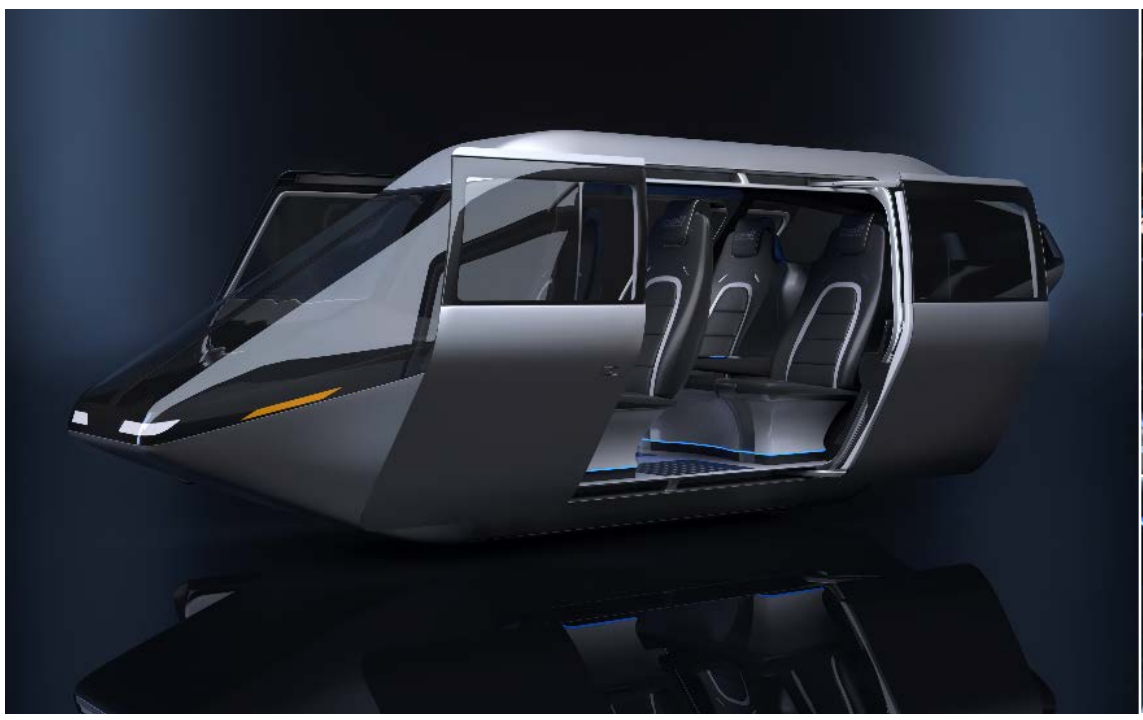
Aviation International News

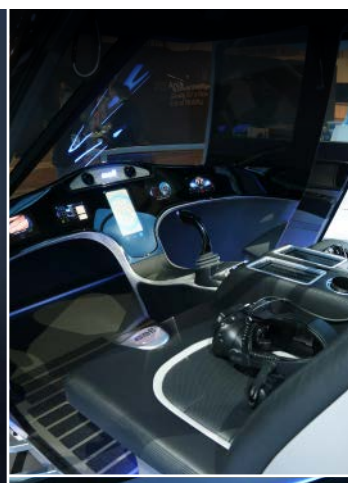
AIN PUBLICATIONS

Vol.49 | No.2

$9.00

FEBRUARY 2018 | ainonline.com





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Bell unveils urban air-taxi

by Mark Huber

Bell Helicopter unveiled its design for an urban air-taxi design last month at the Consumer Electronics Show (CES) in Las Vegas. The four-passenger design will offer full connectivity, including video conferencing capability.

"The future of the urban air taxi is closer than many people realize. We believe in the positive impact our design will have on addressing transportation concerns in cities worldwide," said Bell CEO Mitch Snyder. "While we are laser-focused on the passenger experience and eager to share with the public, Bell continues to develop our air-taxi design to provide safe, reliable transportation services to the world."

During CES 2018, attendees experienced an augmented reality simulator, inside the air-taxi cabin, designed to portray a variety of flight scenarios, including cross-city day and night trips. Last year, global ride-sharing service Uber and Bell announced plans to partner and accelerate the eventual large-scale deployment of electric vertical takeoff and landing (eVTOL) vehicles.

Last year, Scott Drennan, Bell's director of engineering innovation, said his company's design would be robust enough to fly 2,000 hours per year; be "modular, adaptable, and scalable"; be able to use a variety of powerplants; have both civil passenger and military logistics applications; and likely be certified under the FAA's new powered-lift category developed for tiltrotors. Uber believes urban air taxis can be operated for a cost near $1.32 per mile, about one-third of the price of operating a turbine helicopter. ■

Read Our **SPECIAL REPORT**

Helicopter Training

Today's pilots and crewmembers can get realistic and effective training in the latest generation of sims. In fact, some even incorporate night-vision goggles and virtual reality to make students feel like they are sitting in the right seat.

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ATC debate could shift as key leadership changes

by Kerry Lynch

Two high-profile changes in Washington are anticipated to reshape the debate surrounding the move to carve the U.S. air traffic control organization out of the FAA. One of those will not occur until the end of the year: the retirement of House Transportation and Infrastructure Committee (T&I) chairman Bill Shuster (R-Pennsylvania) from Congress. The second occurred in January: the naming of Dan Elwell as acting FAA administrator.

Shuster, the chief architect of the proposal for an independent, user-funded air traffic

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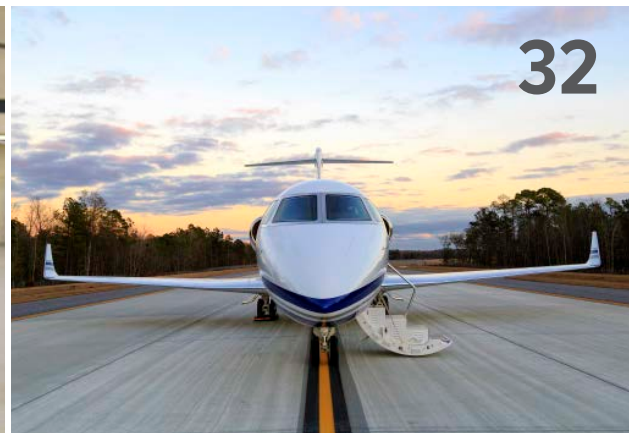

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Aviation International News (ISSN 0887-9877) is published monthly. Periodicals postage paid at Midland Park, N.J., and additional mailing offices. **Postmaster:** Send address changes to Aviation International News, P.O. Box 47628, Plymouth, MN 55447 USA. Allow at least eight weeks for processing. Include old address as well as new, and an address label from a recent issue if possible. Subscription inquiries: +1 (203) 798-2400 or email: subscriptions@ainonline.com.

AIN PUBLICATIONS

BPA WORLDWIDE

LEGACY® 500
BY EMBRAER

LEGACY 500: YOU'LL NEVER WANT TO FLY ANYTHING ELSE

"What we liked most about the Legacy 500 is the technology and value it added to our flight department. The cockpit enhancements, the autothrottle, autobrakes, the HUD, the EVS, the cabin enhancements – those were all things that stood out for us.

Compared to other aircraft I've flown, the Legacy 500 is much more advanced and gives you a lot more confidence. The fly-by-wire technology makes the entire flying operation safer because of its redundancy, its precision and its ability to take the workload off the pilot. The avionics system is also very intuitive; it is very easy to transition into and become proficient flying.

I always tell people, once you fly the Legacy 500 and feel how precise the aircraft is and know how reliable it is, you'll never want to fly anything else.

Really, I can't imagine flying anything else anymore. It's just a fantastic airplane with wonderful support. I can't say enough. I highly recommended it."

- Paul Kohler, Aviation Manager/Chief Pilot, Michels Corporation
Watch Paul's story and request more information at
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The game-changing Legacy 500, with its exclusive fly-by-wire controls – previously available only in modern airliners and much larger business jets – is the benchmark for the future in performance, comfort and passenger experience. On the flight deck, the advanced Rockwell Collins Pro Line Fusion™ platform puts pilots in complete control in a cockpit environment that provides superior ergonomics. With seating for up to 12 passengers, the Legacy 500 features a spacious stand-up cabin with a flat floor, fully equipped galley, state-of-the-art in-flight entertainment system, elegant seating that converts into fully flat berths and the lowest cabin altitude of any medium-cabin aircraft. Its extensive main baggage compartment is complemented by a generous in-flight-accessible cabin stowage space. Boasting enviable speed, the clean-sheet design Legacy 500 delivers a high-speed cruise of Mach 0.82 and excellent runway performance.

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As We Go To Press

GULFSTREAM'S G450 REACHES END OF THE LINE

Gulfstream Aerospace delivered the final G450 on January 19 as it prepares to usher in its replacement, the fly-by-wire G500. The G450 entered service in 2005 and quickly proved it had longer legs than anticipated, flying 4,350 nm at Mach 0.80. "For the past 12 years, the G450 has been one of the best-selling jets in the industry," said Gulfstream president Mark Burns. "During its 30-year history, the GIV series transformed business aviation. The Savannah, Georgia-based airframer has produced more than 360 G450s, which have amassed nearly one million flight hours over more than 461,000 flights. Burns noted the company will continue to provide full product support and sustaining engineering for the G450 fleet.

AIRBUS HELICOPTERS RETHINKING X6

Outgoing Airbus Helicopters CEO Guillaume Faury said unspecified technologies Airbus was considering for the X6 are "not ready" from suppliers and "the market is not sustainable" for a new heavy twin in the depressed oil-and-gas space, which is increasingly turning to smaller super-medium twins such as the H175. Faury hinted that the X6 might ultimately emerge as a significantly different, perhaps military-driven, product. For now, he said, Airbus Helicopters "will not launch a full-fledged program," but will rather continue research.

FAA/EASA TO ANNOUNCE MMEL SOLUTION SOON

Flight information provider Flight Service Bureau expects the joint FAA/EASA workgroup to soon provide a solution to the master minimum equipment list (MMEL) versus minimum equipment list (MEL) "debacle." Last year, ramp checks on some U.S. aircraft in France exposed the fact that EASA and the FAA have different interpretations of the ICAO standards for deferring aircraft discrepancies. In the U.S., operators with FAA authorization can use an MMEL, but in Europe an MEL specific to each aircraft or fleet must be used. Flight Service Bureau said the FAA will soon issue a notice requiring international operators to obtain new D195 LOAs, and EASA will give a 12-month grace period to allow time for these LOAs to be issued.

SWISSHELICOPTER SH09 SLATED TO ENTER SERVICE IN 2019

Marenco Swisshelicopter will bring its second flying SH09 prototype (P2) to Heli-Expo later this month in Las Vegas, where it plans to announce new orders for its light single-turbine helicopter during the show and provide an update on the flight-test program. A follow-on aircraft (P3) is currently undergoing preparations before continuation of the flight-test program. This helicopter and pre-series aircraft PS04 will jointly serve to obtain EASA certification and soon thereafter FAA validation, the company said. Deliveries of the SH09 are expected to begin next year.

FIRST FLIGHTSAFETY GULFSTREAM G500 SIM GETS FAA NOD

FlightSafety International's first Gulfstream G500 full-flight simulator, which is housed at its Savannah, Georgia learning center, has received interim FAA level-C qualification, the aviation training company announced on January 23. A second simulator that is interchangeable between the G500 and G600 will be qualified following certification of the G500, which is expected in the first quarter. Pilot and maintenance technician training will then begin using both simulators at FlightSafety's Savannah center. Gulfstream will determine the timing and location of additional domestic and international training sites according to customer needs, FlightSafety said.

GULFSTREAM CAPS STRONG Q4 WITH NEAR RECORD G650 ORDERS

Gulfstream Aerospace finished 2017 with an increase in both large-cabin and mid-cabin deliveries for a total of 30 and experienced its second best quarter ever in terms of G650/650ER orders, according to parent company General Dynamics. Gulfstream delivered 23 large-cabins and seven mid-cabins in the fourth quarter, up a unit in each category over the same period in 2016. For the year, deliveries overall were down by a unit to 120 as large-cabin deliveries declined four units to 94. Mid–cabin deliveries, however, were up three, to 27. General Dynamics chairman and CEO Phebe Novakovic said the group overall had an "outstanding year" and "very good order intake, particularly in the fourth quarter." Net orders at Gulfstream were up 20 percent on the strength of large-cabin orders. Gulfstream G650/650ER orders were up 78 percent year-over-year.

NBAA: ATC BATTLE REMAINS

"The battle over ATC privatization won't end with Transportation Committee chairman Bill Shuster's retirement," NBAA president and CEO Ed Bolen said last month at the NBAA regional forum in West Palm Beach, Florida. "We're using the regional forum to call members to action on this very issue." Bolen noted that the push for separating air traffic services from the FAA is "still very much alive," and will be amplified as the current FAA reauthorization extension expires in March. To counter this, NBAA and other general aviation groups have created the ATC Not for Sale program and have set up a Contact Congress webpage to make it easy for members to contact their representatives in Washington, D.C.

GULFSTREAM

The Transportation Security Administration has quietly withdrawn a rule that the business aviation community said would have imposed "new, onerous, and largely unworkable security regulations" on general aviation aircraft weighing more than 12,500 pounds.

With no action in a decade, TSA officially drops LASP

by Kerry Lynch

Nearly a decade after the Transportation Security Administration (TSA) introduced the Large Aircraft Security Program (LASP) and was met with an outpouring of opposition, the agency has quietly withdrawn the rule. NBAA noted its official withdrawal, saying that, as originally written, the rule would have imposed "new, onerous, and largely unworkable security regulations on general aviation." Instead, the association said, the business aviation community is continuing to work with the agency on risk-based initiatives.

Designed for aircraft weighing more than 12,500 pounds, LASP called for flight crew criminal history record checks, the cross-check of passenger names against no-fly and selectee lists, compliance with the prohibited items list for scheduled airlines, and security program audits, among other requirements. General aviation groups called the requirements unworkable and warned the TSA that the program would have "disastrous" consequences for the industry.

Opposition increased so much that Congress got involved, pressuring the agency to revise it. The TSA agreed to rewrite the rule, and it had languished at the agency since.

TSA leaders since had acknowledged the rule needed changing, including the previous administrator, Peter Neffenger, who had called the rule too prescriptive and said he wanted to open a dialog with the business aviation community and work more collaboratively.

The more collaborative approach has been widely welcomed by business aviation leaders. "NBAA and its members remain fully committed to promoting appropriate, reasonable, risk-based security measures for general aviation, and in the 10 years since LASP was introduced, the industry has demonstrated a record of compliance with very sophisticated, voluntary, and mandatory security measures," said NBAA president and CEO Ed Bolen. "We look forward to continuing our work with the TSA, Congress and security experts on additional collaborative efforts."

Working through an industry/government Aviation Security Advisory Committee, the business and general aviation community and the TSA have progressed on issues such as the revision of general aviation airport security guidelines, a review of flight-training security procedures and more recently, possible updates to the Twelve-Five Standard Security and Private Charter Standard Security Programs.

The move to drop the program was no surprise. Few, if any industry leaders, expected to see the program resurrected anytime in the near future, and most believed its fate was further sealed by the ongoing regulatory review required by the Trump administration. ■

NEWS note

The European Business Aviation Association (**EBAA**) **has decided to skip a year for its** still nascent **Air Ops Europe** and bring back an "expanded and improved" event in fall 2019. EBAA CEO Brandon Mitchener had told **AIN** that expanding Air Ops Europe has been part of EBAA's strategic plan. The move to skip this year, with an eye on returning with a larger event, was based on feedback from past and potential participants, Mitchener said in a note announcing the decision. ■

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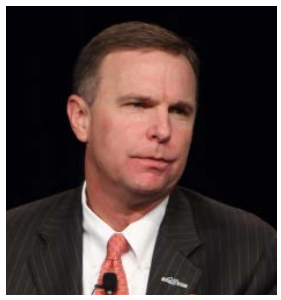
ATC battle, airport access are top challenges in 2018

by Kerry Lynch

The battle over the fate of the nation's air traffic control system, airport access, and personnel shortages remain at the top of the challenges confronting the business aviation community in 2018, said NBAA president and CEO Ed Bolen.

