last month not only marked the start of what the Brazilian manufacturer hopes will be a continued run of success in the segment of the small narrowbody market up to 150 seats. It also heralded news of a plan by JetBlue founder and Azul chairman David Neeleman to launch yet another new airline, using E195s in the U.S.

The largest airplane ever built by Embraer, the E195-E2 goes to Brazil's Azul at a time AerCap CEO Angus Kelly called a unique moment in the company's economic and industrial history and as the country's largest domestic carrier embarks on the next phase of its rapid development. Appearing with Kelly at Embraer's manufacturing campus in Sao Jose dos Campos, Brazil, Neeleman thanked the leasing company executive "for [his] support and all [his] money." AerCap will lease roughly half of Azul's E195-E2s, including part of the order for 51 so far publicized.

GREGORY POLEK

(l to r) Azul chairman David Neeleman, AerCap CEO Angus Kelly, Azul CEO John Rodgerson, and Embraer Commercial Aviation president and CEO John Slattery celebrate the delivery of Azul's first E195-E2 narrowbody airliner, the largest airplane ever built by the Brazilian OEM.

### New U.S. Airline in Works

Now flying four aircraft types, including ATRs, Airbus A320s and A330s, and E190s/E195s, Azul expects the biggest E2s to operate for seat-mile costs as low as its "larger airplanes," helping lower fares and stimulate demand to still more untapped markets, said Neeleman. Plans call for the E2s to eventually replace all the E1s, as many as 30 of which Neeleman said he planned to start sending to the U.S. to launch a new low-fare airline next year. The new carrier would operate on a certificate separate from the AOC that Neeleman has secured for an Airbus A220 operation scheduled to launch in 2021 in the U.S., loosely known as Moxy.

For Azul, Neeleman revealed he tried to convince Embraer to introduce the E195-E2 before the smaller E190-E2. That didn't happen, of course, but Neeleman expects the bigger airplane to prove worth the wait. "This airplane is going to allow us to have the same seat-mile costs as our larger airplanes, which means we can fly to more destinations, we can fly with more frequency, and we can offer even lower fares," he said. "There's a lot of conversation in Brazil about [high air fares]. Unfortunately, the costs of doing business in Brazil are high. There are a lot of government regulations; there are a lot of things that could easily be removed that could make our jobs easier in lowering fares. But this airplane will allow us to lower airfares on certain markets and stimulate demand."

Azul plans to fly the first of 51 E195-E2s from its main hub in Campinas to Brasilia by the end of October. An aggressive service entry plan will see a total of six airplanes arrive at Campinas by December. Embraer plans to deliver 18 E195-E2s by the end of the year.

"It's a historic moment to be picking up the largest aircraft ever manufactured in Brazil," said Azul CEO John Rodgerson. "For many years the skies of Brazil had aircraft from Brazil fly through it but not over it. And now finally, because of Azul, we're flying these aircraft all throughout Brazil. We fly to more than 100 cities and this month we now fly 900 flights a day in Brazil. Our next closest competitor has 720 flights a day."

Rodgerson said Azul plans to double in size over the next five years, largely using the Embraer aircraft. This year alone it expects to add 2,000 employees to its 13,000-strong workforce and invest $1.5 billion in new airplanes. ■

## Boeing's 777X faces further delays

The Boeing 777X program suffered another setback last month when a static test airframe failed its final high-pressure load test, potentially resulting in a further delay to a project whose first flight date had already slipped due to earlier problems involving its General Electric GE9X engines.

The incident, first reported in the Seattle Times, happened at Boeing's widebody facility in Everett, Washington. The so-called ultimate load test forces the wings to bend to 150 percent of the maximum load they would likely encounter in flight while pressure gets applied to the skins of the wing and fuselage. In this case, a cargo door blew off its hinges under the extreme pressure, forcing Boeing to investigate the cause and possibly revisit design details. The overall testing program continues, however, according to a Boeing spokesman.

The latest incident came less than two months after Boeing confirmed it had moved the target for first flight of the 777X to early next year from the second half of 2019 following consultations with engine maker GE, whose new GE9X encountered delays caused by a need to redesign a stator in the front part of the compressor that had shown more wear than anticipated during testing.

Still, at the time, Boeing CEO Dennis Muilenburg expressed satisfaction with the development headway Boeing has made with the rest of the 777X, calling it "one of the cleanest development programs that we've seen." Although Muilenburg admitted to "some pressure" on the schedule, the program's entry into service target officially remained the end of 2020.

About three weeks later, Boeing confirmed reports that it had slowed the development of the second version of the 777X—the 777-8—to "reduce risk." While Boeing hadn't yet disclosed a definitive certification schedule for the 350- to 375-seat 777-8, expectations that entry into service would happen before Qantas went ahead with plans to open routes from the east coast of Australia to London by late 2022 or early 2023 now have proved wrong. **G.P.**

## News Update

### GKN Aero Starts Restructuring

GKN Aerospace plans to reduce its employee headcount by about 1,000 as part of a wide-ranging restructuring that will see it combine its four independent divisions into what it calls a single connected network of global sites supported by shared services.

The plan to integrate into a single business comes following rapid growth through acquisition since 2006, since which time its annual revenues grew from £600 million ($721 million) to £3.5 billion in 2018.

GKN plans to execute the reorganization within the next two years. It said the employee cuts will involve non-production roles and result from a reduction in layers of management and support functions. The company added that it will aim to manage as much of the reduction as possible through "natural means," such as the usual turnover of people, vacancy management, and redeployment of employees.

### UAC Bullish on Narrowbodies but Sees Innovation Gap

Delivering its latest 20-year commercial aircraft market outlook at MAKS 2019 in late August, United Aircraft Corporation predicted narrowbodies will continue to grab increasing market share well into the future, both in Russia and around the globe. Out of a total 20-year demand of 44,310 airplanes, narrowbodies will account for some 31,000, or about 59 percent of the entire fleet by 2038, it concluded.

Appearing during the forecast presentation, UAC competition outlook survey projects lead Igor Panchenko spoke about a trend toward growing overcapacity in the widebody segment in particular and suggested the sector would contribute to lower profit margins due to the resulting pricing pressure. Overall, the industry will see a delay in innovation and a continuing expenditure on production capacity into the 2040s, he insisted.

"Of course, if UAC gets a state decree to revitalize the Tupolev 144 supersonic passenger jet, it will be revitalized," explained a UAC spokesman. "But from the economic point of view, there is no basis for this kind of innovation implementation."

### AirAsia X Buys A321XLRs, Trims A330neo Commitment

AirAsia X in late August became a new customer for the Airbus A321XLR, though it decided to buy only 12 A330-900s rather than 34 as announced during the Farnborough Air Show in July last year. Although at the time the parties presented the commitment for another 34 A330neos as an order, Airbus never added it to its order book, raising speculation that the Malaysian low-cost carrier group might consider other options for its long-haul unit. It did, and on August 30 signed a firm order for 30 A321XLRs in Kuala Lumpur.

# MC-21 customers surface as it debuts at MAKS show

by Gregory Polek

As the MC-21 made its air show debut at Russia's recent MAKS 2019 trade show, United Aircraft Corporation introduced Russia's Yakutia Airlines and BKR of Kazakhstan as previously unidentified customers for the new narrowbody. Now claiming orders for 175 copies of the jet, UAC has identified three airlines as operators, most notably launch customer Aeroflot, which has placed an order for 50. Yakutia has agreed to take five and BKR 10 of the airplanes.

The revelation of two more customers came as questions continued to plague UAC and MC-21 manufacturer Irkut over the threat of further U.S. sanctions, which have already forced the companies to source composite material for the airplane's high-aspect-ratio wings from local suppliers. Meanwhile, the threat of more sanctions that could block further availability of the airplane's Pratt & Whitney PW1400G engines has Irkut accelerating the development of a version powered with Russian-made Aviadvigatel PD-14s.

Briefing reporters at the show, Irkut executives nevertheless insisted on the commercial availability of both engine types. Irkut general director Ravil Hakimov acknowledged that the sanctions have affected the program, but that the company's "technical solutions" have settled the issue. "I don't see any need to comment further," he concluded.

MC-21 chief designer Konstantin Popovich noted that PD-14 would receive its certification addendum to fly on the MC-21 next year. "Airlines would like to have different options; they want more selection," he said.

While the MC-21's designers promote the product as a more technically advanced piece of equipment than anything available now, the airplane will sell for 20 percent less than its direct competitors, said Hakimov. "The airlines are all saying that if [the MC-21] performs as you say there will be a third player in the market [apart from Boeing and Airbus]," he added.

Flying the third PW1400G-powered test aircraft at the show, Irkut has passed the needed testing milestones to allow lifting virtually all operational restrictions, according to Popovich. Planning on building 72 aircraft a year within six years of the start of production, the company already has begun making production parts because, he added, testing results have engendered enough confidence in the fidelity of the design to move forward with fabrication.

At MAKS, the MC-21 graced the skies above the Zhukovsky Aerodrome during the flying exhibits, as test pilots Oleg Kononenko and Vasily Sevastianov demonstrated its high maneuverability at speeds of up to 400 km/h and altitudes of up to 1,000 meters. During maneuvering, the pilots put the airplane in a steep climb and also banked to 90 degrees. The third airframe, first flown in March 2019, comes with a cabin interior, inspected on the show's opening day by Turkish President Recep Tayyip Erdogan with his Russian counterpart, Vladimir Putin, serving as host. All three of the test aircraft now flying rely on Pratt & Whitney PW1400G turbofans, while the fourth, now under assembly, will feature PD-14s. The Aviadvigatel design house promises a 3 to 5 percent advantage in operational cost per flight hour through lower maintenance compared to the Pratt geared turbofan.

So far, Irkut has ordered only five PD-14s. Of those, three (left, right, and a spare) arrived in Irkutsk in December last year and remain in storage, awaiting installation in the fourth flying airframe. At MAKS, the engine's manufacturer, Perm Engine Company (local acronym PMZ), said it had begun final assembly of two more engines for a second PD-14-powered MC-21 prototype in view of planned delivery in the first quarter of 2020. ■

GREGORY POLEK

(Left to right) Irkut general director Ravil Hakimov, general designer Oleg Domchenko, MC-21 chief designer Konstantin Popovich, MC-21 chief test pilot Roman Taskaev, and Irkut marketing chief Cyrill Budaev answer questions from reporters at MAKS 2019.

## 737 Max crisis could alter FAA-EASA ties

European Union Aviation Safety Agency (EASA) executive director Patrick Ky signaled that the Boeing 737 Max grounding and the privileged relationship Boeing allegedly enjoyed with the FAA during the certification of the model could trigger a "very strong change" in the hierarchy of the relationship between the certification authorities. His comments affirm concern over a "de-alignment" of the FAA and EASA, expressed on several occasions by Airbus CEO Guillaume Faury. Speaking during an exchange of views with the European Parliament's transport committee last month, Ky said that the FAA finds itself in a "very difficult situation."

"It is very likely that international authorities will want a second opinion, or a further opinion [once the U.S. FAA clears the Max to fly]," he noted. "It was not like this a year ago."

Ky said EASA did not audit the FAA and how it certified the Max and the problematic maneuvering characteristics augmentation system (MCAS), which safety authorities consider a major cause of the Lion Air and Ethiopian Airlines Max 8 crashes. However, the Cologne-based body is part of the international panel of safety technicians scrutinizing how the FAA allowed the airframer to oversee parts of its own certification. "What is certain is that the authorities have a critical eye on it," Ky said, confirming an observation by an MEP that Boeing "auto-certified" the MCAS.

"Yes, there was a problem in this notion of delegation of the MCAS assessment [to Boeing]," he continued, adding that the conclusion will appear in the Joint Authorities Technical Review's report scheduled for publication later that month. "I have a lot of respect for my counterparts in the FAA; they have strong ethics. But what is needed is a change of their methodology," explained Ky.

EASA banned the Max from flying to and in European airspace on March 12. It set four conditions before the Max can return to service in the continent, including the certification by EASA itself—without delegating to the FAA—for all design changes proposed by Boeing. In addition, EASA has asked for a "broader review of the design of safety-critical systems" of the Max—domains that the EU-U.S. bilateral safety agreement delegated to the FAA. EASA also wants a "complete understanding" of the two accidents from both a technical and operational point of view and for adequate training of flight crew.

EASA, in theory, could set its own flight crew requirements for Max operations, Ky told MEPs. "I can guarantee you that the training requirements for the return to service of the Max will be defined by us and us only," he stated. However, he also said it would "not make sense" to have different training requirements for the Max between the EU and the U.S., or the rest of the world. EASA communicated its flight and simulator requirements—a total of 70 test points—already at the end of May. Simulator evaluations took place in June and July.

Ky noted an "unprecedented level of effort" put into the Max involving around 20 multi-disciplinary experts including test pilots and engineers by EASA. The agency holds two to three weekly web-based meetings with Boeing and has reviewed more than 500 documents and actions. **C.B.**

## Mesa signs for up to 100 SpaceJet M100s

Mitsubishi Aircraft and Phoenix-based Mesa Airlines have signed a memorandum of understanding covering a potential firm order for 50 SpaceJet M100 regional jets and purchase rights on another 50, the Japanese manufacturer announced at the Regional Airline Association convention in Nashville, Tennessee, early last month. In a statement, Mesa said it would operate the jets under capacity purchase agreements with partner major airlines starting in 2024.

The contract with Mesa represents a commercial breakthrough for the M100, an extensively revamped iteration of a 76-seat concept Mitsubishi had called the MRJ70. Scheduled for certification in 2023, the M100 would fly to a range of 2,000 nm, while seating 76 passengers in a three-class configuration, requiring Mitsubishi to seek advances to the airframe to lower weight—including the addition of new lightweight materials such as composites and different metallic alloys. Most significantly, the airplane would meet the 86,000-pound mtow takeoff weight limit specified in the pilot union labor contracts at all three major U.S. airlines.

Mitsubishi considers the U.S. by far the biggest market for the SpaceJet, and when development began more than a decade ago, most company executives expected scope clauses at the major airlines to relax enough to allow operation of the MRJ90—since rebranded the M90—at their regional affiliates. Market conditions and the appetite by mainline airline executives to confront their pilot groups over the issues have changed, however, and Mitsubishi's customers have clearly indicated they don't plan to further push for concessions by the time contract-amendable dates usher in the start of the next round of collective bargaining, soon after the turn of the decade.

The situation has essentially limited the 92-seat M90's future customer base to markets outside the U.S. **G.P.**

VLADIMIR KARNOZOV

Russian Helicopters plans to hand over a VIP-configured Mi-38 to a Russian customer in short order.

# VIP-configured Mi-38 wins Russian Civil Aviation nod

by Vladimir Karnozov

Russian Helicopters demonstrated three versions of the Mi-38, including baseline for 30 passengers, military for 20 armed soldiers, and VIP for eight travelers (up to 11 optionally) at the MAKS 2019 show that ran from August 17 to September 1. The manufacturer characterizes the latter as "the first serial example with higher comfort cabin."

The Mi-38 won type certification in December 2015, according to which this helicopter with a 15.6-tonne maximum gross weight can carry a five-tonne cargo over a distance of up to 1,300 km. Two years later, the helicopter won a supplement permitting passenger transportation.

At MAKS 2019, Russia's Federal Air Transport Agency "Rosaviatsiya" awarded the manufacturer a document approving "major change to the type certificate" for the VIP version. The civil aviation authority also issued approval for installation of a reworked air conditioning system for the passenger and cargo cabin.

Speaking at the ceremony, Russian Helicopters CEO Andrei Boginsky said: "The certification of the Mi-38 in the version dubbed the Saloon opens new perspectives for the type in the domestic and export markets. We are demonstrating this version for the first time at this year's MAKS. Soon thereafter, this machine will go to a Russian buyer. We also expect foreign customers to turn up."

On another occasion, Boginsky added: "The Mi-38 is a next step forward for the local industry. The combination of flight performance, fuel consumption, and payload-range capabilities make this type interesting for commercial and governmental operators. Testing of the Mi-38 with a higher comfort cabin has been completed, and we are ready to commence shipments of such helicopters. Negotiations are in progress with a leasing company to support their sales."

In an official statement, Russian Helicopters highlighted recent improvements to the baseline design that include refined aerodynamic shaping of the fuselage and engine cowling, as well as reshaped shields on the main rotor mast and swashplate.

During MAKS 2019, two Mi-38s flew in a larger formation and occasionally performed a solo lasting up to five minutes. ■

# Airbus delivers first U.S.-made EC145e

by Mark Huber

Airbus Helicopters last month delivered the first EC145e twin produced at its Columbus, Mississippi assembly plant. The helicopter is part of a 25-ship order placed last year by Metro Aviation for its air medical services business. Deliveries on the order will continue over four years.

"Airbus Helicopters is pleased to deliver this EC145e, now the third Airbus model to be produced in the U.S. by workers in our Columbus plant," said Romain Trapp, president of Airbus Helicopters Inc. and head of the North America region. "For more than a decade, our workforce has been producing high-quality aircraft for both the U.S. Army and more recently our commercial operators in North America." The EC145e, UH-72A, and H-125 single are all assembled in Columbus.

Metro plans to operate some of the new EC145e helicopters in its own medevac fleet but said it would also remarket others in medevac, utility, and VIP configurations. While the EC145e was originally developed as VFR-only, Metro and Genesys Aerosystems recently developed an IFR avionics STC for the helicopter. ■


Metro Aviation recently accepted the first Airbus Helicopters EC145e twin produced in Columbus, Mississippi.

## News Update

### Bell 407GXi Gets IFR Approval

The single-engine Bell 407GXi has received FAA supplemental type certificate (STC) approval for IFR operations. The U.S. Navy requires the approval for all candidates for its Advanced Helicopter Training System competition. The winning candidate will replace the Navy's fleet of aging Bell TH-57 Sea Rangers, a derivative of the model 206. Civil Bell 407s are manufactured at the company's plant in Mirabel, Canada. The company said any training aircraft delivered to the Navy would be assembled in Ozark, Alabama. The 407 is currently the platform for the Navy's unmanned MQ-8C Fire Scout. That aircraft is currently built in Ozark. More than 1,600 Bell 407s are in service globally. The fleet has accumulated nearly six million flight hours. The 407GXi is equipped with the Garmin G1000H NXi flight deck.

### U.S. Army Takes 200th Airbus Lakota Trainer

Airbus Helicopters has delivered the 200th UH-72A Lakota for training operations with the U.S. Army Aviation Center of Excellence in Fort Rucker, Alabama. The helicopter is the company's 440th Lakota delivery to the Army since the program began in 2006. Nearly 1,500 U.S. military student pilots have trained on the UH-72A. The aircraft is also utilized by the U.S. National Guard for counter-narcotic, border security, and disaster-response missions. The UH-72A is a derivative of the twin-engine EC145 and is operated by U.S. Navy, U.S. Army, and other military units worldwide. The UH-72A is built in Columbus, Mississippi, where Airbus has manufactured nearly 550 helicopters for the U.S. government. Airbus Helicopters has more than 675 aircraft in operation for the U.S. Army, U.S. Navy, U.S. Coast Guard, and the Department of Homeland Security. The company is also proposing its light twin H135 for the U.S. Navy's Advanced Helicopter Training System.

### Leonardo Teaming With CAE for USG Helo Training

Leonardo and aerospace training company CAE USA have joined forces to offer integrated helicopter training solutions for the U.S. government market. The companies recently signed a memorandum of agreement (MoA) that is focused on delivering customer-specific, tailored helicopter-and-training packages to U.S. government operators and Foreign Military Sales (FMS) customers. The companies will offer integrated training solutions that include aircraft, simulators, and courseware in a cohesive flight training package that includes integrated, live, and virtual training developed for specific aircraft missions. Leonardo is expanding its government business, winning a U.S. Air Force contract with Boeing for 84 MH-139 medium twin helicopters last year and fielding its TH-119 single as a replacement candidate for the U.S. Navy's fleet of primary training helicopters.

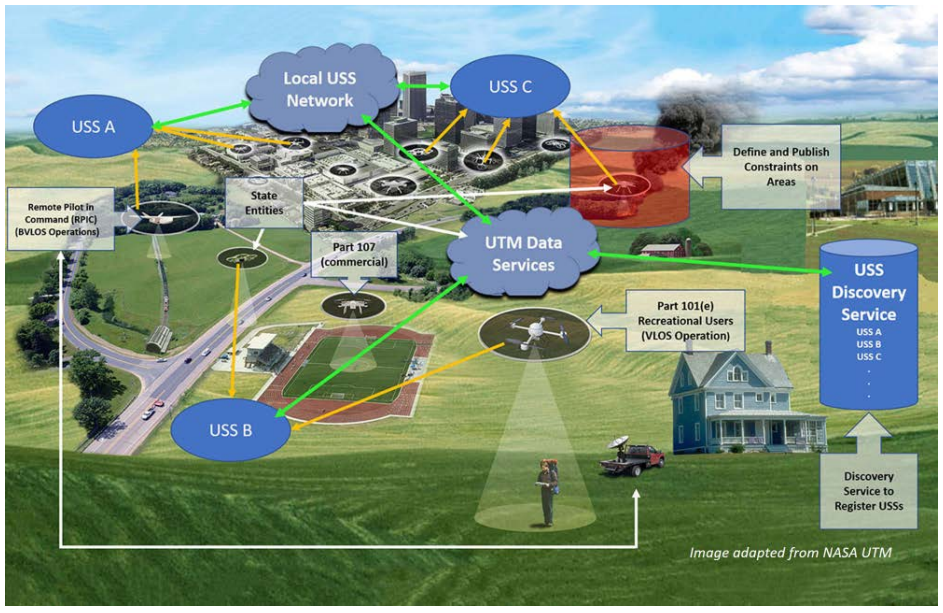
# Demo flights show viability of UAS traffic management

by Mark Huber

Demonstrations of the UAS Traffic Management Pilot Program (UPP) have shown that multiple, beyond visual line of sight (BVLOS) drone operations can be conducted safely at altitudes below 400 feet in airspace where air traffic services are not provided, the FAA and NASA announced last month. The results from the UPP will provide a proof of concept for UAS traffic management capabilities currently in research and development, and the basis for initial deployment of UTM capabilities by the FAA. In January, the FAA selected three UPP test sites: the Mid Atlantic Aviation Partnership (MAAP) at Virginia Tech; the Northern Plains UAS Test Site (NPUASTS) in Grand Forks, North Dakota; and the Nevada Institute for Autonomous Systems (NIAS) in Las Vegas, Nevada.

The first demonstration was conducted by the Mid-Atlantic Aviation Partnership (MAAP) at Virginia Tech on June 13 and consisted of separate flights that delivered packages, studied wildlife, surveyed a corn field and covered a court case for TV. Conducted near an airport, all four flight plans were submitted through a service supplier and received approval to launch as planned. During the demonstration, an EMS helicopter pilot submitted a request for a UAS Volume Reservation (UVR), an alert used to notify nearby drone operators of the emergency. Drone deliveries were re-routed until the UVR was completed. Each operation was conducted without conflict.

The second demonstration, which involved the Northern Plains UAS Test Site (NPUASTS), took place in Grand Forks on July 10. This demonstration was also near an airport and consisted of photo flights, location scouting, and post-storm power line inspections. During one of these flights, a drone pilot received a UVR alert for a transiting medevac helicopter and landed before the alert became active.




Creating a safe, practical UAS traffic management system is complex, as this graphic from the UAS Traffic Management Pilot Program shows.

The third demonstration, which involved the Nevada Institute for Autonomous Systems (NIAS), took place in Las Vegas on August 1 and involved golf course and real estate survey and photo flights and the scan of a nearby lake. All three operators accessed UAS Facility Maps and worked with a UAS Service Supplier (USS) to receive the proper approvals to conduct their flights. During the demonstration, a fire erupted at one of the golf course clubhouses and a helicopter was sent to contain the fire. First responders submitted a request to a USS to create a UVR. The UVR information was shared with the FAA and public portals that notified each of the UAS operators that the firefighting helicopter was on its way to their flying area. The operators were notified and either landed or continued flights at safe distances. ■


A proposed bill from a Hawaii congressman would effectively end helitours in the U.S. It would impose a 55-dB noise limit on helicopters, which no current-production machine can meet. Even the quiet Airbus EC130B4, which is operated by Hawaiian helitour operator Blue Hawaiian Helicopters, can't meet this threshold.

# Bill would effectively end most helitourism in U.S.

by Mark Huber

Citing a pair of recent high-profile helitour crashes in his home state, U.S. Rep. Ed Case (D-Hawaii) on August 28 proposed legislation that would all but eliminate the industry.

His "Safe and Quiet Skies Act" would direct the FAA to impose a series of restrictions on the industry, including flying no lower than 1,500 feet agl; prohibiting flights over military installations, national cemeteries, national wilderness areas, national parks, and national wildlife refuges; and forbidding pilots to act as tour narrators while flying. It would also require helicopters to have a noise signature no greater than 55 dbA during overflight over any "occupied area," be it commercial, residential, or recreational—a standard that no currently certified helicopter can meet.

The bill would also scuttle federal pre-emption with regard to airspace and air operations by giving states and localities the power to "impose additional requirements—stricter than the minimum national requirements called for in the act—on tour flights."