In a new edition of NBAA's *Business Aviation Insider*, Bolen outlined key issues facing the industry as 2018 kicks off. "At the top of the list will be the airlines' continuing effort to replace congressional oversight of the nation's ATC system with a private group unaccountable to Congress," Bolen said. "Although a diverse coalition of opponents, including NBAA members, has made forceful arguments against ATC privatization legislation authored by Rep. Bill Shuster (R-Pennsylvania), it would be naïve to believe the airlines have given up on trying to gain control of the ATC system."



NBAA president and CEO Ed Bolen recently outlined the most pressing challenges facing bizav.

He also pointed to local issues that have national implications such as legal challenges over the fate of Santa Monica Airport in California and access to New York's East Hampton Airport. "A primary function of NBAA is to help ensure that business aviation retains equitable access to airports and airspace," he said, adding that currently the association awaits work on its legal challenge to overturn an agreement between the FAA and the city of Santa Monica that allows the airport to close by 2028.

While aviation advocates prevailed in the courts last year over access to East Hampton Airport, Bolen warns, "Airport opponents continue to seek operating restrictions, which means we need to remain vigilant."

Another growing challenge facing NBAA members, he said, is attracting and retaining talent. "The personnel shortage has become more pronounced recently, as the airlines offer attractive pay and benefits in order to recruit some of our best people," he said and noted that NBAA and its committees are working to address these concerns and plan to expand efforts in this area. He noted NBAA already engages in efforts such as scholarships and offers insights in *Business Aviation Insider* on dealing with these challenges. ■

2017 deliveries climb above forecast at Dassault Falcon

Deliveries of Falcon business jets were nearly 9 percent higher last year than forecast by Dassault Aviation, the company announced on January 8. The French aircraft manufacturer shipped 49 Falcons last year, four more than forecast and on par with its overall number of business jet deliveries in 2016.

Order intake was also more robust as net orders for Falcons climbed to 38 units last year, up from 21 net orders in the previous year. Last year's net orders include three cancellations for the Falcon 5X, a program that was scrubbed last month due to further issues with the Safran Silvercrest engine selected for the large-cabin business jet. In 2016, Dassault recorded 12 Falcon 5X cancellations.

As of December 31, the company's backlog includes 52 Falcons, down from 63 Falcons a year earlier. Dassault Aviation will present full-year annual results and 2018 guidance on March 8 in Paris. **C.T.**

CORRECTION

In an article in our January issue "Consolidation slows as chains acquire prime FBO facilities" (pg.30) the caption accompanying this photo was incorrect. The correct caption should read "Deals this year included Atlantic Aviation's acquisition of Orion Jet Center at Miami-Opa Locka."

News Briefs

VistaJet Sees Flight Hours Grow

VistaJet had its strongest ever year in 2017, with flight hours "up markedly" year-on-year. In fact, VistaJet increased market share across the globe and saw double- and even triple-digit growth in flight hours, with the U.S. up 38 percent; UAE, 44 percent; Oman, 300 percent; and Asia, 16 percent. "If current trends continue, 2018 is expected to be another momentous year for the company," VistaJet said. "The upper end of the sector historically tracks the global economy, and with Europe, the U.S., and the Middle East seeing growth once more, demand is only set to build in 2018." Its all-Bombardier fleet now numbers 72 aircraft.

IS-BAH Hits Major Milestone

The International Standard for Business Aircraft Handling (IS-BAH), a voluntary program of best practices for the world's FBOs and ground handlers, has hit a milestone with the registration of its 100th business. The audit-based program was launched in July 2014 by the International Business Aviation Council (IBAC). "I see our momentum continuing as more FBOs and handling agents embrace the code of industry-developed best practices as our sector recognizes the value of a positive safety culture to their core business," said program director Terry Yeomans. According to IBAC, widespread voluntary adoption of IS-BAH could lead to "preferred long-term self-regulation" for the ground handling and FBO industry.

U.S. Business Aircraft Flying Ends 2017 with Gain

Business aviation flight activity posted a 2 percent year-over-year increase in December, according to TraqPak data from Argus International. By operational category, Part 135 flying came out on top, rising 4.6 percent from a year ago, while fractional activity wasn't far behind, with a 4 percent increase. But Part 91 flying once again slipped into negative territory, falling 0.5 percent year-over-year. Despite an 8.3 percent resurgence in fractional turboprop flying, the turboprop aircraft category remained flat year-over-year. Light jet activity was equally anemic, logging a 0.1 percent decrease. However, midsize and large-cabin flying saw solid gains, ascending 4.2 percent and 5.5 percent, respectively, from a year ago.

Garmin G1000NXi Avionics OK'd for Piper M500

Piper Aircraft has received FAA approval for the next-generation Garmin G1000NXi integrated flight deck on both its M500 turboprop single and M350 pressurized piston single. It will also offer the avionics as a retrofit option for in-service G1000-equipped models including the Matrix, Mirage/M350, and Meridian/M500 later this year. The G1000NXi features enhanced situational awareness, visual approaches, and map overlay on the horizontal situation indicator.

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Only three fatalities in 2017 for U.S.-registered bizjets

by Gordon Gilbert

The number of fatalities from U.S.-registered business jet accidents fell to three in 2017, from eight in 2016, a drop of 62.5 percent, according to preliminary figures researched by **AIN**. Nonetheless, as in 2016, there were still two fatal crashes by N-numbered bizjets last year. The four U.S. fatal accidents for both years occurred under Part 91. The two fatal crashes last year occurred in the first five months.

On March 24, 2017 a Cessna Citation 500 being flown under IFR Part 91 by a private pilot, the sole person on board, crashed while being radar vectored for an approach to an airport that was not the flight planned destination. The pilot requested vectoring because his autopilot was not working and he was having instrument problems. Controllers lost contact when the airplane was about 15 miles from the airport.

AIN tables show "incidents" as well as "accidents" to distinguish mishaps based on their degree of severity. Investigators often draw fine distinctions between the two events, but, typically, incidents result in minor or no damage and their investigations are sometimes delegated to local officials.

Accidents are events that range from minor damage to destruction and/or injuries. Also, some incidents ultimately get upgraded to accident status during the investigative process. ■

U.S.-registered Business Jet and Turboprop Accidents/Incidents Worldwide (2017 vs. 2016)

Business jets	Total		Part 91		Part 91K		Part 135		Public/Gov't		Mfr.	
	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016
Total accidents	8	12	6	11	1	0	1	1	0	0	0	0
Nonfatal accidents	6	10	4	9	1	0	1	1	0	0	0	0
Fatal accidents	2	2	2	2	0	0	0	0	0	0	0	0
Fatalities	3	8	3	8	0	0	0	0	0	0	0	0
Incidents	51	35	41	28	2	5	8	2	0	0	0	0

Business turboprops	Total		Part 91		Part 91K		Part 135		Public/Gov't		Mfr.	
	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016
Total accidents	32	31	22	22	0	0	9	8	1	1	0	0
Nonfatal accidents	23	22	15	18	0	0	7	4	1	0	0	0
Fatal accidents	9	9	7	4	0	0	2	4	0	1	0	0
Fatalities	20	28	16	14	0	0	4	12	0	2	0	0
Incidents	10	51	9	43	0	0	8	7	0	1	0	0

*All data preliminary. Sources: FAA, NTSB, Aviation Safety Network, **AIN** research*

Involving Non-U.S.-registered Business Jets/Turboprops

Business jets	Total		Private		Charter		Other*		Unknown	
	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016
Total accidents	11	3	6	3	3	0	2	0	0	0
Nonfatal accidents	7	1	4	1	2	0	1	0	0	0
Fatal accidents	4	2	2	2	1	0	1	0	0	0
Fatalities	19	6	7	6	3	0	9	0	0	0
Incidents	15	20	12	13	1	2	1	5	1	0

Business turboprops	Total		Private		Charter		Other*		Unknown	
	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016
Total accidents	35	22	17	10	12	9	6	3	0	0
Nonfatal accidents	23	14	12	7	9	5	2	2	0	0
Fatal accidents	12	8	5	3	3	4	4	1	0	0
Fatalities	58	27	19	11	28	10	11	6	0	0
Incidents	13	13	3	5	5	2	5	6	0	0

**For example: ambulance, survey, ferry, training, testing, manufacturer, government (non-military) and head of state.*

On May 15, a Learjet 35 crashed during the turn for a circling approach. The two pilots were killed on the Part 91 positioning flight from Philadelphia to Teterboro, N.J. The aircraft was "less than a mile" from Runway 6 on the ILS approach (in VMC) when it crashed during the right turn for the circling approach to land on Runway 1. At press time, both accidents were in preliminary investigation stages.

Nonfatal accidents of Part 91 decreased by about 50 percent, Part 135 jets remained unchanged year-over-year, and the one Part 91K nonfatal mishap in 2017 happened when the lead passenger was exiting the aircraft, slipped on the door's airstair, and broke her ankle.

Non-U.S. Jet Fatalities Triple

In sharp contrast to their U.S. counterpart, fatal accidents involving non-U.S.-registered business jets doubled, from two in 2016 to four last year, and the number of fatalities more than tripled, from six to 19. Non-U.S.-registered jets saw two fatal crashes during private operations in each of the comparable years, but in 2017, there were two additional fatal accidents—one under charter and the other a government flight.

On May 17, 2017, a Mexican-registered, privately operated Learjet 25 crashed seconds after takeoff, killing the two pilots. On July 4, 2017, all nine people aboard a Venezuelan-registered Gulfstream GIII perished when the aircraft, on an official state flight, crashed into the sea. Five people lost their lives in another crash into the sea by a Venezuelan-registered privately operated Learjet 25 on Aug. 19, 2017. And on Dec. 14, 2017, three people died in the crash of a chartered Austrian-registered Citation Mustang on an approach in Germany. This was the first fatal accident of a Mustang and just the second serious accident of this model on record.

Accidents of non-N-numbered jets resulting in no fatalities increased last year in all three segments: private, charter and other.

Fatalities from accidents of U.S.-registered business turboprops fell to 20 from 28, year over year, although the number of fatal accidents remained unchanged—nine each in 2016 and 2017. Fatal turboprop accidents under Part 91 increased to seven from four. Fatal crashes under Part 135 decreased from four to two—and the number of fatalities in air taxi mishaps dropped from 12 to four. Nonfatal accidents of Part 91 turboprops increased slightly, but Part 135 nonfatal mishaps nearly doubled.

Fatalities from accidents of non-N-numbered business turboprops did not compare well to their U.S. counterparts. There were 12 crashes of non-N-numbered turboprops that were fatal to 58 persons last year compared to eight crashes that took the lives of 27 persons in 2016. Both private and charter operations had more nonfatal accidents as well in 2017 versus 2016. ■

News Briefs

European Bizjet Flying Surges 6% in December

Business jet activity in Europe climbed 6 percent in December, though overall business aircraft flying fell 1 percent year-over-year, according to WingX Advance. "December's flight activity was slightly down, but that appears to have been weather-related, mainly affecting owner-piloted light aircraft activity," said WingX managing director Richard Koe. The year ended with 4 percent growth in overall business aviation flights compared with 2016, however. "Overall, 2017 was clearly a strong recovery year for business jet demand in Europe, and we expect to see more of the same in 2018," Koe noted.

NBAA Begins Mentoring Program

NBAA has kicked off the initial stage of a new mentoring program that partners industry veterans with individuals interested in pursuing opportunities in business aviation. The association called the initial phase a "beta" version of the program, which involves the pairing of 20 sets of people based on their collective interests and goals. A steering group created the program with input from NBAA's Young Professionals Council, the association's Domestic Operations and Business Aviation Management Committees, and staff members. The initial program is anticipated to run through June, followed by a nine-month program to begin in September 2019. NBAA is considering launching a full mentoring program in fall 2020.

Simhawk Logs 16K Hours of Booked Sim Time in 2017

Simhawk handled requests for more than 16,000 hours of simulator time via its online marketplace last year. "We saw a significant increase in the number of users in the second half of 2017, including those from a number of industry segments that we had not previously served," said Simhawk CEO Chris Weinberg. According to Weinberg, Simhawk handled training requests that equate to the annual capacity of three full-motion flight simulators. "And we expect this to increase significantly in 2018," he added.

Sonnie Bates Joins Wyvern

Sonnie Bates has stepped in as CEO at Wyvern. Bates succeeds Art Dawley at the industry audit and risk management specialist. Dawley has left the company. Bates has a more-than-30-year aviation background that spans the U.S. Air Force, industry, and associations. He previously was vice president and COO for aviation consultancy Baldwin Aviation and before that spent six years at the International Business Aviation Council. Bates's career also has included time as a captain on long-range business jets for corporate flight departments. He further has held key roles with CAE, where he developed the pilot training program for the Falcon 7X and was the program manager for Dassault Falcon products.

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Beyond the hype: blockchain uses for bizav

by Kellyn Wagner Ramsdell

On January 3, Israel Aerospace Industries (IAI) and Poalim Bank announced a strategic collaboration on the use of blockchain for securing information within the business aviation lifecycle. With this announcement, IAI joins Air France KLM, Boeing, and many other aviation corporations looking to blockchain to solve aviation problems.

Often confused with bitcoin, blockchain is the technology upon which bitcoin rests. It is essentially a widely accessible database. Participants within a blockchain can submit information. In the case of bitcoin, users submit financial transactions to the blockchain. With aviation, users could submit flight hours, traveler information, safety records, and much more. This information is then confirmed via a mechanism established by the community using that blockchain.

Once an action or submission to a blockchain is confirmed, it is added to a "block." Each block can contain thousands to millions of distinct points of data. These blocks are then sealed upon completion. Once in the chain of blocks, information cannot be changed. Each piece of information and each block is confirmed using cryptography. This allows each blockchain user to confirm that the information remains unchanged.

James Kornberg, Air France KLM's director of innovation, outlined blockchain's benefits.

A key component of a blockchain is that it is decentralized. Therefore, because no one entity owns the blockchain, all stakeholders within business aviation can use it to share records. Similarly, because every entity can access the information within the blockchain, there is no need for multiple record-keeping systems.

The cryptography used in the blockchain offers improved security over traditional web-based and internal record-keeping systems. Additionally, cryptographic timestamps on each point of data reduce the opportunities for fraud. Finally, data within the blockchain is more transparent and accessible than that maintained in current record-keeping systems due to the "ledger" system.

Blockchain data is recorded in ledgers that are on the servers of each participating organization. These ledgers are updated simultaneously with each new addition of a block. This means every participating organization has full access to the data without relying on someone else's server.

Commerical Applications

Air France KLM began researching realistic aviation blockchain use cases in its MRO Lab in mid-2017. In an October 2017 webinar with Microsoft and Ramco Aviation, James Kornberg, Air France KLM's director of innovation, identified four features of blockchain: "resilience, traceability, integrity, and disintermediation" and characterized them as "well suited to the aviation supply chain."

Most proposed aviation blockchain applications seek to resolve problems in operations, as well as maintenance, repair, and overhaul. In November 2017, General Electric filed a series of five patents with the United States Patent and Trademark Office. These five patents create a theoretical system for tracking aircraft maintenance records, parts acquisition, flight records, and any additional information pertaining to the life of an aircraft.

Boeing is examining blockchain for securing the supply chain process and resolving aviation cybersecurity concerns. A December 2017 Boeing patent application reveals the company's intention to use blockchain to prevent GPS spoofing events.

Accenture Consulting proposes the blockchain for e-ticketing and airline loyalty programs. Meanwhile, IATA is evaluating using blockchain for a payment system. It hopes to create a payment network for aviation that will return an estimated $7.7 billion to airlines. ■

Preowned Gulfstream market tightens; pricing firms up

Hagerty Jet Group, which specializes in pre-owned Gulfstream sales, deemed 2017 a success for the aircraft brokerage industry, noting an uptick in sales transactions, a decline in pre-owned inventory and stabilizing prices. The broker also hailed that both Vref and Blue Book published values that were "mostly flat" for Gulfstreams in the fourth quarter.