At the press conference in Honolulu announcing the legislation, Case proclaimed, "My Safe and Quiet Skies Act will further mandate strict regulation of commercial air tour operations to address defense risks and community disruption, including no overflights of defense, park, cemetery, and other sensitive installations and minimum altitude maximum noise limits on all flights. Additionally, it will allow states, localities, and tribes to impose stricter regulations on tour flights in their jurisdictions, to include time, route and frequency, with required public engagement."

Case's bill is just the latest in a series offered by congressional representatives in recent years designed to restrict helicopter operations from New York to Los Angeles that attempted to, among other things, impose minimum helicopter operating altitudes, set a curfew for hours of operation, and mandate flight paths. The FAA has deemed most of these efforts as unworkable and hazards to flight safety.

His bill would have a major impact on Hawaii. The Hawaii Helicopter Association estimates that helicopter operators annually contribute $150 million to the state economy. The association points out that it has endeavored to address the concerns of citizen groups and regulators by investing more than $100 million in quiet technology helicopters such as the Airbus EC130B4 in recent decades, adopting "fly neighborly" programs as advocated by the Helicopter Association International (HAI), and employing the PlaneNoise noise reporting and measuring system since 2017.

The April 29 fatal crash of an air-tour Robinson R44 into the street in a suburban Honolulu residential neighborhood appears to be providing the most recent impetus for not only Case's bill, but also similar moves from state legislators. Following that crash, Hawaii State Rep. Cynthia Thielen (R) called on the FAA to prohibit air tours over residential areas and national parks and called for the immediate grounding of helitour flights in Hawaii pending an investigation.

All three aboard that aircraft were killed. The pilot was new to Hawaii. In its preliminary report on the accident, the NTSB noted that weather three miles from the accident site was reported as visibility four statute miles, broken clouds at 1,800 and 2,800 feet agl, overcast clouds at 3,900 feet agl, and light rain. ■

## MAKS is stage for Kamov Ka-62 flying debut

The Kamov Ka-62 made its flying debut at MAKS 2019, held from August 17 to September 1. The helicopter flew daily in a formation and performed a three-minute solo on two occasions during the show. According to Russian Helicopters, its plant in Arseniev on the Pacific coast has so far completed three operable prototypes. "We expect to win type certification for the passenger version in 2020," Russian Helicopters CEO Andrei Boginsky told journalists at the show.

The type hovered for the first time in April 2016, and 13 months later performed its first level flight lasting 15 minutes. Initial trials highlighted the need for a number of design changes. These included strengthening of the tail rotor and empennage and some alternations to the transmission. Following implementation of these and other changes, the first operable prototype resumed flying in August 2018. It made a safe round trip to Vladivostok the next month.

The Ka-62 is a civilian version of the Ka-60 Kasatka multirole helicopter developed for army aviation but rejected by the intended customer because of costs. The respective industrial effort has had numerous "launches" and "relaunches." In 2011, the Russian Helicopters merger accepted program leadership, and invited foreign companies to join in.

This call attracted Safran Helicopter Engines, which agreed to provide the turboshaft engines. The Ardiden 3G develops 1,780 shp at max continuous mode and up to 1,940 shp in emergency (for two and a half minutes) compared to 1,300 and 1,550 shp, respectively, for the indigenous RD-600V powering the Ka-60. Zoerkler of Austria promised a gearbox and transmission, while Aerazur Zodiac of France a crash-resistant fuel system.

In the wake of the Crimea annexation and Western sanctions that followed, the Kremlin demanded a reduction in foreign content on a number of ongoing aerospace programs. This caused additional delays to the Ka-62 program. As part of the indigenization effort, the type received "a completely indigenous" avionics set from Transas Aviation, but recently the responsibility for it has been accepted by the Ramenskoye Instrument design bureau (RPKB).


VLADIMIR KARNOZOV

The Ka-62 makes its first flight at MAKS 2019.

In the current form, the Ka-62 with two crewmembers (one optional) can transport 15 passengers 324 nm to 380 nm. In level flight, the 6.5-tonne (14,330-pound) helicopter can accelerate to 310 km/h (167 knots). The Ka-62 features a five-blade main rotor and a 12-blade "rotor in a ring located in vertical tail."

Composite materials account for 60 percent of its structural weight. The manufacturer said the weight-saving measures were taken to increase speed, maneuverability, and payload, as well as to reduce fuel burn.

The Ka-62 is promoted as a multirole helicopter for transportating passengers and cargo, as well as surveillance, search-and-rescue, and medical services. Russian Helicopters has big hopes for sales of a VIP variant to big corporations and a version for offshore operations to fossil fuel giants. Special attention is paid to operations in extreme climate conditions, like those observed in the Arctic and Africa.

Although a sales campaign was launched in 2011, the manufacturers have so far named only two foreign customers. Atlas Táxi Aéreo of Brazil signed a contract for seven along with seven options in 2012, and Ecopetrol for five in 2016. **V.K.**

**Compiled** by Kerry Lynch

ANDREW NICHOLS

CHRIS SHORT

GRETCHEN WEST

GARY STRAPP

MORGAN LITTELL

*Yingling Aviation* named **Andrew Nichols** president. Nichols, the son of Yingling chairman and CEO **Lynn Nichols**, most recently was CFO. He succeeds **Lonnie Vaughan**, who has served as president for the past seven years and returns to the position of CFO. Andrew Nichols, who earned degrees in finance and business management from Kansas State University and Wichita State University, served in the finance department at Cessna before joining Yingling full time in 2010. In addition, Yingling expanded the roles of **Chris Short**, director of maintenance, and **Rebecca Williams**, director of parts. Short now will have oversight of aircraft maintenance, avionics, interiors, and aircraft paint services, and Williams will steer the management of propeller sales, repair, and overhaul services.

*Safe Flight Instrument Corp.* promoted **Matthew Greene** to president, reporting to chairman and CEO **Randall Greene**. Matthew Greene has served with the company since 2004, holding a number of roles in sales and marketing, contracts, and program management. Most recently, he was executive v-p for the firm his grandfather, Leonard Greene, founded in 1946 to explore new ideas in aircraft instrumentation.

*Schiebel Group* appointed **Gretchen West** president and CEO of Schiebel Aircraft as it looks to grow opportunities for its Camcopter S-100 UAS. West, who is a co-executive director of the Commercial Drone Alliance, previously was a senior director in the Global Unmanned Aircraft Systems (UAS) practice group at the law firm Hogan Lovells.

**Robert Flansburg** joined business aviation services provider *Dumont Aviation Group* as COO. Flansburg steps into his new role after holding positions as COO for Sikorsky Aircraft, senior director of operations for Dassault Falcon Jet, and director of completions for Bombardier Aerospace.

*Stellar Labs* appointed **Vicki Nakata** COO in a move that consolidates the company's commercialization and business operations. Nakata joined Stellar in April 2018 as v-p of business development and customer success after spending 15 years with companies including Hawaiian Airlines and Booking.com.

*Lease Corporation International (LCI)* appointed **Mark Stevens** and **Alejandro Kerschen** to its advisory board. Stevens previously was managing director of Shell Aircraft and before that, served with the UK Royal Air Force. Alejandro Kerschen is the founder and managing partner of Atlantic Alliance and has more than 30 years of financing experience.

*Jet Support Services, Inc. (JSSI)* named **Gary Strapp** senior v-p of global program management and technical services. Strapp previously spent 30 years with NetJets, including holding the roles of technical support and maintenance reliability, v-p of administration, and v-p of finance for the fractional ownership provider.

**Karen Ingram** joined flight-scheduling software specialist *Avmosys* as v-p of sales. Ingram has more than 30 years of business aviation experience, including serving as both a regional and national charter sales manager for Executive Jet Aviation, holding the position of national sales director for Bombardier Aerospace/Flexjet, and leading the startup of the Part 135 division of FlightTime.

*Heli-One* hired **Christian Drouin** as v-p of operations. Drouin has 33 years of military service culminating in the rank of major general in the Royal Canadian Air Force.

**Ronnie Hudson** was promoted to v-p of *Robinson Aerospace* and *Robinson Aircraft Interiors*. Most recently v-p of operations at Robinson Aerospace and general manager of Robinson Aircraft Interiors, Hudson has 27 years of experience with aircraft interiors, structural repairs, and aircraft maintenance. **Jody Wagner**, meanwhile, has taken over the general manager role at Robinson Aircraft Interiors. Wagner has a 20-year background in cabinet building and detailed parts manufacturing. **Mark Karls** joined the company earlier this year as general manager of Robinson Aerospace after holding roles with Gulfstream Aerospace, Savannah Air Center, Bombardier, and Dassault Falcon Jet.

*RTCA* named **Brett Eastham** v-p of business operations and secretary for the RTCA board of directors. Eastham previously spent the past five years as CFO and v-p of business development for the Flight Safety Foundation

**Mike Ward** joined *DAS/Flite* as v-p of sales, parts, and component repair. **Eli DaSilva**, meanwhile, took the role of director of business development, reporting to Ward. Ward has more than 25 years of aviation experience, previously serving as senior general manager for Spirit AeroSystems, director/GM for Hawker Beechcraft Services and Textron Aviation Services' MRO in Houston.

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## AWARDS and HONORS

NBAA has selected long-time pilot and business leader **Ross Perot Jr.** as this year's recipient of the Meritorious Service to Aviation Award. First presented in 1950, the Meritorious Service Award is considered among the association's highest honors, recognizing "extraordinary lifelong professional contributions to aviation."

Chairman of his family investment firm The Perot Group, Perot is the founder and chairman of Hillwood, a global real estate development firm that drove the development of Fort Worth Alliance Airport in Texas. In addition, Hillwood has frequently operated its business aircraft on humanitarian missions into challenging situations globally.

ROSS PEROT JR.

At 23, he made a mark as the copilot of the "Spirit of Texas," a Bell 206L-1 LongRanger II, on the first round-the-world flight in a helicopter. He served eight years in the U.S. Air Force and later led a 14-year effort to establish the U.S. Air Force Memorial in Washington, D.C. More recently, Perot has become active in the urban air mobility market, including a partnership with Uber Elevate.

Perot is involved in numerous organizations, serving as chairman of the EastWest Institute and on the boards of the Dallas Citizens Council, Vanderbilt University, and the Smithsonian National Air & Space Museum.

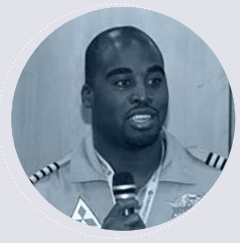
Wilson Air Center founder, business aviation advocate, and philanthropist **Robert A. Wilson** is this year's recipient of NBAA's 2019 John P. "Jack" Doswell Award. The award recognizes "lifelong individual achievement on behalf of and in support of the aims, goals, and objectives of business aviation."

A retired lieutenant colonel with the Tennessee Air National Guard, Wilson founded the fixed-base operation and aviation services chain in 1996 in Memphis, Tennessee. Since then, Wilson Air Center has added locations in Charlotte, North Carolina; Chattanooga, Tennessee; and Houston, Texas.

He has been active within the business aviation community, serving on NBAA's Security Council, as well as on the boards of the Pilatus Owners and Pilots Association and Citation Jet Pilots Association. He additionally is executive v-p of Kemmons Wilson and serves on the executive board of the Edwin L. Cox School of Business at Southern Methodist University.

Wilson further has become involved in numerous charitable organizations, donating time and airplane use for flights with Make-A-Wish Mid-South Foundation and the Veterans Airlift Command. Through his Robert A. and Susan C. Wilson Foundation, Wilson funded the original development and renovation of the Wilson Timeless Voices of Aviation Theater at the Experimental Aviation Association Education Center in Oshkosh, Wisconsin.

**Barrington Irving**, who in 2007 became the youngest pilot to fly solo around the world in a single-engine airplane, will be recognized with NBAA's 2019 American Spirit Award for his continued effort to inspire young people to pursue aviation and aerospace careers.



BARRINGTON IRVING

Born in Kingston, Jamaica, Irving grew up in Miami believing that college football was his only opportunity to pursue higher education, NBAA said. But a Jamaican airline pilot provided guidance and mentoring that led Irving to instead pursue a career in aviation.

"Those experiences set Irving on a course that culminated in his 97-day solo flight around the globe in a single-engine piston aircraft—appropriately christened 'Inspiration'—to demonstrate to young people worldwide that they could also achieve their dreams," the association said.

Irving subsequently founded Experience Aviation at Opa-Locka Executive Airport, along with the Experience Aviation Learning Center dedicated to empowering middle and high school students in the Miami area to pursue STEM careers, including within aviation and aerospace. ■

This TAG service center in Geneva is one of four centers and two satellite facilities that Dassault Aviation has acquired from TAG Aviation.

## Dassault Completes Acquisition of TAG Mx Facilities

As part of a move to expand its worldwide service network, Dassault Aviation completed its acquisition of TAG Aviation's MRO organization. That includes TAG's service centers in Geneva, Switzerland; Farnborough, UK; Paris Le Bourget; Lisbon, Portugal; and satellite operations in Luton, UK, and Moscow.