"For the first time in three years, G550 values remained unchanged," Hagerty Jet said. "Previously, they had been losing around 18 percent to 20 percent per year over the preceding 36 months."

The company has seen a "shift in the market." It said pre-owned Gulfstream buyers entering the market have been "frustrated" due to fewer choices and firming prices. In fact, Hagerty Jet said that three in-production Gulfstream models—the G650, G550 and G280—have very low inventory levels, with less than 4 percent of each fleet currently for sale.

While depreciation has slowed down for most Gulfstream models, supply remains high in older models—including the G200, GIV-SP and GV—with inventory between 10 percent and 12 percent, "which is more in line with the current industry average," Hagerty Jet said.

It also pointed out that the cancellation of the Falcon 5X in December due to engine issues "was a huge blow to Dassault and creates opportunity for Gulfstream to be first to market" with the G500 this quarter. Hagerty Jet also expects that the new U.S. tax bill, which allows for 100 percent bonus depreciation on new and pre-owned business jets this year, "will incentivize buyers on the sidelines to finally make a purchase and reduce supply further." It added, "We're hopeful the new tax bill will incentivize large U.S. corporations to order new airplanes, which will bring more used product into the market in 2019 and 2020." **C.T.**

News Briefs

Boeing/Embraer Talks Leave Questions on Bizjets

A potential tie-up between the Boeing Company and Embraer could provide benefits to the Brazilian manufacturer's business jet and military lines, but whether they would be included in any teaming agreement remains in question, analysts said. Boeing and Embraer in late December confirmed they are engaged in talks over some sort of combination. Noting a lack of overlap between the current Boeing and Embraer lineup, Teal Group's Richard Aboulafia said, "The [Embraer] E-175/190/195 family would be a terrific complement to Boeing's large jetliners." Embraer's business jets and military aircraft might also be of interest to Boeing, he said. Rolland Vincent, president of Rolland Vincent Associates, questioned whether Boeing would have an interest in the Brazilian airframer's Executive Jets division given its lower-volume production.

FAA Cautions Against PED Fire Kit Instructions

The FAA is warning operators to follow the agency's guidance on containing fires involving portable electronic devices rather than conflicting instructions that might accompany a fire containment kit or bag. "There are no FAA test standards for these containment products, nor is there a mechanism in place for the approval of these products," it said. The agency's Safety Alert for Operators 0913 and Advisory Circulars AC 20-42D and AC 120-80A outline specific procedures for extinguishing and cooling a device that might have caught fire.

Citation Latitude To Enter MexJet Fractional Service

Textron Aviation is continuing to expand the international base for its Cessna Citation Latitude with an order from Aerolíneas Ejecutivas (ALE) for three of the midsize business jets. ALE will place the aircraft in its MexJet fractional ownership division. The aircraft will be delivered through the first three quarters of this year.

StandardAero To Close LAX Bizav Mx Facility

StandardAero will close its Los Angeles International Airport (LAX) business aviation repair station by the end of next month. Company officials have met with its approximately 70 LAX-based employees to provide assistance in redeployment, outplacement, and relocation to other StandardAero positions. Despite this closure, StandardAero will continue to provide mobile aircraft service capabilities in Southern California. StandardAero attributed the base shutdown to an "unexpected reduction in the number of worldwide [Honeywell] TFE731 engine events and the associated revenue and volume declines that have accompanied this trend, along with multiple unsuccessful attempts to secure a long-term lease for the LAX facility."

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Bombardier is moving forward on the Global 8000 program, but the company is currently more focused on the Global 7000, for which it has a stronger backlog.

Global 7000 on track, questions remain on 8000

by Chad Trautvetter

While Bombardier remains on track to certify and deliver the first Global 7000s later this year, recent comments from company executives portray a clouded future for its truncated, longer-legged sibling—the Global 8000. Compounding this uncertainty is a still-undefined certification schedule, an apparent paucity of orders, and, according to industry analyst Rollie Vincent, "unclear" market requirements.

During an investor day in late December, Bombardier Business Aircraft president David Coleal said the Global 8000 accounts for "a very, very small percentage of our backlog," implying that demand is lukewarm for a variant that trades nearly eight feet of cabin space for an extra 600 nm of range, to 7,900 nm. He avoided any kind of concrete schedule for the new jet, saying the Canadian aircraft manufacturer will "determine the right schedule for the 8000...probably sometime after" the Global 7000 enters service.

Coleal also touched on the fact that the models might not have enough differentiation in the marketplace. "We're also going to look very closely at the performance of the 7000 in determination with the 8000 and understand the differences between the two." Recent remarks by Bombardier president and CEO Alain Bellemare that there has been an "overinvestment in aerospace" over the past few years cast doubt on whether the company would even invest more to differentiate the Global 8000 from the 7000.

"My thought is that the Global 8000 is no longer on their radar, per se," said Vincent, the managing director at JetNet iQ. "I believe that they will consider a variant of the Global 7000 that will offer additional range at a higher gross weight. Whether they ultimately call it the 8000 is up to them. Furthermore, the timeline for any such development is unclear. The market requirement is unclear; Bombardier has been marketing this concept since 2010 and yet few orders have been taken."

He also questioned trading cabin space for range in an ultra-long-range jet. "One of the challenges has been to ensure an adequate crew rest area in the shortened fuselage of the 8000—this has undoubtedly worked against the design," Vincent told **AIN**. "This is vital and valuable 'corner office' real estate."

Still, a Bombardier Business Aircraft spokesman said the Global 8000 program is moving forward. "For the 8000, simply put, we don't communicate a target entry-into-service date at the moment, which will be determined later," he said. "Because a lot of work required for the Global 8000 is already happening on the Global 7000 from a development perspective [given the 8000 is a derivative of the same family], it's better for us to ensure all hands on deck to enter Global 7000 in service because of the stronger backlog, then shift resources to the 8000."

He further explained Coleal's comment about Global 8000 backlog. "It is really related to near-term deliveries and our operational plan, meaning we do have more flexibility operationally speaking with regards to the 8000 versus the 7000, which was always billed as entry-into-service first," the spokesman said. ■

SMO reopens with new ATC procedures

Operations resumed in late December on the shortened Runway 3/21 at Santa Monica Airport (SMO) in California with new air traffic control procedures in place. The city announced the December 23 reopening of the 3,500-foot runway—reduced by 1,500 feet—proclaiming the project on time and on budget and stressing that the new length would reduce jet traffic and pollution in both Santa Monica and Los Angeles.

"This is a great day for the city of Santa Monica and our residents," said Santa Monica mayor Ted Winterer. "We stayed the course and kept our eye on delivering a shortened runway just in time to usher in the New Year with reduced noise and pollution from large jets."

The airport shuttered to aircraft operations for a 10-day period while the runway-shortening project was completed. During that period the U.S. District Court for the Central District of California dismissed one of the cases challenging a consent decree struck between the FAA and the city that paved the way for the runway shortening in the near term and ultimate closure of the airport in 2028.

A separate lawsuit involving NBAA and a handful of airport businesses and supporters who also are challenging the consent decree is moving forward in the U.S. Appeals Court for the District of Columbia.

The FAA issued a Notam noting new taxiway locations and hold areas and advising of run-up areas. With the new runway configuration, pilots will no longer be able to exit the runway at any point and must use the new taxiways. "Pilots are encouraged to ask SMO ATC for clarification or help at any time they are uncertain or think they need additional assistance," said Santa Monica Tower air traffic manager Robert Russ. **K.L.**

News Briefs

GE ATP Engine Achieves First Run

GE Aviation completed the first run of its new Advanced Turboprop (ATP) engine on December 22 at GE's Prague engine manufacturing facility in the Czech Republic. The first application for the 1,240-shp ATP is the Cessna Denali single-engine turboprop, which is scheduled to fly later this year. Engine certification testing will also begin this year.

FAA Blocks Erroneous ADS-B Signals from Aircraft

On January 2, the FAA implemented a filter for certain ADS-B-equipped aircraft found to be broadcasting erroneous or improper information that could affect the safe provision of air traffic services. "Any aircraft subject to the filter will not have its ADS-B information sent to an ATC facility nor will the aircraft be a client for traffic information services [TIS-B]," the agency said. "Affected aircraft will continue to receive ATC services within radar coverage using secondary radar information." For those aircraft transmitting erroneous information, the Public ADS-B Performance Report will search for the flight ID matching the entered U.S. registry number if it cannot locate the corresponding mode-S code. The FAA intends when possible to provide individual notice to owners/operators before implementing the filter.

EASA Issues Final EFB Rule Proposal

EASA has released details of its proposed rule changes for electronic flight bags (EFBs), including new provisions for non-commercial operators and codifying ICAO's standards for the equipment in the agency's regulations. Existing EASA rules address EFB usage for commercial air transport operators, but the new rules would introduce requirements for other operator categories, including non-commercial operators, those with complex-motor-powered aircraft, and specialized operations. The rules introduce operational approvals for Type B EFB applications for all operators, and integrate ICAO standards and recommended practices in place since November 2014. EASA expects adoption of the EFB rules in mid-2018.

Wanfeng Aviation Buys Diamond Aircraft Industries

Hangzhou, China-based Wanfeng Aviation has purchased Austria's Diamond Aircraft Industries. In late 2016, Wanfeng acquired a 60-percent stake in Diamond's manufacturing operation in Canada, as well as rights to manufacture the seven-passenger DA62 twin and four-passenger DA40 single. Wanfeng Aviation is part of Wanfeng Auto Holding Group. The aviation division includes a Part 135 charter operation, an aircraft management service, and a Part 145 maintenance facility. The company operates an Embraer Phenom 100E and Bombardier Challenger 605.

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On an average day, more than 150 Bombardier Learjet, Challenger, and Global business jets can be found inside the hangars of nine Bombardier Service Centres strategically located around the globe.

Some of these aircraft are regular visitors for periodic maintenance, while others have flown in for 96-month or 120-month inspections, major cabin retrofits, avionics upgrades, or the installation of a new high-speed internet system. In 2017, Bombardier Business Aircraft gathered all its activities across the Customer Experience team associated with new products and services for the aftermarket and consolidated them in a new group with a mandate for rapid growth.

"Our new organizational model is now even more focused on our customers' needs, and every member of our team is driven by the same goal—to deliver an exceptional customer experience.

"The first thing that distinguishes Bombardier from anyone else is that we really know our airplanes," says Jean-Christophe Gallagher, Vice President and General Manager, Customer Experience, BBA. "We've got thousands of engineers who have designed them, built them, and delivered them to the customer, so we're clearly in the best position to provide tip-to-tail upgrades and service.

"Bombardier is a leader in business aviation aftermarket support with 1,000 skilled and experienced technicians at our Service Centres. We want to 'bring our jets home' by offering a complete set of solutions: parts, services, maintenance, completions, upgrades, and training to further grow our aftermarket business."

And growing its worldwide aftermarket business is exactly what Bombardier Business Aircraft has been doing in the last several months. Last year, Bombardier Business Aircraft opened new international service centers in Tianjin, China in April and Biggin Hill airport near London in May; established five new line maintenance centers in Europe; increased its project manager team by 30 percent; hired 20 percent more technicians; expanded its U.S. service capacity by 20 percent; and rolled out more than a dozen new business aircraft products and services.

And in the years to come, BBA will double its aftermarket support business to offer more products and services than ever before.

New Smart Services

Bombardier has been a leader in aftermarket services since 1986, when it launched the pioneering Smart Parts program as the first airframe systems cost-per-flight-hour cost protection plan for customers in business aviation.

At regular intervals, Bombardier has updated Smart Parts. The latest and most comprehensive program—Smart Services—launched at the 2017 National Business Aviation Association (NBAA) convention.

Smart Services is designed to serve both new aircraft deliveries and all existing Bombardier business jet operators' aircraft with up to 20 years of service.

Designed for maximum operator flexibility, the Smart Services program gives customers the ability to select additional coverage options on landing gear overhaul, cabin system components, scheduled labor, and unscheduled labor related to part removals from normal operation.

"This is a fixed-rate, all-inclusive turn-key solution that provides complete maintenance cost management and predictability," says Sean Johnson, Senior Director, Aftermarket Products, for Bombardier Business Aircraft. "We have extended the innovative program to new areas, such as unscheduled maintenance labor, which is an industry first.

"There really is a lot of flexibility to the program, and we now have a more à la carte approach to all the features an operator can add to the program."

Of course, not every Bombardier jet is currently enrolled in Smart Services, but Gallagher says, "The perfect time to enroll an older aircraft into the program is when it changes owners."

"As a first step, we recommend that buyers contact their Regional Sales Manager to prepare a very cost competitive Smart Services proposal."

Bombardier's transaction data shows that over the life of an aircraft, a business jet enrolled in Smart Services has a higher residual value and sells in less time than an aircraft outside the program. And Smart Services contracts can be transferred to a new owner.

Expanding Service Centres

When a Bombardier business aircraft visits a Bombardier Service Centre for a major 96-month or 120-month inspection, the down-

time is a perfect opportunity for the owner to upgrade the avionics, cabin systems, interior furnishings, and exterior paint.

Last year, Bombardier performed 50 major inspections, including 96-month inspections for Challenger 600 series aircraft and 120-month inspections for Global series aircraft, and in January 2017, the company completed the milestone 200th 96-month heavy inspection on its Challenger jets.

The new Service Centre at London Biggin Hill Airport in the UK has close to 100,000 square feet to support more than 600 Bombardier business jets based in Europe. And in China, the new 8,500-square-metre (95,766-square-foot) Tianjin Service Centre will help support more than 280 Bombardier business aircraft in Asia, where the company has the largest market share.

All of Bombardier's nine world-class Service Centres have similar technical capabilities, but the 1 million-square-foot (92,900-square-metre) Service Centre at Tucson International Airport is the largest. Established in 1976, the facility services both commercial and business aircraft, and employs more than 800 engineers, technicians, and staff.

In late 2017, Bombardier opened an interior design center in the Tucson Service Centre, consolidating its interior-design expertise and talent in one atelier. In addition, the meticulous state-of-the-art cabinet workshop has quadrupled its footprint from 1,092 square feet to 4,800 square feet, and will complement existing seat and divan upholstery fabrication areas.

Avionics Upgrades

FAA and EASA require all business aircraft to be equipped with Automatic Dependent Surveillance-Broadcast (ADS-B Out V2) by 2020 or face being grounded for non-compliance.

Bombardier believes that if an operator waits, it will be too late, so it recommends combining the installation of ADS-B Out V2 with an upcoming maintenance event at a Service Centre to save time and money.

Bombardier has partnered with Rockwell Collins and Nextant Aerospace to upgrade Challenger 604 jets with a Pro Line Fusion touchscreen flight deck.

The upgrade replaces the factory-installed CRT displays with three 14.1-inch widescreen displays, which feature a Synthetic Vision System (SVS) allowing for enhanced situational awareness.

The system also includes features needed to fly in quickly evolving global airspace, including ADS-B mandate compliance, SBAS-capable GNSS, localizer performance with vertical guidance (LPV) approaches, radius-to-fix (RF) legs, and optional FANS and Link 2000+ for EASA compliance.

Rockwell Collins is developing the Pro Line Fusion STC, and Bombardier will do installations at any one of its Service Centres.

Bombardier is also offering a Rockwell Collins Pro Line 21 Advanced avionics upgrade for the Bombardier Challenger 300 and Challenger 605 jets.

Other avionics upgrades introduced in 2017 include an improved cockpit display unit for Learjet aircraft (Honeywell DU-875 Primus Elite upgrade); modular CMS solutions for Global XRS/5000 with Rockwell Collins; and FANS over Iridium for Challenger 604 aircraft.

Cabin Upgrades

The first Learjet 23 entered service in 1963, the first widebody Challenger 604 in 1996, and the first ultra-long-range Global Express in 1999.

"We are much more focused on introducing forward-fit features from our production-line aircraft to the aftermarket as retrofits," says Johnson.