Rebranded as TAG Maintenance Services (TMS), the MRO network will operate as a wholly-owned Dassault Aviation affiliate. "The relationship between TAG and Dassault has been built into a close-knit and formidable bond over the decades," TMS president Franck Madignier said. "We are delighted to enter into this new chapter with the strength of Dassault Aviation behind us and a bright future with an expanding customer base ahead of us."

TMS will continue servicing the various aircraft types it has supported in the past—Falcon and others—and its customers will have access to the same personnel.

The acquisition is the latest by Dassault Aviation to increase its service network. This year alone, the company has announced three MRO acquisitions, including TAG, that account for 19 additional facilities and nearly 1,000 more maintenance personnel.

## Austrian Firm Targets China MRO Market

FACC has entered into a strategic cooperation agreement with China-based STAECO to gain a foothold in the Chinese MRO market, the Austria-based developer and manufacturer of lightweight composite civil aircraft parts announced today. "Aftermarket services today already constitute an important economic pillar for FACC with great potential for the future," FACC CEO Robert Machtlinger said. "I am convinced that, together [with STAECO], we will be able to successfully market FACC's MRO services in China."

As part of the cooperative agreement, STAECO will distribute FACC's portfolio of aftermarket parts and services for commercial and business jets. It also will serve as a base for component repairs.

"With the sharp rise in air traffic in China as well as the growing share of composite materials used in aircraft construction in general, the demand for qualified MRO services in the composite sector is also increasing," added FACC v-p of aftermarket services Christian Mundigler.

FACC said it has similar agreements with California-based aerospace distributor Proponent and Alaris Aerospace Systems in Florida.

## Piaggio Pads Mx Business with $14 Million Deal

Piaggio Aerospace is continuing to build up its maintenance business with a recent contract valued at €12.6 million ($14 million) from Italian air navigation service provider ENAV to maintain four P.180 Avanti IIs used for flight inspection activities at national airports. Spanning seven years, the contract will provide integrated support for the Avantis, which rack up about 1,800 hours a year and are equipped to measure and calibrate airport navaids.

Importantly to Piaggio, the contract helps reinforce the company's maintenance business as it strives to get on a stronger footing and searches for a buyer. "The agreement signed represents a further step forward in the turnaround process of Piaggio Aerospace," said Vincenzo Nicastro, extraordinary commissioner of Piaggio Aerospace. "While strengthening the backlog of the Genoa factory-owned service center, it also confirms the unique expertise of the company in the airframe MRO domain, consolidated throughout decades of activities."

The company entered extraordinary receivership late last year and this past spring announced it was accepting bids for a buyer. The Italian government gave important backing to the company this summer when it confirmed commitments for various contracts for €700 million ($798 million). That confirmation came with immediate contracts from the Italian Air Force totaling €167 million for engine maintenance and spares.


The contract with Italian air navigation services provider ENAV for Avanti II support is another important step for Piaggio, which seeks to get on stronger footing as it searches for a buyer.

## Dallas BBJ MRO Specialist Sees Rising Trend

Maintenance provider King Aerospace Commercial Corporation (KACC) has seen an uptick in business for the third consecutive year, with the Dallas-based bizliner specialist on track to provide 40 MRO and interior refurbishments on Boeing business aircraft alone. That compares with 29 the previous year and 10 in 2017.

"Strong markets, access to capital, and new tax rules are contributing drivers to business aviation's upturn, but our forward momentum underscores the strong relationships we build with customers," said company president Jarid King.

The company is an authorized GE OnPoint service center, providing on-wing maintenance and repair for CFM56-7B-powered BBJs, including line inspections, routine maintenance, and replacement of engines and components.

## Gulfstream Completes Appleton MRO Expansion

Gulfstream Aerospace has completed a $40 million expansion to its service center in Appleton, Wisconsin. The expansion adds a nearly 190,000-sq-ft hangar northeast of the airport terminal that will simultaneously house up to 12 Gulfstream G650/650ER twinjets, as well as offices, back shops, general support space, and a new sales and design center.

About 100 new jobs have been created as a result of the expansion, with more hiring to come, according to the Savannah, Georgia airframer. It is part of Gulfstream's 500,000-sq-ft footprint at Appleton International Airport (ATW) that last year recorded nearly 500 aircraft visits.

## Precision Aviation Grows Capabilities with Acquisition

Precision Aviation Group (PAG) has acquired Momentum Services Corp. (MSC) in a deal that's expected to expand PAG's maintenance capabilities. "The addition of MSC to PAG further diversifies our MRO capabilities by expanding our services into LCD cockpit displays," PAG president and CEO David Mast said.

Mast further stated the MSC roll-up enables PAG to provide its customers with next-generation avionics repair services, which will be integrated with its avionics repair stations in Long Beach, California, and Atlanta.

A portfolio company of private equity firm GenNx360 Capital Partners, PAG is an MRO and provider of supply chain products for fixed-wing and rotary aircraft with 10 locations and eight repair stations. in the U.S., Canada, Australia, Singapore, and Brazil."

## Bombardier Highlights Miami Center at M&O USA

Bombardier Business Aircraft recently wrapped its 2019 Maintenance and Operations (M&O) USA Conference in Fort Lauderdale, Florida, highlighting progress on its under-construction 300,000-sq-ft service center in Miami, as well as providing support updates on its latest models such as the Global 7500.

The event, held August 27 to 29, drew 125 customers and operators and included educational sessions and updates on key programs. It provided a venue for attendees to engage in operational discussions, gaining and sharing insights with Bombardier and other operators.

The conference took place as Bombardier is building a new center at Miami-Opa Locka Executive Airport to provide scheduled and unscheduled maintenance, aircraft modifications, avionics installations, and AOG support for Learjets, Challengers, and Globals. Bombardier broke ground on the center late last year and anticipates it will be operational next year.

## ExecuJet MRO Services Malaysia Gets Chinese Nod

ExecuJet MRO Services Malaysia was granted CAAR-145 certification by Civil Aviation Administration of China (CAAC) to conduct line and heavy

maintenance on Gulfstream GIV and Bombardier Challengers and Globals.

Ivan Lim, vice president ExecuJet MRO Services Asia, said the company applied for the approvals from CAAC in response to demand from operators in China. According to Asia Sky Group's fleet report, there are 62 Challenger series jets and 25 Global Express family jets based in Mainland China. Including Hong Kong and Macau, that number will increase to 76 and 61, respectively.

Dassault Aviation acquired Subang, Malaysia-based ExecuJet MRO Services Malaysia earlier this year. It was part of a broader acquisition of ExecuJet's MRO facilities across the world.

## Textron Aviation's Zurich Service Center Marks 50 Years

Textron Aviation recently celebrated the 50th anniversary of its Zurich, Switzerland service center. The facility was one of two in Europe that it acquired in December 2012 from General Dynamics FBO, aircraft charter, maintenance, completions, and staffing services provider subsidiary Jet Aviation. At the time of the acquisition, the Zurich center served as a Cessna Citation Service Center until Textron wrapped up its acquisition of Beechcraft in 2014 and began servicing that brand, as well as Hawker.

In the intervening years, the Zurich center has grown and expanded its capabilities to include comprehensive maintenance and paint capabilities. Services include routine checks and inspections, in addition to extensive avionics and interior upgrades. A mechanical shop at the center performs wheel, brake, and battery repair and exchange, as well as servicing of major structural components.

## Mobile NDT Now Part of Duncan Aviation's Services

Duncan Aviation has begun offering mobile non-destructive testing (NDT) to aircraft owners and operators. Its in-house NDT teams are a minimum of Level II certified in four methods and can be deployed from Duncan facilities at Lincoln (Nebraska) Airport, Provo (Utah) Municipal Airport, and W.K. Kellogg Airport in Battle Creek, Michigan.

NDT services include eddy current, fluorescent penetrant, ultrasonic, and magnetic particle inspections on all aircraft makes and models, including helicopters.

Additionally, Duncan Aviation is an authorized Dassault NDT facility in the Western Hemisphere, one of a handful of facilities with personnel trained and authorized to meet Falcon NDT requirements.

## West Star Aviation Expands Battery Mx Capabilities

West Star Aviation has been authorized to service and repair Meggitt Securaplane Technologies main ship 9750W lead-acid batteries at its East Alton, Illinois facility. It noted the 9750 battery is available for most Cessna Citation models. In addition, West Star's East Alton facility is authorized to perform reblocking of XL245, XL246, Xl249, XL2410 and 2411 series emergency batteries.

West Star also recently received STC approval for modifications involving waste drain valves and LED light assemblies on Hawker airframes. One of the STCs was developed for West Star's lavatory waste drain valve modification. "We've installed around 20 of these now via FAA Form 337 Field Approvals, and the FAA asked us to get an STC for this," said Hawker program manager Kendall Kreiling.

A second is a "new concept" STC, Kreiling said, involving the replacement of refuel panel magnetic valve position indicators ("doll's eyes") with LED light assemblies. "The OEM indicators have become difficult to obtain in either new or serviceable as removed condition, so this STC provides operators with a modern solution at very favorable pricing," he added.

Duncan Aviation's non-destructive testing (NDT) services include eddy current, fluorescent penetrant, ultrasonic, and magnetic particle inspections on all aircraft makes and models.

## MRO Insider Adds Maintenance Oversight Feature

Aviation maintenance quoting website MRO Insider has added a feature called Virtual DOM that offers maintenance oversight to flight department clients. This includes squawk/invoice review by a team of experienced maintenance directors, including Thoroughbred Aviation president/founder Nathan Winkle.

"By teaming up with Nathan and his team at Thoroughbred," said MRO Insider co-founder Andy Nixon, "we now provide an avenue for aircraft owner/operators to dramatically increase their confidence when submitting and receiving maintenance quotes through our online platform, including physical oversight of the project when requested." ■

# AMAC touts its MRO side

by James Wynbrandt

Though bespoke cabin designs and interior installations are the glamour side of the business, completion centers often offer and rely on VIP aircraft MRO and support services as part of their business models. And AMAC Aerospace is among the most active. The Basel, Switzerland-based company announced in August completing a trio of ADS-B Out installations, on two privately-owned B737s and one Airbus A319, among a slew of other non-completion projects. Orders for three more ADS-B installations are also in hand.

Meanwhile, AMAC completed major maintenance projects on an additional two BBJs (one a head-of-state aircraft) and an ACJ319. The BBJs underwent a heavy maintenance check and a base maintenance check, respectively, and were returned to service on schedule. The ACJ319 underwent major maintenance and a landing gear overhaul. All three bizliners also received minor unspecified interior modifications.

The company recently announced plans for a fifth hangar at its Basel headquarters facility, an investment of some $17 million, primarily to support its Bombardier-authorized serviced center activity. But AMAC also provides Gulfstream service and reported recent completion of a G550 C-Check with service bulletin compliance, corrosion treatment, and minor interior modifications.

AMAC's mobile repair squad has also been active. The company reported responding to a pair of AOG service requests in August, one from Zurich, the other from Africa for a Gulfstream GIV. The company sent a team to Africa within 24 hours, where work was still underway near the month's end.

Additionally, AMAC announced new maintenance contracts for two Airbuses—an ACJ340 and ACJ318—for unscheduled maintenance and minor cabin refurbishment, respectively; a BBJ C-Check and ADS-B install; and a Gulfstream G450 for an expedited pre-purchase inspection.

In late August, AMAC signed new contracts for a McDonnell Douglas MD-87 major modification, as well as a BBJ for a FANS and Iridium satcom system for FANS installation under AMAC's STC. The aircraft are scheduled to arrive in Basel in September and November, respectively.

### Completions Work

A full plate of MRO work notwithstanding, AMAC remains committed to its VIP cabin design and completion business, underscored by the introduction in May of a cabin concept for the A350-900 XWB, created in partnership with Pininfarina. According to the Italian design firm, the design will "make passengers forget" they're on an aircraft, even if it's a customized executive airliner with a range in excess of 11,000 nm with 25 passengers aboard.

The concept draws on architectural, nautical, and aerial influences. "Our 360-degree vision on the living spaces, thanks to our expertise in different sectors, allowed us to conceive an innovative concept able to let the traveler enjoy the time onboard as he was in his living room or office," said group chairman Paolo Pininfarina.

The multifunctional interior space is "conceived around the traveler's desires and able to fulfill all his needs: relaxing, working, dining, entertaining conversations, and holding meetings," the design firm said, with private and working spaces joined in a seamless flow. A welcoming area includes a wet bar, and the lounge space is sculptured by a flowing band drawing passengers to different environments such as a cocoon-like relaxing area. There is also a dining/meeting space and a "green space" dedicated to personal, relaxing moments. The concept is currently without a name, but group chairman Pininfarina said the partnership with AMAC "gives the warranty to turn this innovative concept into reality."