There has always been a link between Bombardier's new aircraft completion centers and its Service Centres, but now the company is committed to offering every new interior to the aftermarket as well.

For example, elements of the Premier cabin, introduced for the Global 5000 and Global 6000 at EBACE in 2017, can now be retrofitted on any in-service Global aircraft built after 1999, including seats, conference tables, and monuments.

"We are making it easier for owners to refresh an aircraft and keep it looking new if they decide to own it longer," says Johnson. Installations can be done at the nearest Bombardier Service Centre, or during an aircraft's visit to Europe or North America, for example, on business.

In 2016, Bombardier became the first aircraft manufacturer to offer the revolutionary Ka-band high-speed data system in a business aircraft cabin. The system is now available on new Challenger 650 and Global series aircraft, and as a retrofit on Challenger 604/605/650 and Global aircraft through Bombardier's extensive service network.

The aircraft maker also partnered with Duncan Aviation to bring to market Gogo Business Aviation's 4G next-generation air-to-ground (ATG) internet system Gogo Avance L5 on new Bombardier business jets, and as a retrofit on in-service ones. The system uses the Gogo Biz 4G ground network of more than 250 towers, providing reliable connectivity over the continental U.S. and large parts of Canada and Alaska.

"We can also be very flexible with our customers about when and how we serve them. We can bring one of our mobile service trucks to the customer and do the installation in their facility.

"We have the know-how and can provide the best service and ownership experience," says Johnson.

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Despite lessons of 2013, shutdown threatens registry

by Kerry Lynch

As Congress scrambled to reach an agreement to end the government shutdown last month, the lack of protections for the U.S. aircraft registry once again became a major concern for the aviation industry.

The U.S. government shut down for three days before lawmakers reached an agreement on a short-term funding bill. That bill funds the government through February 8, setting the stage for another possible showdown. While at press time the shutdown appeared resolved, the funding dispute on Capitol Hill highlighted that the aircraft registry remains vulnerable to a government shutdown.

The U.S. Department of Transportation released a lengthy list of activities and personnel affected by the shutdown that began on January 20, including the aircraft registry, aviation rulemaking, NextGen activities, airman certificate issuance and approvals of unmanned aircraft systems, among many others. In all, DOT said, 17,859 of the FAA's 45,668 employees were on the furlough list.

Those not furloughed are involved in safety-sensitive positions such as aviation inspectors or air traffic controllers. In addition, activities that continued included maintenance of navaids, airmen medical certification, limited certification services, on-call accident investigation and foreign relations of aviation safety-related matters, among others. As the shutdown rolled in the FAA issued a statement that "There will be no impact to safety or safety oversight for the traveling public."

'Unprecedented Action'

The move to close the registry during the shutdown followed the practice of the 16-day-long shutdown in 2013. But that was an unprecedented move; the registry had been unaffected during prior shutdowns. The decision to categorize the registry as a "non-exempt" activity that is subject to a government shutdown had a profound effect in 2013. Estimates are that the 2013 shutdown affected hundreds of aircraft transactions valued at $1.9 billion. And once the shutdown ended, it took weeks for the agency to restore operations to their normal levels.

Congress in 2013 appealed to the FAA to re-examine the decision to include the aircraft registry in the shutdown. Numerous House and Senate lawmakers signed letters asking why the agency had reversed course from previous shutdowns to include the aircraft registry.

In subsequent years, the concern that the registry remained vulnerable to government shutdown has persisted. Lawmakers included provisions in long-term FAA reauthorization proposals to shield the registry from shutdowns, and individual bills to keep the registry open were introduced in the House and Senate. "Not only is this office essential to ensuring the day-to-day operations of the aviation industry, but the database it houses is essential to maintaining our national security interests in the event of a 9/11-style terrorist attack," said Sen. James Inhofe (R-Oklahoma) in introducing his version of the bill in the Senate.

But despite the pain of 2013, Congress still hadn't finalized any protections by the time the most recent shutdown took effect.

Long-term Plan Needed

The General Aviation Manufacturers Association (GAMA) stressed that this is another reason why Congress needs to reach agreement on long-term FAA reauthorization.

"It's ironic the one aspect of the government shutdown of most immediate concern to general aviation, the shuttering of the FAA's aircraft registry, could have been avoided had House Republicans dropped its proposed 'airlinization' of air traffic control and approved the FAA authorization, a provision of which requires the registry to remain open during these shutdowns," added National Air Transportation Association (NATA) president Martin Hiller.

GAMA and NATA were among a half-dozen general aviation groups that in January wrote the DOT, urging that it be reopened regardless of a shutdown. The registry, the groups argued, performs essential safety and security functions, in line with international aviation treaties.

"DOT has authority under the Anti-deficiency Act to staff the U.S. Registry as it is vital to protection of human life and property, and necessary for the U.S. to fulfill its ongoing international legal obligations under the Chicago Convention and the Convention on International Interests in Mobile Equipment ('Cape Town Convention') relating to the registration of aircraft," the associations said.

The groups further note FAA estimates that 10,000 aircraft registrations expire each month.

"We commend you for taking actions to bring off furlough other safety-sensitive FAA personnel, but urge you in the strongest possible terms, in the interests of safety, security, and our international obligations, as well as the enormous economic consequences of its closure, to immediately reopen the aircraft registry," the groups said in their appeal to DOT secretary Elaine Chao.

Also signing the letter were leaders of the National Business Aviation Association, Aircraft Owners and Pilots Association, Experimental Aircraft Association and Helicopter Association International.

Beyond concerns of the registry, the industry had feared the ramifications of the overall shutdown. "General aviation is among the nation's most regulated industries, with daily oversight and essential services provided by several federal agencies," NBAA president and CEO Ed Bolen said as the shutdown began. "If history is any guide, this shutdown could severely impact the industry, jeopardizing jobs and causing economic harm."

The concerns had crossed FAA activities, as well as "services and decision-making from myriad other agencies, including the DOT, the Transportation Security Administration and U.S. Customs and Border Protection," Bolen added.

Sine the government-funding agreement reached last month runs only through February 8, Congress still must come to a compromise on full-year appropriations. The House and Senate have authored full-year transportation appropriations bills that would provide a boost to FAA's funding in Fiscal Year 2018—the House, to $16.6 billion; and Senate, to nearly $17 billion.

The full-year bills included a number of other provisions that the industry has been watching, such as a directive to improve use of organizational delegation authority, improved studies on Part 135 activity and continued privacy protections for real-time flight tracking activity. The Senate version of the full-year bill also includes an outright ban on a transition of FAA air traffic control functions to an independent entity. That measure emphasized the clear opposition of Senate appropriators to the ATC proposal.

The series of continuing resolutions and specter of a shutdown has provided fuel to advocates of creating an independent user-funded ATC organization. "There is the exhausting potential for it to happen again... This cycle of dysfunction in funding perfectly underscores the critical flaws in the current system [and is] why A4A is advocating for air traffic control modernization," Airlines for America (A4A) president and CEO Nicholas Calio said when negotiations over the budget loomed during a previous appropriations negotiation. ■

Former Embraer executive pleads guilty to fraud charges

A former vice president of sales and marketing with Embraer Executive Jets has pleaded guilty to being involved in a scheme to bribe a high-level Saudi Arabian government official in exchange for assistance in selling Embraer aircraft to the country's national oil company, Saudi Aramco.

According to information released by the U.S. Department of Justice (DoJ), 61-year-old Colin Stevens, a UK national living in the UAE, admitted to crimes including violating the Foreign Corrupt Practices Act (FCPA), committing conspiracy to violate the FCPA, conspiracy to commit wire fraud, money laundering, and making a false statement. A sentencing date has not yet been set.

The DoJ statement alleged that while the airframer was in negotiations with the oil company regarding a potential sale of aircraft, Stevens and the foreign official "devised an arrangement whereby the foreign official would guarantee that Embraer would win a contract and that the contract would involve new rather than used aircraft in exchange for approximately $1.6 million in bribe payments."

In early 2010, Aramco awarded Embraer a contract for three new jets, valued at nearly $100 million.

The statement further alleged that Stevens arranged to try to hide the bribes as commissions to a South African company owned by one of his personal friends, who then transferred the bulk of the bribe money to an intermediary of the Saudi official, but diverted $130,000 back to Stevens.

When questioned by the the FBI, Stevens said the money had been transferred to him by an executive of the South African company for the purpose of buying real estate in connection with a potential business venture.

The guilty plea entered last month in New York follows a deferred prosecution agreement between the airframer and the DoJ made in October 2016, in which Embraer agreed to pay a $107 million penalty to the department as part of a $205 million global settlement related to a wider investigation by the U.S. DoJ, the U.S. Securities and Exchange Commission, and Brazilian officials into corrupt conduct in several countries including Saudi Arabia.

According to the U.S. justice system, bribery of foreign government officials to win business is a crime, a statute that applies to any company whose stock is traded in or who does business in the U.S., along with its employees.

The investigation has also resulted in Brazilian authorities charging 11 individuals for their alleged involvement in the airframer's misconduct in the Dominican Republic, while Saudi Arabia has charged two individuals.

In a statement, Embraer noted the U.S. DoJ has been conducting investigations with regard to certain individuals, and that it is not a part of, nor has it been informed of, the development of these investigations.

The airframer added that it treated the matter seriously and fully cooperated with the investigation. As events unfolded, the company said, it voluntarily expanded its scope and shared the results with the relevant authorities. **C.E.**

NTSB: severe vibration triggered Bell 525 breakup

by Mark Huber

The fatal July 6, 2016 in-flight break-up of Bell 525 flight test vehicle 1 (FTV-1) was caused by "severe vibration of the helicopter that led to the crew's inability to maintain sufficient rotor rotation speed (Nr), leading to excessive main rotor blade flapping, subsequent main rotor blade contact with the tail boom, and the resultant in-flight breakup," according to the NTSB final report released on January 16.

The NTSB wrote, "Contributing to the severity and sustainment of the vibration, which was not predicted during development, were (1) the collective biomechanical feedback and (2) the attitude and heading reference system response, both of which occurred due to the lack of protections in the flight control laws against the sustainment and growth of adverse feedback loops when the 6-hertz airframe vibration initiated. Contributing to the crew's inability to maintain sufficient Nr in the severe-vibration environment were (1) the lack of an automated safeguard in the modified one-engine-inoperative software used during flight testing to exit at a critical Nr threshold and (2) the lack of distinct and unambiguous cues for low Nr."

The vibration initiated at 92 percent Nr excited the main rotor scissors mode, meaning the adjacent blades were moving together and apart in a scissors motion. This resulted in a 6-Hz airframe vibration that, the NTSB concluded, "was transmitted to the crew seats and created a biomechanical feedback loop through the pilot-held collective control. A second feedback system, driven by the attitude and heading reference system (AHRS) inputs to the main rotor swashplate, also continued to drive the scissors mode and its resultant 6-Hz airframe vibration."

The accident occurred during a simulated OEI (one engine inoperative) test with forward center of gravity at 185 knots. The test used special software to reduce the power in both engines to simulate OEI. At the time of the accident, FTV-1 was equipped with a combination flight data recorder/cockpit voice recorder (CVFDR), but it was not activated, nor was it required to be under FAA rules for flight test/experimental operations.

Neither pilot made radio transmissions during the accident sequence, which was monitored from close range by a chase aircraft and by ground-based telemetry and test team members. They noticed the increased vibration during the fatal test and radioed instructions to "knock it off" during the accident sequence. The chase aircraft also radioed cautions to the FTV-1 pilots during the test about excessive blade flapping.

The NTSB noted, "After the crew engaged OEI special training mode, rotor rotation speed (Nr) decayed from 100 percent to about 91 percent, and the crew began lowering the collective to stop Nr decay and increase Nr to 103 percent (the target Nr for recovery). About 5.5 seconds into the test, the crew stopped lowering the collective, and Nr only recovered to about 92 percent. About 6 to 7 seconds into the test, the helicopter began vibrating at a frequency of 6 Hertz.

"The vibration was evident in both rotor systems, the airframe, the pilot seats, and the control inputs; the vertical vibration amplitude at the pilot seat peaked at about 3 G. Nr remained between about 90 percent and 92 percent until about 12 to 13 seconds into the test, then began fluctuating consistent with collective control inputs; subsequent collective control input increases led to further decay in Nr.

"Nr decayed to about 80 percent as the collective was raised, and the main rotor blades began to flap out of plane. About 21 seconds into the test, the main rotor blades flapped low enough to impact the tail boom, severing it and causing the in-flight breakup of the helicopter," according to the NTSB report.

Return to Flight Test

Since the crash, Bell has made numerous changes to the 525 and its test program. These include: designing a software filter for the collective control law to dampen biomechanical feedback due to oscillatory control inputs as the frequency of control input increases; adjusting the aero-servo-elastic model with a correlation factor to incorporate the aerodynamic effects observed during flight test and the accident test to preclude such occurrences seen in the accident flight's telemetry data; performing shake tests with pilots using a side-stick collective to determine and incorporate the transfer function for human biomechanical feedback; modifying the AHRS software filters to further reduce the AHRS response to a 6-Hz airframe vibration; indicating that, for the 525, cockpit audio is now being recorded by an onboard CVFDR, and communications to and from the ground monitoring station are recorded by the CVFDR and the telemetry system during all flights (cockpit video is also being recorded by the instrumentation system and archived at the ground station); issuing a company-wide business directive to ensure that cockpit audio is recorded during all telemetered flight test activities across all flight-test sites; developing plans to conduct flight testing in the 95 percent to 100 percent range of Nr in an OEI condition; developing plans to implement, for the 525, the unique low Nr aural tone in their test aircraft, and a software update that includes a larger font size for the Nr numeric display on the PSI; planning to implement a separate PBA specifically for low Nr and incorporating more salient cues into the tactile cueing system; planning to incorporate the automatic termination of OEI training mode should Nr fall below a certain limit; and incorporating a safety officer for the accident helicopter model test program who will have dedicated safety-related responsibilities. Bell resumed flight testing of the 525 on July 7, 2017.

Post-crash Analysis

In a prepared statement, Bell said, "An in-depth analysis of the flight data resulted in a thorough understanding of the corrective actions necessary, and appropriate changes to the aircraft have been implemented. A carefully planned approach is under way to complete the remaining certification flight testing. We remain committed to the 525 program—the continued work of the program team will result in a reliable, innovative helicopter with advanced rotorcraft safety features when it comes to market."

Further, Bell said the changes/enhancements made to the 525 post-crash "are being carefully tested to ensure that our corrective actions have fully addressed the unique problem encountered on July 6, 2016." It said the vibrations encountered on the fatal flight were "the result of an unanticipated combination of very high airspeed with a sustained low rotor rpm condition."

Due to the lack of a functioning CVR in the accident aircraft, investigators could only theorize why it took the test pilots so long to recover from the low Nr condition that soon became fatal. On previous OEI tests at slower speeds the crew had lowered the collective to 50 percent to recover, during the accident sequence it was lowered only to 58 percent. Recovery times required increased with airspeed.

"Investigators explored possible reasons why the crewmembers stopped their recovery from the initial Nr drop, including a reaction to an abnormal condition on the helicopter, distraction from the recovery task, or a conservative response due to the high airspeed. Telemetry data does not indicate the existence of an abnormal condition when the crewmembers stopped their recovery," the NTSB noted.

Based on interviews with Bell flight-test members, the NTSB noted, "Helicopter manufacturer test pilots indicated that they interpreted this trend as the tendency of the crew to be more judicious while applying collective at successively higher airspeeds to avoid recovering too fast and overspeeding the rotor or damaging the transmission. Thus, the crew may have been more conservative during recovery at the helicopter's high speed during the final test. The chief test pilot also stated that if Nr had stabilized, the pilot would not have been in a rush and was possibly initiating a slow recovery." ■

FAA revises key ATC procedures at Aspen

The FAA, working with industry stakeholders, has modified air traffic control procedures at Aspen/Pitkin County Airport (ASE) that safely maintain arrival/departure rates while addressing issues the agency had with the old procedures.