AMAC has "installed contemporary, culturally assertive, intelligently designed cabins in the past," said director of business development Waleed Muhiddin. "But what we see today from Pininfarina is a whole new kind of cabin, harnessed with clever human input that manifests itself into areas that anyone can work in, relax, and utilize."

With deliveries of the ACJ350 XWB platform scheduled to begin next year, "We are excited to see how much attention it can create in the private aviation market, and hope to able to work together in the future with the OEM and the Pininfarina design studio," Muhiddin said. ■

# FBO and Airport news by Curt Epstein

When it opens on October 10, Williston Basin International Airport will replace nearby Sloulin Field International Airport, which faced expansion constraints and design issues.

## New FBO and Airport To Serve Williston, North Dakota

Sloulin Field International Airport—which has been serving Williston, North Dakota, since 1947—and its FBO, Signature Flight Support, are scheduled to close on October 10 simultaneously with the opening of Williston Basin International Airport (XWA) and a new FBO there. Sloulin is being decommissioned because it faces expansion constraints, design issues, a significant increase in air traffic, and the need for runway refurbishment.

Williston Basin has been under construction since October 2016 and will initially open with 7,500-foot-by-150-foot Runway 14/32. So-called "stub outs" will be included to accommodate the future 4,500-by-75-foot crosswind Runway 4/22. The airport is located about 10 miles northwest of Williston, slightly farther away from the city than Sloulin.

At XWA, general and business aviation will be served by Overland Aviation. Although this is the first full-service FBO for Overland, the company has been operating a facility at Sloulin, providing flight training, scenic flights, and aerial photography since 2011. Overland Aviation's new 51,000-sq-ft facility at XWA will include an executive passenger terminal and crew lounge, a private terminal for oil-laborer crew change flights, and management and rental office spaces. According to Overland's founder and president Tanner Overland, "Our heated hangar will be capable of storing large aircraft up to a Gulfstream G650." Also located within the Overland Aviation facility will be a U.S. Customs general aviation facility.

## Jet Aviation To Boost TEB Hangar Space

Jet Aviation expects to open a new 40,000-sq-ft hangar at its Teterboro Airport FBO this month which will bring the location to approximately 270,000 sq ft of overall hangar space, at the metro-New York area dedicated business aviation hub.

The new structure is designed for tenant aircraft storage for business jets as large as the Bombardier Global 7500 and it includes 7,500 sq ft of customizable tenant offices. Its doors are 30 feet high, and interior lighting is all energy-efficient LEDs.

Jet Aviation spent more than $20 million on the new hangar and renovations to its Teterboro FBO that include new design elements that match other Jet Aviation FBOs and upgraded amenities for passengers and flight crew. The Teterboro upgrades are part of Jet Aviation's project to improve its facilities in the U.S. The company is also building FBOs at Van Nuys Airport in California and Scottsdale in the Phoenix area. And upgrades are under way at Jet Aviation's West Palm Beach, Florida; San Juan, Puerto Rico; and Dallas FBOs.

## Signature Renews FBO Lease at ICT, Plans $2M Upgrade

Signature Flight Support has signed a new 30-year lease for its FBO at Wichita Eisenhower National Airport (ICT) and agreed to spend at least $2 million on facility improvements under an agreement approved last month by the Wichita City Council, acting as the Wichita Airport Authority.

Signature has been at ICT since July 2008, taking over an FBO previously operated by the former Hawker Beechcraft, which exited the business. Additionally, it provides fueling services to commercial airlines serving ICT and operates and maintains the aviation bulk fuel farm for the airport under a separate contract. The new agreement includes two five-year renewable lease options. Included is the lease of 7,665 sq ft of offices and customer service space, 44,997 sq ft of community clear-span hangars, and 38,279 sq ft of t-hangars. It's not clear what specific improvements Signature plans for its facilities because company officials did not respond to requests for additional information. According to the lease agreement, permissible improvements include structural upgrades, exterior painting, and hangar door replacement, as well as upgrades to roof, HVAC, electrical, and/or plumbing systems. It does not include interior paint and flooring or furnishings.

## Duncan Calibrates Fueling Equipment

Duncan Aviation recently equipped its calibration lab to handle FBO equipment used to ensure fuel quality. The company now offers a full slate of instrument calibration services required for FBO operators to comply with ATA 103 standard for jet fuel quality at airports and for military compliance. Among the equipment now serviced are master hydrometers, working hydrometers, multimeters, torque wrenches, and conductivity meters, as well as fuel truck and fuel farm master fuel gauges.

"Because there are so few calibration labs capable of handling numerous calibration specialties, it is not unusual for FBOs to send tools to multiple locations, experiencing several weeks of downtime," said Ed Sabata, Duncan's line services trainer and quality assurance specialist, adding the in-house calibration lab has been a huge benefit in ensuring ATA 103 compliance of the company's refuelers and tank farms at its four FBO locations.

## New Genav Terminal in Offing for Marco Island Airport

Marco Island Executive Airport (MKY) in southwest Florida is undergoing a $15 million makeover that includes a new general aviation terminal, Collier County airports manager Justin Lobb told **AIN**. Now underway, the first phase of the project involves the construction of a two-story, plantation-style terminal that will house the airport's FBO—operated by the county—and offices for airport administration, flight schools, and charter operations based there.

Construction of a 16,000-sq-ft terminal is underway at Marco Island Executive Airport in southwest Florida.

The 16,000-sq-ft, $10.5 million project is expected to open in the first half of 2020, Lobb said. A $4.5 million second phase calls for demolition of the original terminal and construction of an expanded apron. That phase is expected to start next month. "When all is said and done, we hope to have everything completed by the end of 2020," Lobb said.

Separately, a private developer plans to add a mix of box hangars and three larger hangars on just under three acres. And construction of a new Civil Air Patrol (CAP) hangar is about to begin, Lobb added, replacing the CAP hangar destroyed by Hurricane Irma two years ago. "These new facilities are being built to withstand some of the strongest hurricanes," Lobb said of the projects planned and underway at MKY. They are also designed to mitigate the effects of flooding. MKY, which has a single, 5,000-foot-long runway, was originally opened as a private airport in the 1970s.

## India's FBOs Face Headwinds

General aviation in India, projected just four years ago to see a thriving future, today is a cash-strapped industry trodden under the weight of taxes and an economic slowdown. As an example, the two FBOs at Delhi International Airport, Bird ExecuJet Airport Services and Indamer MJets Airport Services, were contracted in 2016 and expected to be ready as part of a general aviation campus by this month, but a senior official told **AIN** the facility to be inaugurated is "temporary," with no conference rooms or added amenities. He added while Customs and Immigration would be available, "the start of the first phase would be announced later." Rajeev Gupta, managing director of Indamer, expects the permanent building to be ready by March 2020 based on a design supplied by the airport authority.

Two hangars to be shared by both the companies are under construction along with two ancillary facilities. While earlier it was believed the two concessionaires were mandated to invest around $15 million each on the FBO terminal, lounges, hangars, fuel and parking, approximately $9 million is being spent on the joint FBO.

## Shell Aviation Network Expands in New England

The Shell Aviation Fuel network has added two Columbia Air Services locations in New England. Columbia operates the lone service facilities at Maine's Hancock County-Bar Harbor

Airport as well as Rutland-Southern Vermont Regional Airport.

Home to Acadia National Park, "Down East" Bar Harbor sees strong summer tourism, especially from those seeking the country's finest lobsters. The Columbia facility there offers a 6,400-sq-ft and a 3,200-sq-ft storage hangar; a 5,880-sq-ft maintenance hangar, and an office and shop area. Amenities include passenger and pilot lounge, flight planning room, concierge, onsite car rental, crew car, and 24/7 callout service.

Rutland is the heart of Vermont's ski region and Southern Vermont Regional is the gateway to six major ski resorts. The FBO specializes in cold weather operations, and its facilities include approximately 40,000 sq ft of aircraft storage space, and 4,000 sq ft of office space.

## Colorado FBO To Continue Major Expansion

Based on growth in business jet traffic, particularly international flights, the Vail Valley Jet Center, the lone service provider at Colorado's Eagle County Regional Airport, expects to complete construction this month on the first of three new community hangars. Designated as "Hangar 7," the 38,000-sq-ft structure, which will bring the location to 240,000 sq ft of heated space, will feature a private customer lounge, vehicle garages, aircraft maintenance bays and offices, each with direct hangar access.

Located on the west side of the airport's commercial terminal, Hangar 7 is already overbooked with based tenants according to the company, and it has begun preparations for the similar-sized Hangar 8. The FBO recently added five more acres of concrete apron to support further development. In addition, the company is also launching a custom-build hangar complex, tailored to the unique specifications of each owner.

Designed with 30-foot-high doors to accommodate the largest business jets, each of the 10,000 or 14,400-sq-ft hangars will have options for deluxe business offices and lounges, private garages, and recreational equipment storage.

## Two Washington State FBOs Join Avfuel Network

Avfuel has expanded its branded dealer network in the Pacific Northwest with the addition of two FBOs in central Washington.

Pangborn Flight Center is the lone service provider at Pangborn Memorial Airport in Wenatchee, providing customers easy access to the north-central region of the state. The full-service, airport-operated FBO offers a passenger lounge, pilot lounge with snooze room, and services such as catering and concierge, along with volume fuel discounts.

In Yakima, McCormick Air Center is the only FBO at McAllister Field, which offers a 7,600-foot main runway, averages more than 100 operations a day, and services the state's wine-production region. The 10-year-old, two-story terminal offers a passenger lounge, shower facilities, pilot lounge, conference room, a rampside patio and observation deck, on-site car rental, a courtesy car, and aircraft cleaning and detailing service, along with an FAA Part 145 repair station. Both locations will participate in Avfuel's contract fuel program, as well as its Avtrip customer loyalty plan.

## Latvian Ground Handler Makes Scandinavian Debut

Latvia-based FCG OPS, the ground handling division of Flight Consulting Group, has expanded its operations into Scandinavia. The company, which operates FBO Riga, has established itself as a business aviation services provider throughout the CIS, Baltic States, and Eastern Europe, has begun operations at four airports in Finland: Pori, Tampere-Pirkkala, Rovaniemi, and Turku.

Among the services provided are aircraft handling, best fuel price search, concierge, catering, and limousine ground transport. Over the past few months, FCG added new ground handling locations at Rijeka and Bol in Croatia and at Banja Luka Airport in Bosnia Herzegovina, which with this latest expansion brings the company's ground handling footprint to 41 airports in 20 countries. ■


An artist rendering shows the new 38,000-sq-ft community hangar at Colorado's Vail Valley Jet Center, with its planned sisters behind it.

## FBO PROFILE: Air Service Hawaii

LINDA EPSTEIN

Air Service Hawaii's headquarters and flagship location is at Honolulu's Daniel K. Inouye International Airport. With 40,000 sq ft of hangar space, it is home to several business aircraft and provides a full slate of FBO services.

### The company traces its Hawaiian roots back to 1948

Air Service Hawaii traces its roots back to 1948 when its antecedent began as a crop-dusting service that also performed occasional piston aircraft maintenance at Honolulu (now Daniel K. Inouye International) Airport. Along the way, it offered flight training, air charter, Cessna aircraft sales, and finally FBO services, until 1967, when it incorporated under the Air Service Hawaii name. While the company has since shed most of those businesses to concentrate on FBO operations, with six locations, it is now one of the biggest service providers in the islands. The company changed hands in 2015 when it was purchased by a group of local investors led by industry veterans Mi Kosasa and Shaen Tarter.

Honolulu (HNL) remains the company's flagship and headquarters and unlike its sister FBOs on the other islands, which rely mainly on tourist traffic, sees a steady pace through the year, with a slight bump from December through January. "Honolulu sees a lot of business traffic on the way to and from the mainland and Asia, Australia, and New Zealand," said Tarter, who serves as company president. As such, the FBO is well equipped to perform quick turns. The service providers at HNL draw from the airport's fuel storage which, given the island's location as a waypoint in the middle of the Pacific Ocean, is an astounding 42 million gallons of jet-A. It is distributed between the on-airport storage tanks and those on nearby Sand Island, which is connected via pipeline. The three FBOs also perform the into-plane service for all aircraft including commercial, and the airport is equipped with a hydrant fueling system. Air Service Hawaii operates four hydrant service vehicles among its ground service fleet, which also includes two 7,000-gallon and two 5,000-gallon jet fuel tankers. With its own 10,000 gallon-100LL tank, it has a pair of 1,400-gallon avgas trucks to supply piston aircraft.