The changes, detailed in a December Letter to Airmen (LTA), affect opposite-direction operations that help the single-runway airport maximize operations while accounting for surrounding terrain. ASE's "Westbound in front of" and "Wrap" procedures result in 95 percent of departures using Runway 33, and 90 percent of arrivals operating on Runway 15.

The procedures, in use for years, were put under review by the FAA starting in late 2016 to ensure they met the agency's latest regulations and guidance. As part of the review, the FAA suspended the Wrap in May 2017. "As a result, the airport's IFR arrival/departure rates were reduced by 40 percent," a July LTA explained.

During the review, the FAA put together a safety panel of industry stakeholders to provide feedback. The collaboration led to a modified Wrap, which went into use in November.

"There was a real positive here in that the FAA immediately reached out to the business aviation community," Heidi Williams, NBAA's director, air traffic services and infrastructure, told **AIN**. "We worked through the challenges that needed to be worked and FAA implemented procedures that addressed the issues prior to ski season. That's an impressive time frame."

In a related move, the FAA worked with the general aviation community to develop a new VFR departure to use while the Wrap was suspended. That departure was codified as COZY.

The COZY departure, which pilots must request, went into FAA's Chart Supplement in October. It was subsequently charted by Jeppesen and included in the Jeppesen database.

The revised procedures and new VFR departure have helped restore ASE's normal arrival/departure rates to pre-Wrap-review levels. The airport can handle about 32 operations per hour in IFR conditions **S.B.**

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Pentastar Aviation
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"I am deeply rooted in this industry and am generally skeptical whenever someone comes out with a new idea. PIA and the team of industry professionals they have assembled have got it right. This program serves a segment of our industry with a structure that really seems to makes sense. JSSI's Tip-to-Tail program is a perfect complement to PIA Co-Ownership by providing operators budgetability to their maintenance costs."

Lou Seno | Chairman Emeritus
Jet Support Services, Inc.
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"As a General Dynamics company, we have a responsibility to carefully scrutinize any industry players that we would consider partnering with. We listened and looked closely at this program and this team. The program is well-crafted, and we believe it presents a good option for some of our customers – so we elected to join forces with PIA as a strategic partner."

Don Haloburdo | Vice President and General Manager
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IN AVIATION

UAS collision damage exceeds bird strikes'

by Kerry Lynch

Unmanned aircraft systems (UAS) that collide with large manned aircraft can cause more damage than similar-sized birds, according to research released by the FAA. The Alliance for System Safety of UAS through Research Excellence (Assure) conducted the study as part of an effort to help outline operational and collision risk mitigation requirements for integration of UAS into the National Airspace System, the FAA said.

"While the effects of bird impacts on airplanes are well documented, little is known about the effects of more rigid and higher mass [small unmanned aircraft systems] on aircraft structures and propulsion systems," said Mississippi State University's Marty Rogers, director of Assure. "The results of this work are critical to the safety of commercial air travel here in the U.S. and around the world."

The research is particularly important because the UAS market is anticipated to reach 4.7 million units by 2020, the report said.

The research involved both computer modeling and physical validation testing. Researchers modeled impacts of 2.7-pound and four-pound quadcopters, along with four-pound and eight-pound fixed-wing UAS on a single-aisle commercial airliner such as a Boeing 737 and a Learjet 30/40/50.

The study explored potential impacts of several areas: the wing leading edge, windshield, and vertical and horizontal stabilizers.

Potential Damage

Structural damage ranged from little to no impact to penetration of the drone into the airframe. "The windshields generally sustained the least damage and the horizontal stabilizers suffered the most serious damage," the FAA said.

Fixed-wing UAS collisions appeared to create more severe damage overall, but the risk of associated battery fire was greater when involving a quadcopter. In fact, very little risk of fire was found involving fixed-wing collisions.

Generally, a collision between a commercial transport or business jet and either a 1.2 kg (2.7 lb) quadcopter UAS or a 1.8 kg (4.0 lb) fixed-wing UAS at 250 knots may result in a medium to high severity level of damage to the horizontal and vertical stabilizer, medium in the leading edge of the wing and medium to low level in the windshield, the study found.

The research did not assess risk to flight that may result from the damage. Researchers, however, "concluded that unmanned aircraft system manufacturers should adopt 'detect and avoid' or 'geo-fencing' capabilities to reduce the probability of collisions with other aircraft," the agency added.

The report was released as Congress continued to take a heightened look at how to support integration of UAS and ensure safety at the same time. House aviation subcommittee chairman Frank LoBiondo (R-New Jersey) said during a hearing on UAS issues that the research results thus far are "concerning" and that "We will monitor the future of this research closely as they investigate the risks of ingestion of UAS into jet engines." ■

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Full-throttle opinion from former NTSB member John Goglia

It's time to reconsider 'hangar rash'

We've probably all used the term "hangar rash" at one time or another to describe so-called "minor incidents" of damage. Usually the term refers to damage from moving aircraft in the hangar, but it can also refer to other incidents on the ground that cause minor damage. I have used that term myself without giving it a second thought. But as I look at several recent ground incidents, I'm beginning to think that term may be part of the problem. Referring to these events as hangar rash tends to minimize an expensive and potentially safety-critical problem.

One of the incidents that got me thinking about these words looked like fairly minor damage on the outside of one particular corporate jet. But it had significant consequences because of the location of the damage through the pressure vessel. The repair required approved engineering data and an FAA 337 major repair form, which becomes part of the aircraft's permanent maintenance records. It can have a significant impact on the resale value of the aircraft. So even though the damage looked "minor" and the aircraft could be made airworthy readily and relatively inexpensively, the location of the damage through the pressure vessel and subsequent patch could significantly lower the value of the airplane to potential buyers. A minor incident with not-so-minor consequences can hardly be considered an innocuous sounding "rash."

Underlying Safety Lapses

In the past, I have raised concerns that seemingly minor damage to composite surfaces can mask more significant issues. This is a particular concern when mechanics who have not received the specialized training necessary to evaluate composite damage are involved in assessing surface damage. So many mechanics working corporate and general aviation aircraft have little to no training on composites.

What looks like a slight scrape on the surface of a composite can hide significant structural damage underneath. Calling damage on a composite surface "hangar rash" could result in a significant structural problem being overlooked.

My other concern with the use of the term "hangar rash" is that it can mask the significance of the events that led to the damage. Oftentimes, people mistakenly equate the severity of damage with the carelessness or recklessness of the conduct that led to it. In other words, if an incident results in minor damage, the erroneous conclusion is that the events that caused it were minor, and little or no effort is put into examining what happened and why. But that can be a very dangerous conclusion. Every accident investigator has seen fatal accidents that were triggered by minor lapses; and minor incidents that were caused by incredibly reckless actions.

In my opinion, every incident of ground damage should be investigated to determine the root cause, so that in the future, more serious outcomes can be prevented. And programs that can protect employees from FAA enforcement action and company discipline for careless conduct should be put in place. Such programs encourage ramp personnel, who frequently don't report incidents for fear of losing their jobs, to report ground damage.

When "hangar rash" happens, it's usually the result of some breakdown in proper procedures, often—in my experience—rushing to get a job done.

Ground damage is certainly a major economic problem for aviation users generally, whether airliners, corporate operators, or weekend fliers. According to the Flight Safety Foundation, using data developed by the International Air Transport Association (IATA) a number of years ago, "ramp accidents cost major airlines worldwide at least US$10 billion a year." A more recent interpretation of IATA data has put the worldwide cost to airliners at $12 billion. And this data covers only major airlines. The costs to smaller airliners and general aviation isn't even included.

It's probably time to do away with the term "hangar rash" and treat all ground damage incidents as indicators of safety problems whose root causes need to be determined and addressed. ■

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

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Unstable approach led to MU-2 accident | by Sean Broderick

The decision to continue an unstable approach despite numerous warning signs played a central role in the March 2016 accident involving a Mitsubishi MU-2 at Îles-de-la-Madeleine in Quebec (YGR), Canada's Transportation Safety Board (TSB) found. Both pilots and all five passengers, including former Canadian minister of transport Jean Lapierre, were killed.

TSB's final report revealed that the problems started en route from Montréal/Saint-Hubert Airport (YHU), the airplane's base, when the pilot, looking to save fuel, modified his approach plan to "delay" his descent into YGR. This necessitated using higher-than-recommended approach speeds and descent altitudes.

The pilot chose the RNAV/GNSS approach to YGR's Runway 7. The approach's minimum descent altitude (MDA) is 620 feet msl/598 feet agl. A LOC/DME approach with a 480-foot msl MDA was also available.

The TSB's probe was aided by data recovered from a Wi-Flight GTA02 flight data recorder, which captured 13 parameter and ambient cockpit audio.

"The pilot stated that he preferred the RNAV (GNSS) approach because the autopilot system can remain coupled for the descent and approach," the TSB wrote. "However, the pilot advised the passenger-pilot that, if the ceiling was below the RNAV (GNSS) MDA, he could easily switch to the LOC/DME approach and continue to the lower MDA."

Reported weather conditions at YGR included a broken cloud layer at 200 feet agl, well below each approach's MDA. The pilots never discussed this, the TSB found.

After crossing a fix that called for a turn to intercept the runway centerline, the aircraft—1,500 feet above the 3,000-foot msl recommended altitude and nearly 100 knots faster than the 140-knot approach speed—soon began "a meandering flight path," the TSB wrote. "The pilot's workload had increased significantly," and neither the approach nor before-landing checklists were done, the report said.

At about 1.5 nm from the runway and having slowed to near-stall speed to lose altitude, the pilot added full power. This caused "a power-induced upset and resulted in the aircraft rolling sharply to the right and descending rapidly," TSB wrote. "There was insufficient altitude to recover the aircraft."

The MU-2 struck the ground 1.4 nm west of the airport.

The pilot flying had 2,500 hours' total time, including 125 in MU-2s. He had a Canadian airline transport pilot license, an FAA private pilot certificate, and had completed all required training to operate a U.S.-registered MU-2. The MU-2 involved in the accident carried a U.S. registration.

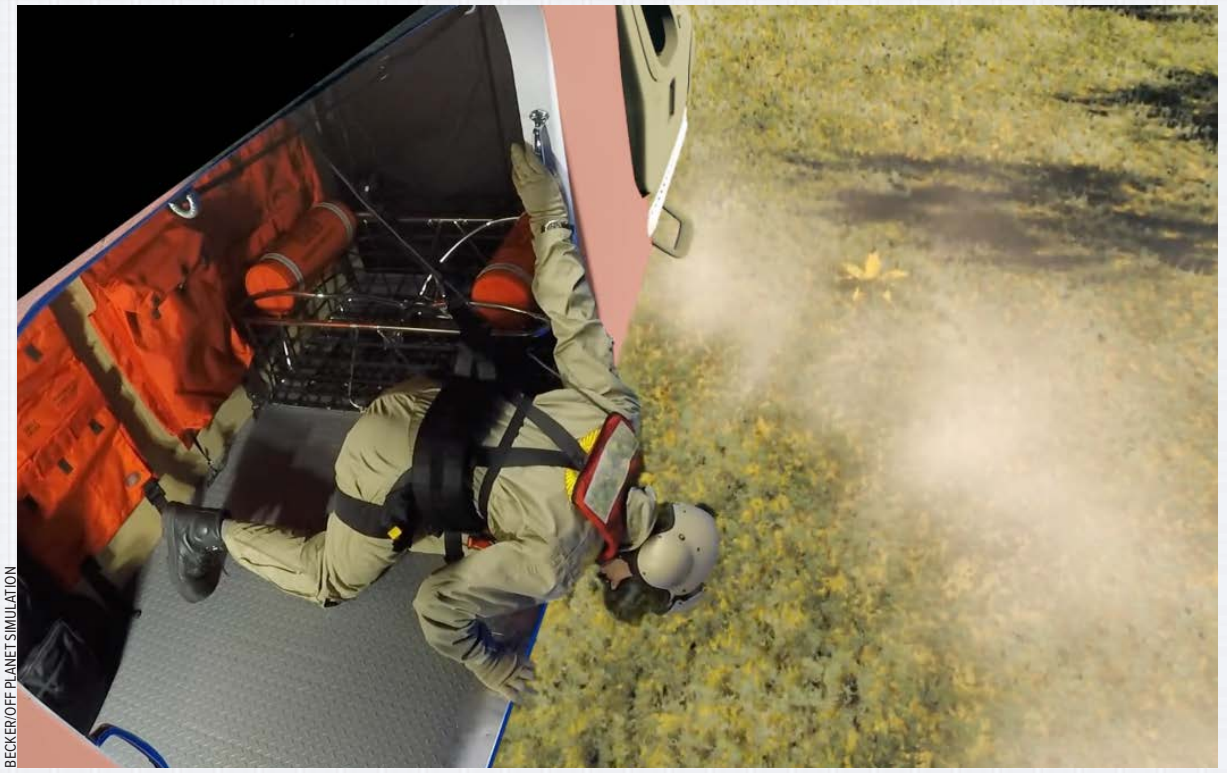
The passenger-pilot was licensed but "had no experience on the occurrence aircraft type," the TSB wrote. His lack of familiarity contributed to the flight deck workload, investigators found.

For instance, during the approach, the pilot asked the passenger-pilot to contact a flight service station and spent 40 seconds explaining how to select the correct frequency. But "At no time during the approach did the pilot discuss discontinuing the approach as an option available to reduce the workload," wrote the TSB. ■

Simulator technology takes helicopter training into the future

by Kim Rosenlof

In the past, some helicopter pilots and even governing agencies have dismissed simulators as not realistic enough to provide effective training. Sitting in a fixed-base simulator, some pilots experience vertigo from the disconnect between what their eyes are seeing and what their ears and butts are experiencing. But the newest wave of helicopter-specific flight simulators use a combination of multi-axis motion actuators, high-definition graphics, and advanced computer programming to achieve realistic and effective training for helicopter pilots and crews. Some companies are even incorporating virtual reality (VR) and night-vision-goggle (NVG) simulators into their training curriculum.



BECKER/OFF PLANET SIMULATION

Becker Helicopter's virtual reality sim safely immerses AW139 crewmembers in realistic training situations.

FlightSafety's Crew View Brightens Level-D Displays

While many pilots recognize FlightSafety International for its simulator-based flight training at more than 40 locations worldwide, they might be surprised to learn that the Flushing, New York-based company has been manufacturing its own simulators since approximately 1978. That's when FlightSafety purchased Atkins Merrill, a flight simulator manufacturing company located in Broken Arrow, Oklahoma. It then purchased the visual systems division of McDonnell Douglas in St. Louis, Missouri, shortly thereafter.

These little-known simulator and visual systems divisions of FlightSafety work together to manufacture state-of-the-art full flight simulators (FFS) not only for the flight training giant, but also for off-site military and commercial customers as well. In addition to recently installing new FS1000 level-D FFSs for the Airbus AS350, Airbus EC130, and Bell 407 at its Denver learning center, FlightSafety has delivered 28 (soon to be 32) Airbus UH-72A Lakota simulators—including 10 cockpit procedures trainers and 18 instrument and operational flight trainers based on the FS1000 FFS—to the U.S. Army's helicopter training center Flight School XXI at Fort Rucker, Alabama.

FLIGHTSAFETY

FlightSafety's level-D sims like this Sikorsky S-76D use a glass mirror display for brighter and sharper images.

"The helicopter training segment is very important to FlightSafety," said a FlightSafety International spokesman. "We've invested a lot in helicopter training in the past few years, and we're very pleased that the industry realizes how important it is to train in level-D qualified simulators. It's a good thing for our customers and for the industry, as well."

The latest simulator configuration in FlightSafety's simulator arsenal, the FS1000 introduced in 2014, provides the six-axis motion and separate vibration platform cues expected from a large motion base level-D FFS. It also incorporates the company's Vital 1100 visual image generation and display system, which supports FLIR, ColorTV, low-level light TV/electro-optical, all level light TV, visual threat recognition and avoidance trainer, and digital video output sensors, and is compatible with NVG, HUD, and EVS systems.

One of the big differentiators between the FS1000 and other level-D simulators is the CrewView rigid glass mirror used to display the simulator visuals. Combined with the Vital 1100 visual system, the CrewView display provides a more realistic image than simulator systems that use Mylar canvas, according to Scott Goodwin, general manager of simulation at the FlightSafety's Broken Arrow facility.

"Because it's a fabric stretched over a frame, [with Mylar] there are distortions and imperfections in the surface," said Goodwin. "The glass mirror has no distortions and no imperfections. It's a true spherical surface that is brighter and provides more contrast, resulting in a much sharper image. And when you're talking about helicopters where you have training tasks like maneuvering in close proximity to buildings, landing on an oil rig, or other things that require high visual acuity, the glass mirror is a perfect fit for a helicopter simulator."

FlightSafety has also begun adding chin windows to its helicopter simulators using separate displays correlated to the main windscreen. "If you're looking down the runway, then you look down beneath you, it's the same scale, the same coloration. It looks like a continuous image. All of our helicopter simulators are coming with the chin window displays now," said Goodwin.

He added that correlated eyebrow window displays are next, with introduction on the FFS being produced in conjunction with Sikorsky for the HH-60W Combat Rescue Helicopter Black Hawk variant. The HH-60W simulator will be an upgraded version of the HH-60G

INDUSTRY
INSIGHTS

A Market View

from the World's Leading Aircraft Management Companies

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Brian Kirkdoffer
President and CEO
Clay Lacy Aviation

California-based Clay Lacy Aviation, with 110 managed aircraft, celebrates its 50th anniversary this year.

Michael Tamkus
Senior Vice President, Owner Services and Management Sales Executive
Jet Management

Executive Jet Management, a subsidiary of Berkshire Hathaway-owned NetJets, manages some 210 aircraft.

Don Haloburdo
Senior Vice President Flight Services
Jet Aviation

A subsidiary of General Dynamics, Jet Aviation has some 160 aircraft in its U.S. managed fleet.

Bill Papariella
CEO
Jet Edge International

California-based Jet Edge International, a Bard Capital company, manages about 50 aircraft.

Michael Moore
Vice President of Aviation Sales
Meridian

The roots of Meridian, with some 30 aircraft under management, go back to 1958 at its Teterboro, New Jersey base.

Growing acquisitions and charter activity signal a long-awaited rebound in business aviation. **AIN** asked experts from five leading aircraft management firms for their perspective on issues affecting owners today. An edited transcript of their comments follows.

What brings clients to your management company?

Brian Kirkdoffer, Clay Lacy Aviation:

Our customers refer the large majority of new clients, but it is the experience and personal attention our people provide that enable those referrals. We have the strongest team in the industry and our core leadership team has been together for over 25 years. Add to that, in the past five years we moved from being a West Coast company to a national one, capped by our acquisition of Key Air in 2016, which provided the foundation for a new operations and maintenance center in Connecticut. We now have aircraft in 20 cities around the U.S., and owners who often fly around the country have access to dispatch and maintenance centers and much more support wherever they are.

Bill Papariella, Jet Edge International:

Clients choose Jet Edge because we manage their asset as if it were our own. Each owner has unique needs and desires, and our services are very customizable. We don't put a round peg in a square hole. We're extremely flexible.

Our company is built on relationships and word of mouth, and most clients come from owner referrals. We're also very active in the charter market, and most of the fleet is on our 135 certificate, so we have owners who are former charter customers, and clients who upgraded from jet cards or fractional ownership to their own aircraft. Many owners want to take advantage of demand for our charter product to maximize utilization of their aircraft. We have airplanes that do up to 100 hours a month in charter.

Michael Tamkus, Executive Jet Management:

Clients choose EJM for our industry-leading safety, service, security, and experience. We invest heavily in safety management, including our emergency-response plan and risk-mitigation. Because we're owned by NetJets, our clients benefit from our ability to optimize efficiencies and manage their best interest through charter, fractional, and full-aircraft/asset management.

We have strengthened our partnership with the aircraft manufacturers and continuously align our goals to support owners' interests and goals for their flight departments. We have dedicated crews and maintenance technicians for each owner's aircraft. We embrace the culture flight departments have built while driving our experience to them. Our mission is to take on as much of the administrative responsibilities as possible. Our commitment to industry groups and focus on staying ahead of the regulatory environment keeps our flight departments under management on the leading edge of compliance and best practices.

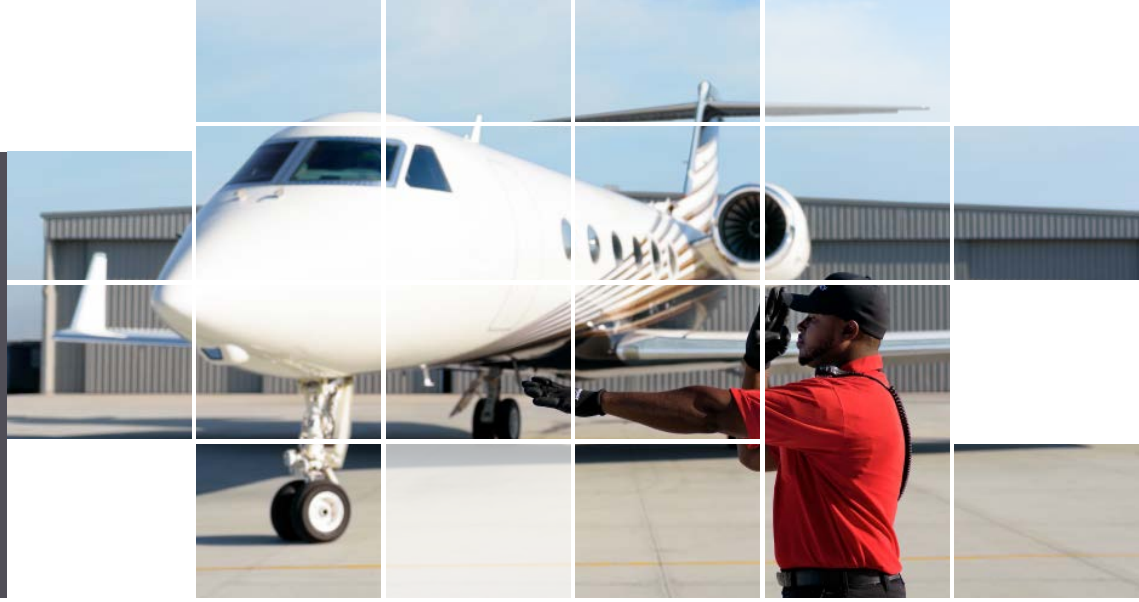
Don Haloburdo, Jet Aviation:

Most owners who come to Jet Aviation for aircraft management services are international travelers looking for a company with an established track record who can support them no matter where they are. Having our fleet of aircraft managed out of Europe, Asia, and the Middle East, and a network of management and FBO structures around world, are benefits for customers who move from one continent to another. We're never too far away to provide additional services they're going to need. Also, because we're a subsidiary of General Dynamics, clients don't have to worry about our financial stability, and we have access to resources and information we otherwise wouldn't have. When a client is planning a trip, we evaluate the security situation in whatever part of the world they're going to and we plan comprehensive risk-mitigation contingencies.

Michael Moore, Meridian:

The reason for Meridian's success is that we do a great job for clients and they tell their friends. That's how we grow and build our brand. We also hear [from customers] that big factors include our financial stability, the longevity of the company, and our ability to offer excellent customized management programs. The most common reason for leaving a management company that I hear from clients who come to us is that they're not getting the service they want. We're focused on customer service and professionalism. Our whole company—every person, top to bottom—does the Ritz-Carlton Customer Service training course every year. Our Ritz-Carlton committee meets once a week to see what we can do better for external and internal customers. If the team is happy here, it will reflect out.

Transactional activity is on the upswing. What should new and upgrading aircraft owners keep in mind?



Michael Moore, Meridian:

The number-one issue now is proper crewing of the airplane. Let's just say it's a good time to be a pilot. There are a lot of aircraft entering the market. If you're buying a light or a midsize aircraft, pilots are willing to build time. But when you get into the Falcon 7X or a G550, these pilots have made it to the top. They're not looking to build time. They're looking for a long-term commitment. If an owner wants to operate Part 135 and generate revenue, it's especially important to get ahead of this. [Part 135 paperwork] is a long, drawn-out process.

Owners also need to carefully evaluate any management company they're considering. Do your homework. Show up and talk to people. Ask the right questions: What is your business model? How do you make money? How do you expect to make money off me?

Michael Tamkus, Executive Jet Management:

Our first priority in any partnership is setting realistic expectations and goals for the flight department. We've seen aircraft owners come to us with a desire to resolve issues related to service delivery, crew/staffing, cost controls, and overall client relationships.

We assist in defining goals for the flight operations, the number of hours they want to fly, and the number of hours of charter. New owners are exposed to all the responsibilities involved with owning and operating an aircraft. This can be quite a significant change. Our responsibility is to be proactive about any risk of the aircraft not being available due to maintenance and to avoid surprises. EJM simply wants to create an exceptional experience for informed owners.

Don Haloburdo, Jet Aviation:

The pilot shortage is an ongoing challenge, and it's important to communicate that to new customers, whether this is their first, second, or third aircraft. We hire the best-qualified candidates for our customers. If the choice is an A, a B, or a C, nobody ever says, "I'm totally good with a C," and that requires us to recruit into the marketplace to fill those positions.

The second issue that needs attention is the quality of the overall asset: the aircraft, maintenance records, and the crew. Recently, we brought on some aircraft from operators that had run into financial difficulties and, in situations like that, maintenance can be an issue. We spared no effort to bring their aircraft up to the standard we expect as an operator and advisor, and that ensures the owner can maximize the value when he wants to dispose of it for another aircraft.

Bill Papariella, Jet Edge International:

Whether you're flying one hour or 400 hours [per year], the fixed costs of ownership are tremendous. So, for most owners, getting the highest utilization possible makes the most sense. That means putting the airplane on a charter certificate and having a charter program developed around the owner's unique usage profile. New owners typically simply want to outsource the hundreds of variables associated with the operation of a multimillion-dollar aircraft.

Underutilization of the aircraft and crew retention are also common issues. The pilot supply-and-demand curve is certainly swinging in one direction, with demand outweighing supply, and that has created a little sticker shock for some owners. We're making sure that being a pilot for Jet Edge provides a good quality of life, with competitive rates, great benefits, and vacation time.

Brian Kirkdoffer, Clay Lacy Aviation:

New owners should get a management company involved as soon as possible during the acquisition, preferably before the aircraft enters the pre-purchase inspection. Otherwise, the company sometimes inherits—and the owner pays for—problems that could have been prevented earlier in the transaction. The prepurchase inspection, for example: the owner may expect the aircraft to be [operated] Part 135, but if the scope of the inspection does not include auditing for Part 135 specific items, that can create delays and added expenses for those owner.

The management company can provide tremendous value in obtaining LOAs [Letters of Authorization from the FAA] quickly to fly internationally, and begin a pilot search before the plane is ready to begin flying. There's a shortage of great pilots, which is creating longer lead times in recruiting top talent. Selecting and involving a management company early is critical so they can have the perfect flight crew trained and ready to fly when the airplane is ready.

When should a company consider outsourcing its flight department operations to a management firm?

Don Haloburdo, Jet Aviation:

Flight departments should consider their options, including working with a management company, whenever a significant change in their situation occurs, such as a change in the aircraft, mission, or key personnel. Maybe the company needs a larger or more up-to-date aircraft. Maybe you were going back and forth between Chicago and New York, and you suddenly have international business requiring a lot of travel to Europe or Asia. Or perhaps a longstanding aviation director or chief pilot is retiring without a clear succession plan in place. All of these situations should prompt a review of flight operations, including an analysis of the department's resources. Most don't have the scale of operations to staff it in a cost-efficient manner. That's significant when an AOG or other situation arises and you're 12 time zones away from your home base.

Michael Moore, Meridian:

The first thing to consider is the additional oversight when it comes to safety. We all answer to the FAA; we're audited by Argus and Wyvern; we have DOD [Dept. of Defense] audits and we have a mature Safety Management System (SMS) program. All that gives you an opportunity to learn what other aviation professionals think of your systems.

A management company can also save you money. We've sat down with flight departments and reviewed their operations. They might typically have an airplane, a dispatcher, a full-time flight attendant, and a couple of company accounting people. We have a 24-hour experienced flight department, including 10 licensed dispatchers and 20 mechanics. We're constantly updated on the latest procedures; we travel to every NBAA trade show; and we have aviation professionals in marketing, accounting and billing, and oversight. If I'm charging $150,000 per year to manage that aircraft, I don't think you're doing it for less.

Brian Kirkdoffer, Clay Lacy Aviation:

Efficiency is one factor a company should consider regarding its flight department. Twenty years ago, my answer would have been different, because the industry has matured and the value of a management company is so much greater today. It gets down to scale. You need 25 to 30 aircraft or more to support the people I have, for the payroll to make sense. Few in-house flight departments have enough scale to provide the level of expertise and cost effectiveness of major management companies.

In the last two years, two flight departments that had operated for over 50 years came to Clay Lacy Aviation for aircraft management. They had a positive culture for five decades and wanted to keep their flight operations in-house. But when they look at the supply-and-demand curve, at some point they say it's not efficient, and recognize they are not getting the same level of experience and oversight a quality management company can provide.

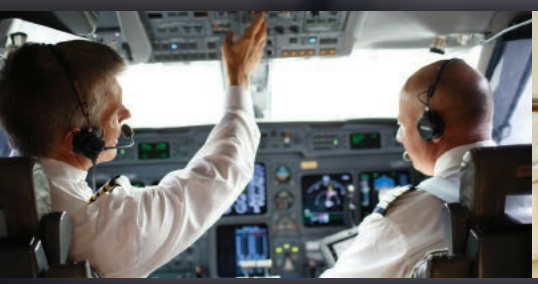
Michael Tamkus, Executive Jet Management:

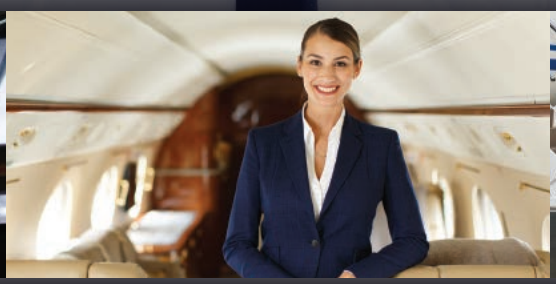
We've seen many individual and corporate owners transition in-house flight departments to EJM, to maximize efficiencies and risk management and manage the complex regulatory environment. We protect and embrace the corporate culture our clients have built while adding value.

EJM brings economies of scale that drive down the flight department's costs, and we can expand support for the flight and maintenance crew, allowing them to focus on flying their missions. Because we take administrative and business responsibility off the flight department, service and value can improve. We also help owners to develop industry insights and best practices. Our flight-department management takes pressure off the crew and maintenance technicians, allowing them to focus on safety and service to the owner. Everybody wins.

Bill Papariella, Jet Edge International:

There are so many variables that can cause an owner to consider a management company. Top-tier management companies can offer significant economies of scale, safety-management systems, oversight by multiple experts in the field (eliminating single source of failures), specific customized accounting for the operations, and offsetting revenue if operated under FAR Part 135. But for a lot of owners it's an emotional decision, and there's a little concern that the management company will take control. You have to be customizable in your management program, and communicate to your owners that they get the final say, as long as it doesn't put the aircraft in an unsafe situation or violate any FARs. At the end of the day, it's still their airplane.