Yet, unsurprisingly, it's not all trans-Pacific tech stops. As the cosmopolitan gateway to Hawaii, Honolulu also attracts hundreds of thousands of visitors each year for both business and pleasure, and the Air Service Hawaii facility, which dates back to the early 1980s, offers a 2,600-sq-ft two-story terminal which is split between two buildings. Guests arriving streetside enter the flight dispatch area and are then shuttled with their luggage to the airside terminal. Offering panoramic views of the ramp, it has a downstairs lobby with flight-planning area, while a comfortable VIP lounge is upstairs with shower facilities and bathrooms. Concierge, rental cars, snacks, and beverages are available as well. Those who choose to bypass the terminal entirely can enjoy rampside vehicle access.

According to Tarter, as much as 90 percent of the FBO's jet traffic is from "overseas," and to provide catering for those long oceanic flights, the company has a near-exclusive agreement with Pacific Inflight, which is owned by a local restaurateur. According to Kosasa, the food is so good that the passengers ask to take any leftovers home with them at the end of the flight.

The facility, which has a staff of 43, is open 24/7, with U.S. Customs clearance available on the ramp. The FBO has 40,000 sq ft of hangar space and is home to a handful of business aircraft ranging from a Global 5000 to a pair of PC-12s.

When it comes to customer service philosophy, the company believes it begins with conscientious, contented workers. "We have really tried to focus on taking care of our employees, who we trust will take care of our customers," Tarter told **AIN**, "and our customers will take care of us by coming back."

With two 12,000-foot runways, HNL and by extension the FBO, can handle anything that can fly there. Air Service Hawaii regularly fuels Airbus A380s, and last year after a hurricane ravaged Saipan, it handled 25 Antonov 124 flights carrying supplies from Hawaii.

The company also operates FBOs at Kona and Hilo on the Big Island, Lihue on Kauai, at Maui, and Lanai. Next January it will inaugurate new facilities at Lihue and at Kona. ■

by David Jack Kenny

## PRELIMINARY REPORTS:

### No Injuries in Oroville Overrun

**CESSNA 560XL, AUGUST 21, 2019, OROVILLE, CALIFORNIA**

All 10 occupants evacuated the aircraft without injury after it overran the departure end of Oroville Municipal Airport's Runway 02. Most of the airplane was subsequently consumed by a post-crash fire. Two pilots and eight passengers were on board the charter flight to the Portland, Oregon International Airport. According to the pilot flying, the airplane accelerated through V1 to VR, but failed to respond to elevator inputs when he tried to lift the nose (*see related story on page 14*).

### No Survivors in Majorca Mid-air

**BELL 206L3 LONGRANGER III AND AEROPRAKT A22L FOXBAT, AUGUST 25, 2019, BALEARIC ISLANDS, MALLORCA, SPAIN**

Four members of a German family, the Italian pilot of their sightseeing flight, and two Spanish citizens were killed in a low-altitude collision between a helicopter operated by a German tour company and a locally registered "microlight" airplane (a designation comparable to the U.S. light-sport category). The accident took place around 1:30 p.m. local time in characteristically clear weather.

Press reports described the helicopter passengers as a couple from Munich and their two children, ages 9 and 11. The majority of the wreckage fell onto a private estate, though press photographs show the airplane's tailcone on a gravel road. The collision was the deadliest accident in the Spanish archipelago in many years. In 1972, 102 perished when an Iberian Airline flight crashed on the island of Ibiza.

### Norwegian AS 350 Accident Prompts Emergency AD

**AIRBUS HELICOPTERS AS350B3E, AUGUST 31, 2019, IN THE SKODDEVARRE MOUNTAINS SOUTH OF ALTA, NORWAY**

Airbus Helicopters issued an emergency service bulletin that EASA upgraded into an emergency airworthiness directive following the crash of an almost-new AS 350B3e that killed all six on board. The AD requires a one-time inspection of the main gearbox drive shaft/engine coupling in AS350, AS550, and EC130 helicopters with less than 300 total flight hours. The Accident Investigation Bureau of Norway (AIBN) reports that the accident helicopter "had less than 73 hours since new."

In a press release issued on September 11, the AIBN reported that on-scene work has been completed, with the wreckage recovered to a facility in Lillestrøm. Among the components retrieved was the helicopter's recording unit, designed to capture not only flight and voice data but video feeds of the cockpit and outside view, GPS coordinates, attitude in all three axes, and sound signatures from the engine and gearbox. The unit was not hardened to air-carrier impact and thermal standards and suffered severe heat damage. It has been sent to the recorder lab of France's BEA, which is assisting the AIBN investigation. Fire damage prevented recovery of any information from any of the other data-logging devices in the aircraft.

### Three Hurt in Challenger Wake-turbulence Encounter

**BOMBARDIER CL600 2B16, AUGUST 8, 2019, LUBBOCK, TEXAS**

The flight attendant and one passenger sustained minor injuries and a second passenger suffered a tibia fracture requiring surgery during an 11-second wake turbulence encounter. The Challenger 600, operated by NetJets on a fractional ownership flight, was en route from Dallas Love Field to Santa Ana, California. While climbing through FL335 for its assigned altitude of FL340 in light and variable winds, the jet encountered a sudden right quartering headwind of 77 knots that imposed a 2.1-g vertical load which reversed to -0.7 g in less than one second. During the same second, it experienced a yaw acceleration from -0.6 (left) to 0.4 (right), causing a simultaneous 10-degree pitch excursion and uncommanded 20-degree right roll. According to the preliminary report released by the NTSB on September 6, "All unsecured objects in the cabin were thrown about including all passengers and the flight attendant…Cabin service items (food, broken plates, and dishware) and the lavatory fluid spilled on the interior of the cabin."

After assessing damage and injuries, the captain requested an immediate diversion to Lubbock, where the flight landed without further incident. Two passengers and the flight attendant were transported to the hospital; one passenger and the attendant were released after treatment for minor injuries.

Radar track data showed that at the time of the encounter, the Challenger was eight to 10 miles in trail of a FedEx Airbus A300 on a scheduled flight from Fort Worth Alliance to Bob Hope Burbank Airport, level at FL340 on the same assigned route. The Challenger's flight crew was not made aware of the FedEx flight before the encounter. According to its flight data recorder, variable winds of two to seven knots prior to the accident returned to less than 12 knots afterward.

## FINAL REPORTS:

### Snow Ingestion Brought Down Powerline Patrol

**MD HELICOPTERS 369HM, JANUARY 15, 2018, PERRYSBURG, OHIO**

In a probable cause report released on September 10, the NTSB attributed the loss of the aircraft to a low-altitude engine flameout precipitated by the ingestion of ice or snow. Both the pilot and the powerline inspector were killed when the helicopter crashed onto a snow-covered field after a near-vertical descent. Recovered GPS data showed that for most of the preceding hour it had operated between 180 and 220 feet agl at forward airspeeds below 10 knots, making a series of right turns consistent with powerline inspection.

Witnesses reported moderate snowfall at the time of its departure from the Wood County Airport in Bowling Green, Ohio as well as at the accident scene, the latter confirmed by police photographs showing "falling snow and flat light or white-out conditions at the time of the accident." Visibilities as low as 1.25 miles were reported throughout the area. (Federal regulations require only a half-mile visibility for daytime VFR operations in Class G airspace below 1,200 feet msl.) The pattern of vertical crushing on the bottom of the fuselage suggested that the helicopter struck the ground in a nose-level attitude not consistent with an in-flight loss of control. There was also no evidence of contact with the power lines or transmission towers. Stretch signatures on the filament of the instrument panel's RE-IGN lamp indicated that a gas generator speed below 55 percent had activated the engine's re-ignition system, required by the manufacturer for operation in falling or blowing snow.

Airport surveillance footage confirmed witness accounts that the helicopter sat on the ramp in falling snow for more than an hour after arriving to pick up the inspector. The surveillance camera captured an image of two people walking around it before boarding but did not provide sufficient resolution to determine whether they removed accumulated snow from the engine air inlet. Low-airspeed operation would also facilitate accumulation of snow in the inlet, and a 1968 study cited by Rolls-Royce found that ingestion of as little as 30 grams (1.07 ounces) of snow or slush could cause a flameout in the Allison 250 engine, which had a filter to strain ice particles from the fuel but no system to prevent snow ingestion at the air inlet.

Damage to the main rotor hub was consistent with excessive coning and downward flapping of the blades, suggesting a loss of main rotor rpm. The flight was conducted in the shaded area of the MD 369's height-velocity diagram, a condition in which limited potential energy (altitude) and kinetic energy (airspeed) combine to make both engine restart and successful autorotation unlikely or impossible. Flat light conditions would also have impeded efforts to land from an autorotation.

### Spatial Disorientation Implicated in Ontario R66 Accident

**ROBINSON R66, MARCH 4, 2019, TIMMINS, ONTARIO, CANADA**

In its final report issued on August 22, the Transportation Safety Board of Canada concluded that the helicopter's pilot and owner lost visual references while flying over "remote areas with almost no ambient or cultural sources of light" on a dark, moonless night. Because he had not filed a flight plan or flight itinerary, the aircraft was not reported missing for another 36 hours, and searchers did not locate the snow-covered wreckage until the afternoon of March 11, nearly one week after the crash. The emergency locator transmitter was found turned off. The pilot and his wife, the only passenger, had been ejected from the cockpit, neither having apparently been wearing their safety harnesses. However, the TSB judged the crash to have been unsurvivable in any case.

The accident site was 36 nm south-southeast of its destination, the pilot's private helipad near Fauquier-Strickland, Ontario. Tree damage and impact signatures in the wreckage indicated that the helicopter struck the ground in a steep nose-down, left-bank attitude. A weather report filed six minutes earlier at the Timmins airport, 18 miles southeast of the scene, included 15 miles visibility under a 4,000-foot overcast, but visibilities as low as one mile in light snow showers were reported in the area earlier that evening.

The accident flight was the last of four legs spanning eight flight hours and nearly 11 hours of clock time that began with the couple's departure from Nashville's John C. Tune Memorial Airport at 9:24 a.m. They stopped for 40 minutes at the Springfield-Beckley Municipal Airport in Ohio and one hour 14 minutes at London, Ontario. Their final stop at Sudbury, Ontario, was just 15 minutes, taking off two minutes before the end of civil evening twilight at 6:42 p.m. The crash is believed to have occurred at 8:06, though unlike the three preceding legs, the accident flight was not tracked by radar.

The pilot held a private pilot helicopter certificate with night rating and a Category 1 medical certificate but no instrument rating, and the helicopter was not certified for IFR flight. He had logged 925 hours of flight time, 585 of them in the R66 including 157.5 in the preceding year. ■

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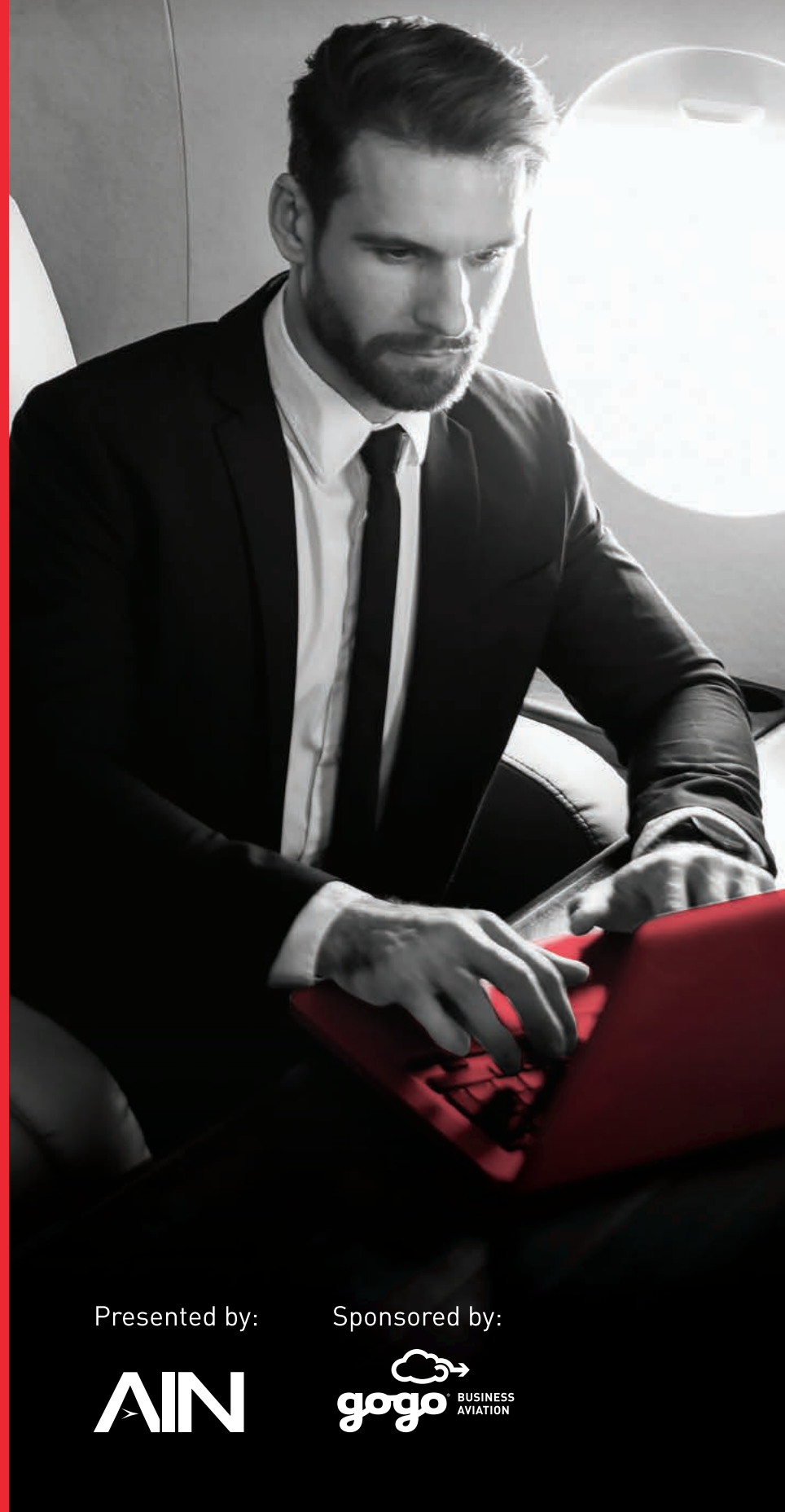

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## FINAL FLIGHT

**C.G. "Hank" Henry**, the long-time chief pilot for West Houston Airport who flew dignitaries such as of Charles Lindbergh and Glenn Curtiss, died on August 7. He was 94. A renowned flight instructor involved in aviation throughout his life, Henry amassed more than 35,000 hours in flight time and flew more than 300 models of aircraft, according to the West Houston Airport.