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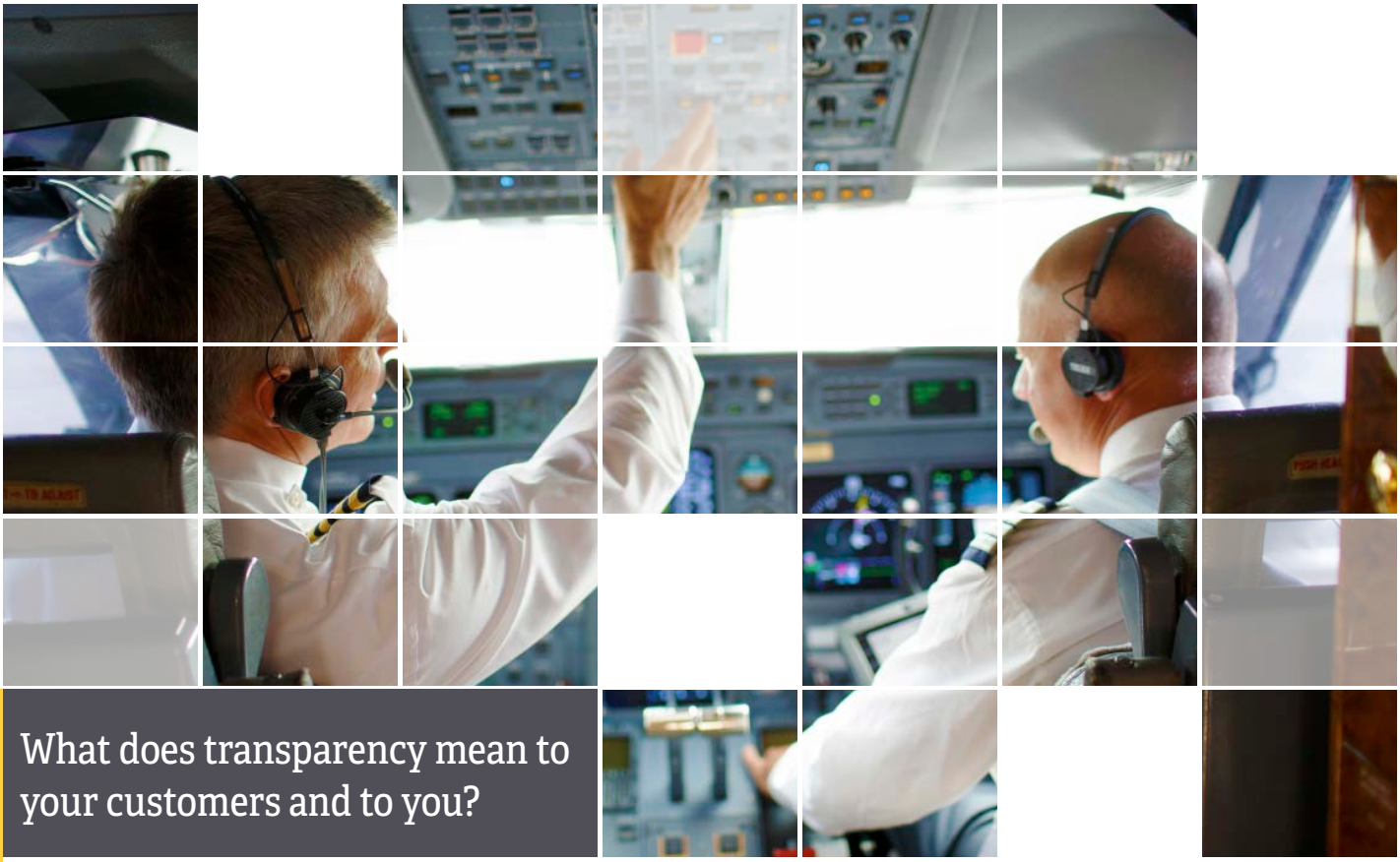

What does transparency mean to your customers and to you?

Bill Papariella, Jet Edge International:

This business is based on relationships and the owners' trust that the management company has their best interests at heart. Transparency is the key to our business and to the trust Jet Edge instills in our clients. At the outset of our relationship, we clearly define our services, revenue streams, and all other items related to the operation of an owner's aircraft. Our revenue stream is simple: we don't mark up ancillary services. The basis of our revenue is charter commission and management fees. If there's significant charter revenue, the management fee might be lower, and that's part of our communication with the customer at the outset. Our monthly reports are also transparent and customizable with the amount of detail desired. We show receipts for every dollar that passes through our hands.

Don Haloburdo, Jet Aviation:

Today, transparency is of the utmost importance to customers. We offer an online customer portal that we equate to online banking. Customers can see all transactions, with hyperlinks on the statement to all their invoices, and they get a bill at the end of the month showing every penny they spent plus our management fee. We're open to customer audits at any time. Customers often wire several hundred-thousand dollars a month to pay a bill and, if I were them, I'd want to make sure the money was actually paying bills and not just noted on a monthly statement. They can also audit our payments to vendors, money paid into employee 401(k) accounts, and medical benefits. We don't mark anything up—if we did, it'd be too difficult for us to figure out the billing and way too difficult for customers to understand what exactly they were paying for.

Michael Moore, Meridian:

I think transparency is everything. We give everybody a monthly report of all revenues, all expenses, every receipt, everything scanned in. Some owners want four pages, some want 50 pages. It's important to give them anything they want. Unless I'm traveling, I'm in the office five days a week. We can pull flight logs, look at invoices. If you're doing the right thing all the time, it shouldn't be a problem. Those are the kind of things that build trust, and trust builds your business.

A management company should make a good, honest deal with the owner of the aircraft it's going to manage, and both the company and the owner should feel good. Before the aircraft shows up on the management company's doorstep, the owner should understand if you're marking up, what the markup is, and how the management company is making money off the owner.

Brian Kirkdoffer, Clay Lacy Aviation:

Transparency is more important than ever, but it means different things to different companies. Owners can compare the reporting and access that different companies offer, and the sophisticated owner will see a difference. Our clients have 24/7 electronic access to their account information. They can create their own dashboards and manipulate information, and the monthly statement is customized for them. We watch trends,

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Meridian's Aircraft Management Team customizes a program for each aircraft owner, tailors it to their specific needs, and manages all aspects of the process. All provided at a level that always exceeds our customers' expectations.

When you're considering an Aircraft Management company, you should choose one that offers financial stability, transparency, and expertise. Choose Meridian, and discover the most important benefit in jet ownership.

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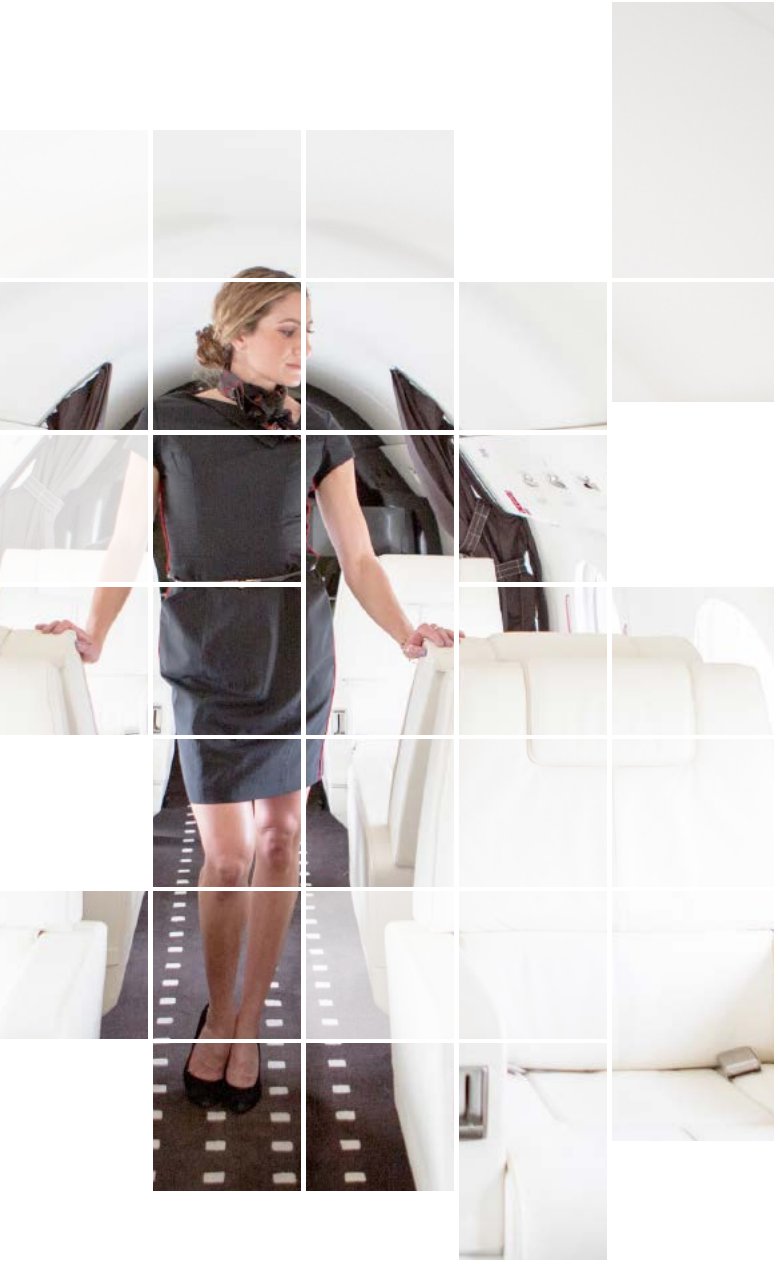
track monthly data, and provide recommendations on any anomalies, and manage toward a goal. That is when transparency really pays off for the customer.

An example came across my desk last week. We track the cost of international data plans, to make sure customers are getting the best rates for their usage. Often, you can prepurchase bundles of data and drastically reduce costs, and because we monitor those costs, we were able to recommend a plan to a client that will save them 25 percent.

Michael Tamkus, Executive Jet Management:

EJM's business philosophy is simple. Our core business is aircraft/asset management for our owners and providing exceptional charter services. That's it. EJM does not sell maintenance, parts, or fuel or have other sources of revenue. Our revenue comes solely from our management fees and charter revenue we produce for our owners. We provide our owners with our buying power within the industry with 100 percent pass-through transparency. As a wholly owned subsidiary of NetJets, which is a Berkshire Hathaway company, we have financial controls in place to protect our owners, our company, our employees, and Berkshire shareholders. We allow our owners to openly audit EJM and routinely go through internal compliance reviews successfully. EJM's goal is to open up our complete organization to a prospect and for owners to see the true value in our service and our commitment to safety. EJM's level of expertise and support behind every flight segment, every maintenance event, and every owner mission is unique.



Charter revenue is important to many customers. How can they evaluate a management company's ability to generate charter hours?

Michael Tamkus, Executive Jet Management:

When considering a management company, owners should review its ability to not only support flight operations, but to sell trips. Do they have an in-house sales team or do they rely on the broker network? How do they quote and sell trips? How will they present the aircraft to potential charter clients? Do they have data to justify proposed charter volume? How much control do they have in the sales process? We've had owners who've been offered lofty charter revenue guarantees. Owners should routinely review with their management company the progress toward goals. We have over 90 aircraft open to third-party charter, and every owner has unique goals for the flight department. Our objective is to be realistic and open about our progress toward those goals.

Brian Kirkdoffer, Clay Lacy Aviation:

Each client has their own appetite for charter, and it has little to do with the net worth of that company or individual. They either want this to be a working business asset that is creating revenue or reducing cost, or they just want it available for them. We advise clients that there is a benefit to having an aircraft on an FAA Part 135 certificate. It does not necessarily mean it will do a lot of charter, but that it holds the management company to a higher standard. Clay Lacy does not make commitments and promises on charter revenue. Many times, guarantees misalign the interests of the owner because the management company is incentivized to meet the goals, even if it means putting 15 people going to a bachelor party on an airplane. Our philosophy comes from Clay: under-promise and overachieve. We track each owner's goals and make sure to meet or exceed them.

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Bill Papariella, Jet Edge International:

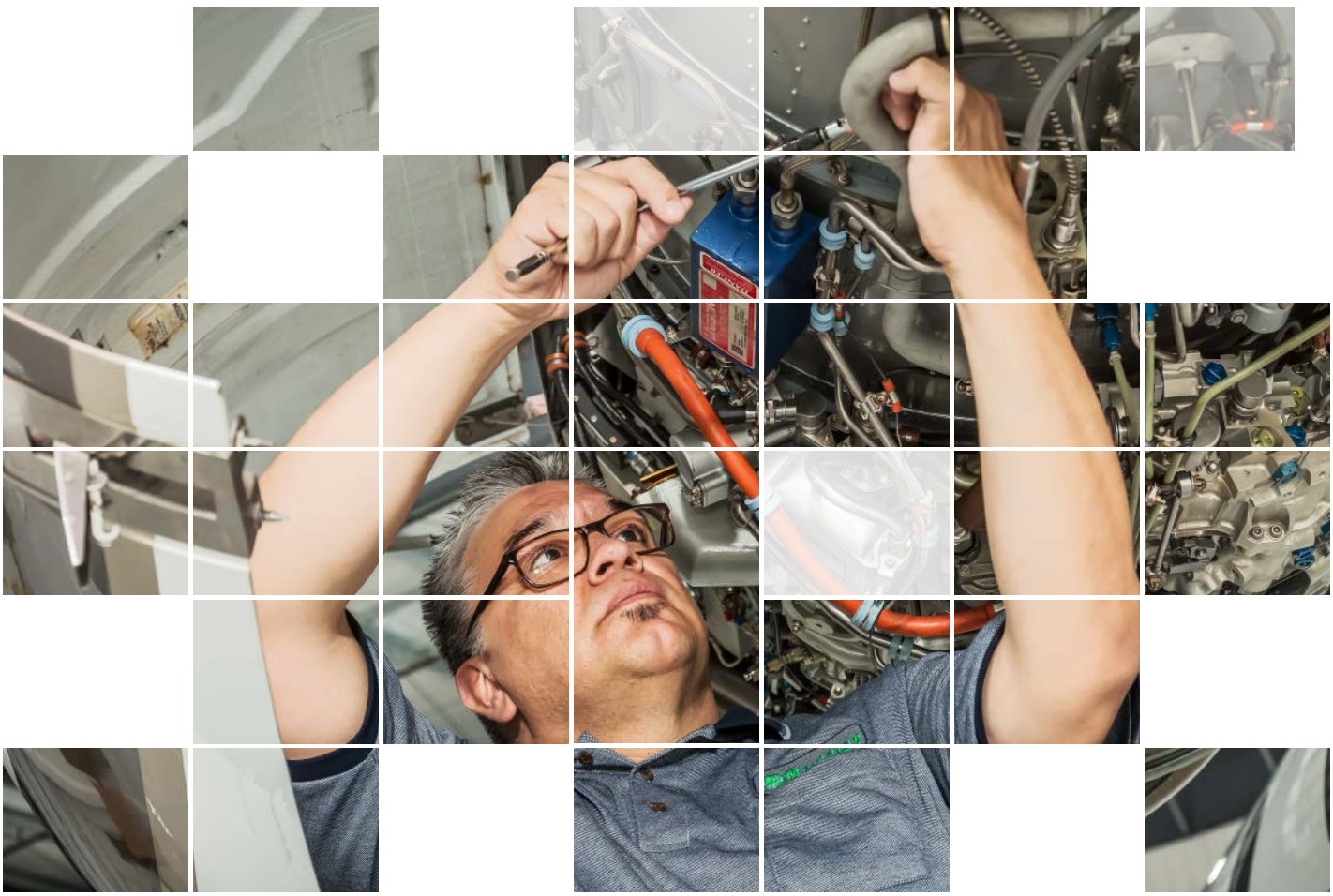
Unfortunately, many aircraft owners are led down a path based on unrealistic expectation regarding charter hours, potential net revenue, and the complications of FAR Part 135 operations. Owners should ask for referrals from other clients with similar mission goals. We have a charter revenue guarantee program, but it has to be the right airplane in the right situation in the right location for us to do it. We are very focused on super-mid- and large-cabin airplanes in the L.A.-New York-Florida market. If the owner doesn't have Wi-Fi, we've gone so far as to install it in exchange for a time commitment to make it attractive on the charter market. We average more than 20,000 hours of charter per year and find that most of our clients want to maximize the utilization of their aircraft. We've got a robust in-house sales team around the country whose sole purpose is to source retail charter for our airplanes. We've also got great relationships with large brokerage firms.