Born on Jan. 10, 1925 in Crossville, Tennessee, Henry learned to fly at an early age and joined a B-24 crew flying missions over the English Channel during World War II. Later, Henry managed flight operations for an FBO in Galveston, Texas, and later served as the chief pilot/test pilot for Navion Aircraft and mechanic and pilot for Guinn Flying Service in Pearland, Texas.

His five-decade tenure with West Houston Airport began in 1973. Over the years, he held positions with the airport that included maintenance supervisor, charter pilot, certified flight instructor, chief pilot, and FAA-designated pilot examiner. He held numerous certificates and ratings and was a recipient of both the Charles Taylor Master Mechanic Award and the Wright Brothers Master Pilot Award. ■

› continued from page 69

*Nomad Aviation* named **Paul van der Blom** v-p of aircraft management sales. Van der Blom brings more than 20 years of aviation experience to his new role, most recently as director of commercial for DC Aviation Al-Futtaim, Dubai, and also has held varying senior roles with Hawker Pacific, ExecuJet, Avolus Dubai, TAG Aviation, and Airbus.

**Paul Rose** rejoined *Banyan Air Service* as v-p of technical sales. A 37-aviation executive who has served with Bombardier and Hawker Beechcraft, Rose returns to the position he previously held with Banyan for more than 14 years after a three-year stint with Embraer Executive Jets.

Wichita-based *Equity Bank* appointed **Morgan Littell** v-p of business aviation. Littell, who is tasked with establishing an aircraft financing division with nationwide services, has 10 years of aircraft financing experience and 20 years of aviation experience overall, including serving in sales and marketing for a Wichita-based aircraft manufacturer.

**Krystal Brumfield** was named chief of staff for *Reach Airports*, a U.S.-based airport management joint venture between Munich Airport International and the Carlyle Group's CAG Holdings. Brumfield, who has been president and CEO of the Airport Minority Advisory Council, has worked closely with airports, Congress, federal agencies, aviation trade associations, and other industry-related organizations.

*London Biggin Hill Airport* named **Bob Graham** its first operations director. Graham, who steps into his new role on October 1, formerly held a similar position for Birmingham Airport and has 30 years of airport operations and safety management experience that also includes senior roles with Abertis Airports and TBI Airports.

*Jet Aviation* named **Grischa Schmidt** senior director of the Design Studio. Schmidt first joined Jet Aviation in 2009 as a senior designer-project manager, left the company in 2012, and then returned in 2017 as senior project manager for interior design services.

*Bombardier* named **Jeff Cole** sales director, Northeast U.S., with a territory including New York City, Connecticut, Massachusetts, and New Jersey. Cole brings more than 25 years of experience to his new role, including with new and preowned business jet sales, as well as with technical marketing and sales support.

**Robert Randall** was named to the newly created position of director of strategic business development for *Universal Avionics*. Randall, who has 35 years of avionics experience, joined Universal Avionics in September 2008 as Midwest regional sales manager and later became U.S. senior sales manager.

**John Shea** joined **Helicopter Association International** as director of government affairs. Shea formerly served as director for government relations and interim president for the National Association of State Aviation Officials.

*TAG Aviation* named **Joanne Goodall** director of customer services for the UK. Initially working with cargo and commercial carriers, Goodall joined TAG in 2017 as a client relations manager and before that served with a Swiss-based FBO and maintenance company.

**Hervé Rousselle** was appointed regional sales manager for Europe for *Universal Avionics*. Rousselle will steer the company's growth in France, Luxemburg, Italy, Belgium, and French-speaking areas of Switzerland.

**Jeremy Ojerholm** joined aviation services provider *Meridian* as a charter sales executive. Ojerholm, who most recently served as director of charter sales and business development at Bohlke International Airways/M&N, will be responsible for growing the overall retail charter business as well as focusing on business development in the South Florida market.

**Alex Almonte** joined *Western Aircraft* as regional sales manager. Almonte will cover the Southwest and Midwest region territories for Falcon, Gulfstream, Embraer Legacy/Praetor, and Hawker customers.

Connecticut-based on-location aviation aircraft, avionics, safety, and professional development training provider *Global Jet Services* has added experienced Falcon aircraft instructor **Rob Fisher** to its Dassault-Falcon maintenance training program. ■

**Correction:** Last month's coverage of EAA AirVenture mischaracterized leadership of the effort to restore "That's All Brother," the C-47 that led the first wave of paratroopers on D-Day. The report also misspelled Doug Rozendaal's name. The copy has been corrected in the online version. **AIN** regrets the error. **M.P.**

by Gordon Gilbert

## Within 6 Months

Dec. 31, 2019 **Reminder**

### U.S.:NAT MNPS Compliance

U.S. operators with older minimum navigation performance specifications (MNPS) approvals have until December 31 to get these updated if they want to keep flying in the North Atlantic tract under new operations specification management letter of authorization (LOA) B039. These requirements have been in effect for nearly two years.

Jan. 1, 2020 **3 Months to Deadline**

### U.S./Taiwan/Mexico: ADS-B Out Mandate

ADS-B Out equipment must be operational starting Jan. 1, 2020, in aircraft that fly in the U.S. under IFR and where transponders are currently required, and in Taiwan IFR airspace above FL290. Mexico: Requirements are proposed for a start date of Jan. 1, 2020, in Class A, B, C, E above 10,000 feet, and other specified airspace. The requirement could take effect earlier in some airspace over the Gulf of Mexico.

Jan. 1, 2020

### Aircraft $CO_2$ Emissions

The first international standards for carbon dioxide ($CO_2$) aircraft emissions have been enacted by ICAO and initially apply to large subsonic jets, including business jets, for which the application for a type certificate was submitted on or after Jan. 1, 2020.

Jan. 30, 2020

### Datalink Com in North Atlantic

Aircraft flying within the North Atlantic Tracks between FL290 and FL410 must be equipped with FANS-1/A controller-pilot datalink communications and ADS-C starting on Jan. 30, 2020. Aircraft that are not FANS-equipped will be able to operate at cruise altitudes of FL430 and above.

Feb. 18, 2020

### EASA: Halon Banned

Under EASA rules, operators of large airplanes and large helicopters shall ensure that built-in lavatory extinguishers on aircraft newly certified on or after Feb. 18, 2020 do not use Halon as the extinguishing agent. The goal is to gradually mitigate the environmental impact that Halon extinguishing agents in firefighting equipment have on the ozone and climate. The requirement applied to portable extinguishers on these classes of aircraft starting last May.

## Within 12 Months

June 7, 2020

**8 Months to Deadline**

### Europe: ADS-B Out Mandate

The ADS-B Out retrofit requirement in Europe takes effect June 7, 2020. This mandate applies only to aircraft with a mtow exceeding 5,700 kg (12,566 pounds) or having a maximum cruising speed greater than 250 knots, and received its individual certificate of airworthiness before June 8, 2016.

Aug. 14, 2020

### EU: Pilot Mental Fitness

The European Union has published revised air operations safety rules to incorporate provisions to better identify, assess, and treat the psychological fitness of air crew. The rules, applicable to commercial air transport operators, go into effect Aug. 14, 2020. The requirements include mandatory alcohol testing of flight crews during ramp checks.

Oct 1, 2020 **NEW**

### Australia: Rest and Duty Times

New fatigue rules apply to holders of commercial air operator certificates (AOCs), including charter, on-demand air taxis, and Part 141 flight schools. Operators who select the prescribed limits must be in compliance by June 30, 2020. Operators who develop their own fatigue risk management system (FRMS) must be in compliance starting Oct. 1, 2020.

## Beyond 12 Months

Feb. 25, 2021 and Jan. 27, 2022

**16 Months to Deadline**

### Canada: ADS-B Out Mandate

The implementation date of Feb. 25, 2021 is proposed for ADS-B use in Canadian domestic airspace, initially limited to Class A airspace. The mandate would be expanded to include Class B airspace above 12,500 feet on Jan. 27, 2022. Beyond this date, expansion of ADS-B requirements to other Canadian domestic airspace will be based on an assessment of the safety and efficiency requirements for specific airports.

Jan. 1, 2021

### EASA: Cockpit Voice Recorders

Cockpit voice recorders with a recording duration of at least 25 hours will be required on commercial airplanes with an mtow of 60,000 pounds or more manufactured from Jan. 1, 2021. ■

› continued from page 1

# Bizav shows heart

Agency, complete with a makeshift triage center to assist arriving evacuees needing immediate medical attention, food, or water. It processed more than 2,000 individuals displaced by the storm.

West End Airport is a 6,000-foot non-towered concrete strip located at the far northwestern tip of Grand Bahama Island, with no services even in the best of times. But the airport became a lifeline for GA aircraft to provide relief and evacuation to that side of the island, which was connected by a single causeway. Among the scores of aircraft assisting in the efforts were four owned by Germany-based Dieter Morszeck Foundation, a charitable organization set up by the industrialist, initially to provide airborne medical assistance in Brazil. At the urging of German-born Sven Lepschy, CEO of Waco Aircraft, who also serves as one of the foundation's pilots, the foundation dispatched a pair of its Quest Kodiak turboprop singles (one on floats), a float-equipped Pilatus PC-6, and a Cessna 206. "Our small airplanes can reach even the outermost islands in the Northeastern corner of the Bahamas," said Lepschy. "Many people there have lost everything. Their houses are destroyed, and they are currently living under dreadful sanitary conditions." The foundation transported more than 140 people and carried greater than 70 tons of cargo with its 45 flights.

By September 10, aviation fuel was once again available at Freeport International, and those coordinating general aviation activities there began to stand down as governmental and international aid organizations ramped up their activities.

AERObridge announced that it ceased its Dorian disaster response airlift by the end of the following day.

"Our purpose in creating a supply chain to include donations, transportation, and distribution has been fulfilled," said Marianne Stevenson, the group's founder and president. "Government agencies are now shipping supplies and providing aid on a large scale.

"We had 325 pilots flying multiple sorties," Stevenson told **AIN**, adding they transported 175 passengers and carried more than half a million pounds of supplies. "We created a complete supply chain of donations with long-time partner Crossroads in Ocala, as well as general donations in Fort Myers, Palm Beach, Fort Lauderdale, and Key West. With our volunteer pilots, we transported them to Treasure Cay, Marsh Harbor, Freeport, and West End." ■


Dieter Morszeck Foundation pilot Sven Lepschy, CEO of WACO Aircraft, accounted for several of the 1,835 general aviation flights, as calculated by FlightAware, to the Bahamas between September 2 and September 11.

**AIN** senior editor Curt Epstein visited the Bahamas just weeks before Dorian hit. In the wake of the storm's devastation, not knowing how the people who hosted him had fared during the storm, he wrote the following blog:

Little more than two weeks ago, I was in the Bahamas, ill-fated Grand Bahama Island specifically. I was a guest of the country's Ministry of Tourism and Aviation, on a trip to demonstrate how that island, which had lackluster tourism numbers compared to its sisters, had worked to rebound from 2016's direct hit by Hurricane Matthew. Last year, the Bahamas set tourism records, attracting more than 6.6 million visitors, and was on a pace to exceed that amount.

That is until September 1, when Hurricane Dorian arrived. The monster storm, ferocious even by Category 5 standards, stalled and sat on top of the chain's major northernmost islands, Grand Bahama and Abaco, wreaking havoc. According to satellite imagery, by the second day of the storm, more than 60 percent of Grand Bahama was under water. Online and television images show structures at Freeport International Airport in shambles, with the shredded carcasses of light aircraft unable to flee Dorian's wrath, strewn like playthings broken by gigantic unruly children.

My visit coincided with a meeting of the Bahamas Aviation Ambassadors, a group of GA pilots from the U.S. who flew to the area so frequently and encouraged their friends to fly there in train with them so often, that the government decided to formalize the arrangement and establish the ambassador program. Through them, the Ministry (which just recently had the "and aviation" part added to its title) promotes the islands to general aviation pilots, hosting events such as the one I was invited to, to educate them about island destinations.

If a pilot was interested in flying to the Bahamas but uncomfortable about operating alone over open water, they could contact one of the ambassadors who would offer to escort them, and maintain radio contact with them during the trip, from takeoff (usually from Banyan Air Service in Fort Lauderdale) to landing. The ambassadors also lead scheduled groups of GA aircraft to the islands after major aviation gatherings such as EAA AirVenture Oshkosh and Sun 'n' Fun. Some of the ambassadors have served that role for more than 20 years, and were flying relief missions to the islands after Dorian.

One of them with me on that trip was Terry Carbonell, international director of women's pilot organization The Ninety-Nines, who has flown to the Bahamas dozens of times. "These people are our friends," she told me as the reports of Dorian's devastation there continued to filter out. "When I saw 185 mph hit the islands, and knowing that our friends are there, and people that we love, it's heartwrenching. To see how everybody is suffering and we had such a good time there, such a short time ago, it just doesn't seem like it could really happen."

I know exactly what she means, for it is hard to juxtapose those memories of an island paradise with the harsh realities of today.

During our trip, our accommodations were at the Viva Wyndham Fortuna Beach, a resort located, as its name would suggest, right on the beach. I'm told it was situated on the leeward side of the storm and hope that it received some measure of protection from that. But the island's power grid was most likely destroyed, along with other vital infrastructure, and unlike similar situations here in the U.S., there's no line of repair trucks waiting to come in.

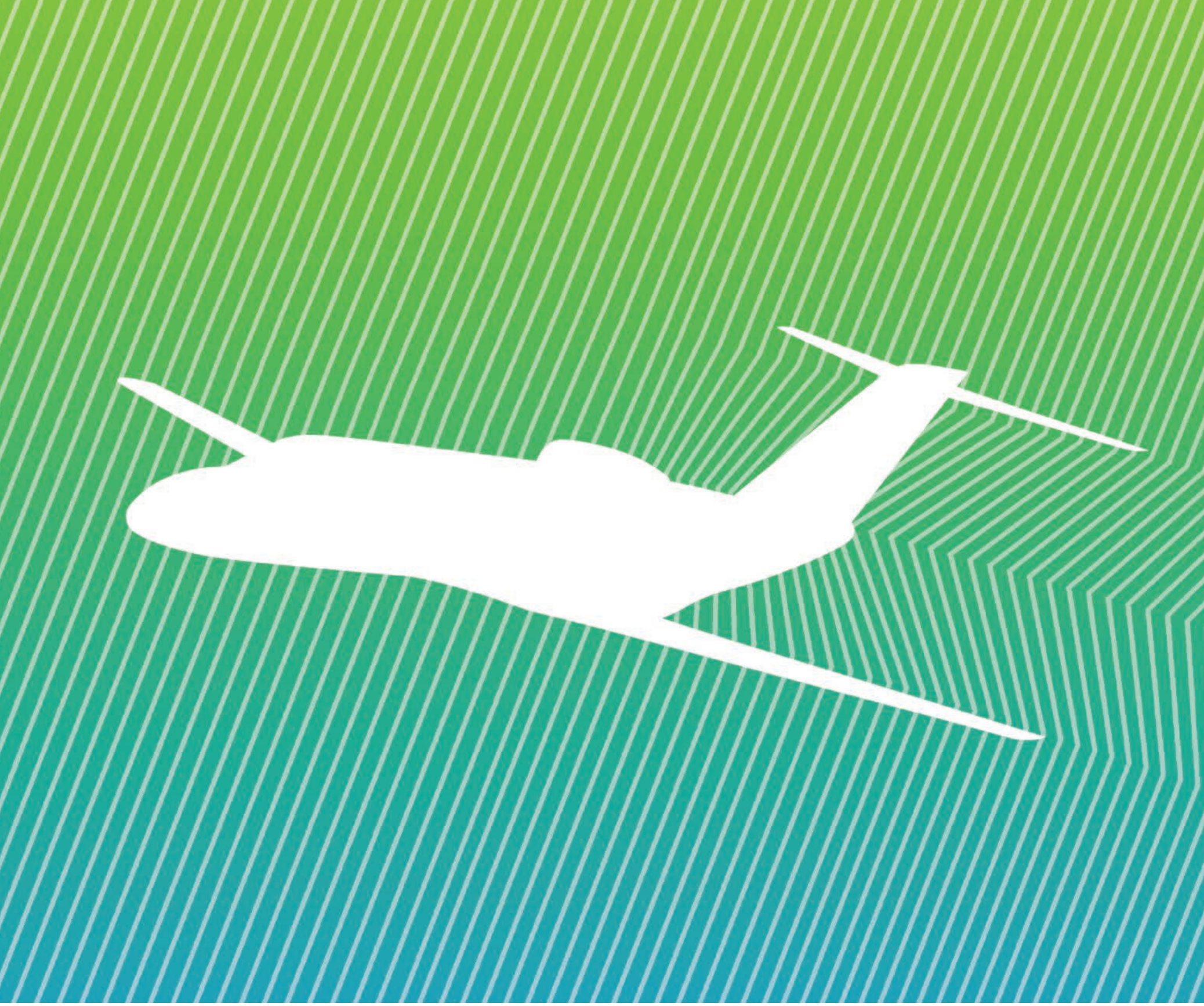
Other stops on our tour included West End Airport, a quiet 6,000-foot strip on the other side of the island with no tower or fuel. Inbound aircraft simply notify the Old Bahama Bay Resort and Marina (which oversees the airfield) with their arrival time and a van with customs officials will meet them.

We toured (and sampled) the Sands Brewery, a modern facility that produces several varieties of beer (including passionfruit and grapefruit-flavored radlers) for the local community only, no export. But with likely power or water outages, let alone storm damage to the facility itself, those taps could run dry. Another destination was the Underwater Explorers Society (UNEXSO), a nine-acre lagoon which is home to a group of dolphins, and hosts encounter sessions with these magnificent animals. One of only a handful of locations that allows the dolphins access to open ocean, I remember in chilling retrospect the then-innocent question asked by one of my companions. "What happens to the dolphins during a hurricane?" "They know better than us when one is coming, and head out to sea," was the reply.

One of the trip's highlights was observing the summer-ending Junkanoo celebration where huge groups of elaborately costumed dancers and musicians marched in competition, all to the beat of drums fashioned from oil drums, and raucous whistles. It was Mardi Gras in a microcosm, and while most of the musical instruments looked well-worn, they were surely family treasures.

While there, I met with airport executives to discuss the airport-owned FBO and general aviation handling operation. The 11,000-sq-ft GA terminal was a recent addition, which was well received by its customers. One Challenger 350 owner who arrived during my visit described how the GA facilities used to be contained in a trailer. "Now its as good as any FBO in the Caribbean," he told me. I have no idea if or in what condition it survived the storm.

I've attempted to reach my contacts there, but have had no reply as of yet. Even if they are able to read my emails or receive my voicemails, I can imagine that getting back to me is either at, or very near the bottom, of their list of priorities, somewhere below finding clean water, food, and shelter for themselves and their families. I wish them and all the Bahamians the best and hope that they will recover their islands as they have done in the past. For those pilots flying relief missions, I salute you. ■



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DAVID McINTOSH

DUBAI 2017


MARK WAGNER

## OCTOBER

**CHC SAFETY AND QUALITY SUMMIT...**
October 1-3, Omni Dallas Hotel, Dallas, Texas.
Info: chcsafetyqualitysummit.com.

**REDBIRD MIGRATION FLIGHT TRAINING CONFERENCE...**
October 15-17, Wings Over the Rockies Blue Sky Aviation Gallery, Englewood, CO.
Info: migration.redbirdflight.com.

**NBAA TAX REGULATORY & RISK MANAGEMENT...**
October 20-21, Las Vegas, NV. Info: nbaa.org.

**NBAA-BACE BUSINESS AVIATION CONVENTION & EXHIBITION...**October 22-24, Las Vegas Convention Center, Las Vegas NV.
Info: (202) 783-9000; nbaa.org/events/bace/2019/.

**MALTA AVIATION CONFERENCE AND EXPO...**
October 30-November 1. Info: mace.aero/.

## NOVEMBER

**THE FLORIDA INTERNATIONAL AIR SHOW...**
November 1-3, Punta Gorda Airport, Punta Gorda, Florida.
Info: floridaairshow.com

**FLIGHT SAFETY FOUNDATION INTERNATIONAL AIR SAFETY SUMMIT...**November 4-6, Taipei.
Info: flightsafety.org/events.

**BOMBARDIER SAFETY STANDDOWN...**November 12-14, Omni Fort Worth Hotel, Fort Worth, Texas.
Info: safetystanddown.com.

**IBERIAN PENINSULA BUSINESS AVIATION CONFERENCE...**
November 14, Madrid, Spain. Info: ipbace.com.

**DUBAI AIRSHOW...**November 17-21, Airport Expo, Dubai, UAE. Info: +97 1 4286 7755; dubaiairshow.aero.

**7TH EASA AIRWORTHINESS DIRECTIVES (AD) WORKSHOP...**
November 25-26, Cologne, Germany. Info: easa.europa.eu/newsroom-and-events/events/7th-easa-ad-workshop-0.

**AFRICAN AIR EXPO...**November 27-29, King Shaka International Airport, Durban, South Africa.
Info: africanairexpo.com.

## DECEMBER

**MASSACHUSETTS BUSINESS AVIATION ASSOCIATION SAFETY DAY...**December 4, Marriott Burlington. Info: massbizav.org.

## JANUARY 2020

**THE PRINCIPLES OF AIRCRAFT VALUATIONS AND APPRAISALS...**January 10, Fort Lauderdale, Florida.
Info: haeropodium.com/valuation.html

**HAI HELI-EXPO...**January 27-30, Anaheim Convention Center, Anaheim, CA. Info: rotor.org.

**NBAA WEST PALM BEACH REGIONAL FORUM...**January 29, Palm Beach International Airport, West Palm Beach, FL. Info: nbaa.org.

## FEBRUARY 2020

**SINGAPORE AIRSHOW...**February 11-16, Changi Exhibition Center, Singapore.
Info: singaporeairshow.com.

## MARCH 2020

**AIR CHARTER SAFETY SYMPOSIUM...**March 3-4, NTSB Training Center, Ashburn, VA. Info: acsf.aero/symposium/.

**NBAA SAN JOSE REGIONAL FORUM...**March 5, San Jose International Airport, San Jose, California. Info: nbaa.org.

**INTERNATIONAL WOMEN IN AVIATION CONFERENCE...**March 5-7, Disney's Coronado Springs Resort, Lake Buena Vista, FL.
Info: wai.org/conference.

**NBAA INTERNATIONAL OPERATORS CONFERENCE...**
March 16-19, Charlotte, North Carolina. Info: https://nbaa.org/events/2020-international-operators-conference/.

**AIRCRAFT ELECTRONICS ASSOCIATION INTERNATIONAL CONVENTION AND TRADE SHOW...**March 24-27, Nashville, TN. Info: aea.net.

## APRIL 2020

**EURASIAN BUSINESS AVIATION SUMMIT AND EXHIBITION...**
April 28-30, Gostiny Dvor Exhibition Complex, Moscow, Russia.
Info: +7 9372 757 085; email: info@eabaa.show; eabaa.show.

## MAY 2020

**EUROPEAN BUSINESS AVIATION CONVENTION & EXHIBITION...**
May 26-28, Palexpo Convention Center, Geneva, Switzerland.
Info: info@ebace.aero; https://ebace.aero/2020/

## JUNE 2020

**NBAA WHITE PLAINS REGIONAL FORUM...**June 10, Westchester County Airport, White Plains, New York. Info: nbaa.org.

## JULY 2020

**FARNBOROUGH INTERNATIONAL AIRSHOW...**July 20-24, Show Centre, ETPS Rd, Farnborough, England. Info: +44 (0) 1252 532800; enquiries@farnborough.com; https://farnboroughairshow.com/

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