Michael Moore, Meridian:

Do your homework. Every owner has a different philosophy on how much charter they want. If you have a target number, come in, speak to the executive team, the director of operations, the chief pilot, the marketing guy. If they spoke about an impressive number of hours they put on an airplane, ask how they did it. Meridian has an inside sales team, and more than 50 percent of our charter is retail rather than wholesale—we reimburse the owners the same either way. Crewing is also an issue. If you own a GIV and want to put 400 hours of charter on it, give me three to four crewmembers and there's no problem. With two pilots, it's much more difficult.

Don Haloburdo, Jet Aviation:

In our world, we'd rather have a relationship with the customer where they say, "This is what we're looking for" in terms of charter hours, and we work toward that together, instead of providing guarantees. There are differing levels of expectations people have when putting aircraft out for charter. Some aircraft are on "look and book" status—we look at the schedule and if nothing conflicts, [the aircraft] goes out for charter under a prearranged agreement. Some owners have requirements for what trips they'll accept for charter, and some owners may need a specific portion of overall commercial activity to realize a tax or other benefit. If charter revenue is important, ask the management company about their customers' goals for number of hours, and what has been delivered over the past 24 months.



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simulator produced by FlightSafety in 2012 and in service at Kirtland Air Force Base, New Mexico, that contains coordinated crew and pilot training stations. The HH-60G level-D simulator includes two side gunner stations equipped with simulated mini-gun and .50 caliber machine guns to provide training for the flight engineer and gunner. The simulated weapons contain active recoil and aerodynamic torque system programming to provide realistic recoil and aircraft slipstream feedback to the gunner crew positions.

"It's a trend we're seeing in government and getting more prevalent in the commercial industry: wanting to integrate training of mission crewmembers—the people in the back—on the same platform with the pilots, all together in one simulator," said Goodwin. "The combat rescue helicopter will have separate visual systems, one on each side, with gunner positions. It will look like a seamless continuous image from front to back, but you will be looking out the side doors of the helicopter and be able to fire the guns."

CAE Special-mission Training

CAE has been manufacturing simulators for a variety of aircraft for many years, including full flight simulators for medium and larger helicopters, but the company's CAE 3000 series flight and mission simulator offers a lower-cost package designed to help train pilots for any special-mission helicopter operation. These include not only simulating the way the helicopter flies, but also the environments in which operators spend most of their time flying.

For example, offshore operators can train pilots in the CAE 3000 with databases supporting highly realistic oil-and-gas platforms populated with objects and even random people, while wind-driven whitecaps adorn waves on the ocean below the rig. EMS operators can practice confined-area landings in rural areas or densely populated cities, surrounded by emergency vehicles and personnel and even EMS first-responders pushing a stretcher. According to CAE, the 3000 series is the first simulator for the civil helicopter training market to provide realistic human form and moving vehicle dynamic simulation driven by artificial intelligence technology.

Other scenarios in the CAE 3000 include all types of emergencies, such as engine failure, hydraulic system failure, tailrotor problems, and even a stuck tailrotor control.

The CAE 3000 meets global standards for helicopter flight training simulation training devices, including for FAA level 7 flight training device (FTD) credits, but it isn't just a fixed-base device. A three-degree-of-vibration motion platform helps pilots experience more realistic helicopter simulation, without the expense of a full-motion system.

The visual system is CAE's Tropos-6000, which uses projectors to deliver imagery to a 220-degree horizontal by 80-degree vertical field-of-view director projection dome. Pilots can look down and see the expected view through simulated chin window coverage.

Dose Of (Virtual) Reality At Becker Helicopters

Responding to the requirement to provide state-of-the-art training for crewmembers in the back, Queensland, Australia-based Becker Helicopter Pilot Academy recently built a VR simulator to conduct crew training in a Leonardo AW139 rear cabin.

"Currently we're using the virtual reality trainer for basic crewman control procedures, including standard communications and phraseology for guiding the pilot," said Becker's director of maintenance Michael Yip. As director of maintenance, Yip oversees not only the maintenance of the 20-plus helicopter fleet but also the engineering, development, and maintenance of fixed-base FTDs, VR, and NVG simulators, all developed and built in-house. "The benefit of virtual reality is that you can put a person in a place that you can't put him in with any other simulator. It's like when you're in a game. As soon as you put the virtual reality goggles on, you have to do whatever the virtual reality situation is."

Founded by Mike and Jan Becker in 1995, Becker Helicopters employs more than 30 instructors providing approximately 15,000 training hours per year to both pilots and crewmembers. The company has developed and built four traditional fixed-based FTDs in house, all certified to Australian CASA level B standards (approximately applicable to FAA FTD level 7) for pilot training and recurrency requirements. Having completed the VR sim in mid-2017, Becker has already conducted two crewmember classes in it.

DEAN ROSENLOF

Australia-based Becker Helicopter Pilot Academy builds its own VR, NVG, and FTD sims like this Bell 206 FTD.

FRASCA INTERNATIONAL

Frasca's small-stroke Motion Cueing System allows pilots to adapt faster to fixed flight training devices like this Airbus H-125 sim.

For crewmembers receiving the VR training at Becker, the realism starts before the goggles go on. The simulator is the size, shape, and essential configuration of a Leonardo AW139 rear cabin with the doors off. Dressed in their duty flight suits, helmets and protective gear, crewmembers must attach themselves to the cabin harness just as if they were going flying. Only then will the instructor start the program. When the student puts the VR goggles on, the student can see the entire helicopter, including main and tail rotor, plus all outside graphics encompassing the scenario including underneath the aircraft.

"To immerse the student in the VR world, we make sure the VR aircraft is the same as the real aircraft," said David Betts, an instructor who teaches crewman training at Becker. "For example, the door handles and the ceiling rings are in the same position. Then if you start by putting your harness on before you put your VR goggles on, your brain starts to think in the same mind[set] as when you walk out to the aircraft. When you can then reach your finger through a ring on a hard point on the roof, your brain believes that you're in the aircraft...That's what we're trying to do: immerse the student in the aircraft by first making it look like the real aircraft, and then take the same level of seriousness. If you do that, it works well. If you just walk out to a chair in a room and put the goggles on, you're going to get sick very quickly."

One of the biggest benefits of VR training is that the instructor can see not only what the student is doing in the cabin, but also what the student is looking at through the VR goggles. "We want to make sure that when the guys say they are looking at the rotor system, we physically see them looking at the rotor system," said Yip. "When you're brand new, you spend time looking all over the place. When you get more experienced, your situational awareness becomes a lot better."

Yip says that it was not a big jump to go from development of the existing flight simulators to the VR simulator, partially because Becker developed an NVG simulator in between. While NVGs can be used in the Becker FTDs for training normal NVG operations, the NVG simulator is a special set of goggles synced to the flight simulator that projects images onto the goggle lenses to train crewmembers to deal with failures of the goggles themselves.

"We can simulate the defects on the night vision goggles, such as a tube failure, 'chicken-wiring' [an irregular pattern of dark lines, sometimes hexagonal or square-wave shaped], edge glow, dark spots or white spots. You can simulate all of that on each goggle, or you can simulate a complete failure to practice emergency procedures such as handing over to the next pilot, changing the battery pack, etc."

At Frasca, Bigger Isn't Always Better

Urbana, Illinois-based Frasca International turns 60 this year, but its simulator technology is not only keeping up with the times, it's making breakthroughs. Based on decades of research in building simulators and training devices of all types for both airplanes and helicopters, CEO

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John Frasca, son of founder Rudy Frasca, is convinced that when it comes to helicopter simulators, short strokes are better.

"Big motion bases have existed for years, and we've built them with up to 60-inch stroke legs," said John Frasca. "The large simulators move so much in response to the pilot inputs, when they wash that motion out, it imparts a negative cue." Frasca used the classic cues of a sustained bank—when after several seconds the vestibular system equalizes to make the pilot feel as if he's straight and level even though instruments still show the aircraft turning—as an example. "The way we do that with motion bases is that [the actuators] move to put the initial bank in, and then as the pilot sustains the turn, [the actuators] wash out so that the motion base is sitting level even though the visual still shows the turn. When you do that with a large motion base, it means that you have a large negative cue in the wash out."

FRASCA INTERNATIONAL

Frasca manufactures a variety of AATDs, FTDs, FFS, HTDs, and other sims at its Urbana, Illinois facility.

Frasca said that small motion bases using six-inch stroke actuators, such as Frasca's Motion Cueing System (MCS), as opposed to the 60-inch strokes normally used on Level D FFSs, can feel more like the actual aircraft—especially when training in small helicopters.

"With the small motion base we're seeing pilots adapt to the simulator more quickly, and their workload is more comparable to what they encounter in the aircraft. And it may be more prevalent in small helicopters where the cues are felt sooner. That's the market we're really after with this," said Frasca.

The MCS uses six six-inch actuators with brushless electric motors and three pneumatic assist cylinders to provide six degrees of freedom (6DOF) motion plus vibration cues. The company began offering the MCS on its custom FFSs and as an option to fixed-base FTDs about two years ago, delivering one of the first instances on a Bell 206L level-7 FTD delivered to EMS operator Air Evac in December 2015. According to a testimonial on the Frasca website given by Air Evac instructor Stephen Sullivan, "It took about four weeks for the FAA to approve it and our instructors to become familiar with [the] capabilities before it was 'ready for training' on January 27, 2016... With Frasca's new cueing system a pilot really senses motion with the vestibular apparatus [in the inner ear] and the proprioceptive sensors [the body]."

In 2017, Frasca introduced the Helicopter Training Device (HTD), a new product aimed at the small helicopter operator or flight school. Essentially an off-the-shelf fixed-base AATD using Frasca's level-D helicopter mission simulation database, the HTD can be ordered in one of four models: Bell 206, Bell 407, Robinson R44, and Airbus AS350. Avionics include a choice of analog or Garmin G500H primary instruments and Garmin GTN 650 or 750. With no motion or vibration cues, the HTD is essentially an advanced procedures trainer with some beefy software upgrades, including the same aerodynamic modeling as used in Frasca's level-D FFS, and a helicopter mission database designed to provide IFR training scenarios.

"With the HTD, we really focused on one training task: inadvertent IMC," said Frasca. "Pilots were getting into the clouds without being current. This device is designed around getting them current and keeping them current."

The HTD also comes standard with Frasca's SimAssist adaptive training software module introduced in 2015. Developed to measure the pilot's task proficiency in real-time and provide variable assistance to optimize training, SimAssist is useful for pilots learning new tasks but can also help experienced pilots adapt more quickly to a fixed-base FTD. Currently only programmed to activate during hover, SimAssist reduces aggressive inputs and assists in the hover when the student is first learning. As the student gets better at hovering, the SimAssist program gradually adapts to the student's capability and returns the sim to the full realism of the aircraft.

"It's like a variable augmentation system," said Frasca. "Instructors often have to hold on to the cyclic or pressure the control one way or another to keep the helicopter stable when the student is flying poorly. With SimAssist, the software is doing it so the student can find it easier to fly. As he starts coordinating and muscle memory begins to develop, the system slowly reduces the amount of assistance provided."

Although the technology is still in its infancy, Frasca sees the adaptive SimAssist technology expanding beyond single

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Helicopter Simulator Terminology

While any device that represents or reproduces a real-life scenario can be called a simulator, the FAA and other certification agencies rigorously categorize various types of helicopter simulators for flight training.

Flight Simulator Training Device (FSTD): generic term used to designate any level of flight simulator in FAA or EASA documentation.

Aviation Training Device (ATD): An open flight deck or enclosed cockpit containing a replica of aircraft instruments, equipment, panels and controls with the hardware and software necessary to represent a category and class of aircraft in ground and flight conditions. May use a mixture of physical and virtual controls.

Advanced Aviation Training Device (AATD): An ATD that represents a specific model aircraft cockpit using physical knobs, controls, switches, and panels in the proper position and distance from the pilot's seated position. An AATD must include a digital avionics panel, GPS navigator with moving map display, two-axis autopilot (not required for helicopter), an independent visual system, panel or screen, and a separate instructor station.

Flight Training Device (FTD): Fixed-base simulator containing a full-size replica of a specific aircraft type cockpit and controls with equipment and software capable of representing the aircraft in ground and flight conditions. Most FTDs also contain an out-of-cockpit visual system but lower level FTDs do not need one. No motion or vibration cueing actuators are necessary to be considered an FTD, but motion can be added without bumping up to FFS levels. Designated by numerical levels based on fidelity of simulator operation, visuals, programming, etc. FAA levels 1-7 with 7 as highest; EASA Helicopter FTD levels 1-3 with 3 as highest (Note: EASA only categorizes Aeroplane FTDs into levels 1 and 2).

Full-flight Simulator (FFS): Full-motion simulator with out-of-cockpit visual system and large-base force cueing system providing three to six degrees of freedom and special effects cues such as buffet due to translational lift, vortex ring, turbulence, and high speed and retreating blade stall. Must contain full-size replica of specific aircraft cockpit and controls, including control force feedback replicating helicopter feedback under the same conditions. Designated by lettered levels A-D for both FAA and EASA with level-D the highest. Type ratings may be performed in level-D FFSs. **K.R.**

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TRU Simulation's Odyssey H sim employs a roll-on/roll-off cockpit configuration to allow training for different helicopters in one sim.

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maneuvers like hovering and autorotation to encompass entire lessons. Since the system essentially assesses when the student is ready to fly certain maneuvers without assistance, SimAssist or its future incarnations may allow students to learn the basics of helicopter flying without a human instructor.

"I think teaching hover with the SimAssist is more effective than the instructor fighting [the student] or turning him loose by himself," Frasca said. "As you get into more complex maneuvers, we still have to develop the software to be able to replace the instructor. But it's only a matter of time until the student will take an entire flight lesson without an instructor."

TRU Provides Small/Large Motion Base

Determining that two motion bases are better than one, South Carolina-based TRU Simulation + Training, a subsidiary of Textron formed in 2014, recently introduced its Odyssey H helicopter-specific platform, which incorporates a large-motion-base FFS exterior with a separate small-motion base under the interior cockpit. Both motion bases provide 6DOF cues, but are independent to allow the small secondary motion base to provide essentially a seventh axis, such as a yaw kick simulating an engine failure during a turn.

"You can almost think of the secondary [motion base] as providing the 'seat of the pants' cues and the large primary [motion base] providing the sustained g's that you would feel in the aircraft," said Troy Fey, TRU v-p of technology. "They have to be synced together to make it seamless and prevent any negative abnormal effects that the brain could pick up."

According to an example provided by Fey, the primary motion base with its 60.5-inch actuators can pitch down 33 degrees from horizontal. The secondary motion system can separately pitch an additional 9.5 degrees down, for a net down pitch attitude of 42.5 degrees. The secondary motion system also provides vibration cues.

"[The secondary motion system] will also give you very good cues for vibration, which is important for various failures on the aircraft," said David Smith, TRU v-p of training centers. "When you drive really strong vibrations from that secondary motion system, you can then use the full motion to drive the aircraft cues, so it just gives a higher fidelity."

The Odyssey H platform includes a 10-projector, 41-megapixel visual system consisting of a 240-degree horizontal by 80-degree vertical field of view display, with an 11th projector for the chin window. Both the Bell 429 level-D FFS certified at the Bell Helicopter Training Academy in Valencia, Spain, early last year, and the Bell 525 FFS soon to be certified at Bell's Fort Worth facility use the Odyssey H platform, which also encompasses a roll-on/roll-off cockpit configuration.

"[The 525 FFS] is nearly identical to the 429 [FFS at Valencia]," Smith said. "You could take a 429 cockpit and roll it into the 525 mothership and use that same visual system to do both. That's not been the current plan, because they think the 525 will be busy enough to stay in 525 configuration all the time. But the Odyssey H gives us the ability to have one fixed expensive asset and then swap out lower cost cockpits to keep the biggest, most expensive part running round the clock. The projectors, the actuators all stay the same, but one day you can park a Bell 429 cockpit in the slot and then the next day you could slide a Bell 412 cockpit into the slot."

In July 2017, TRU delivered an Airbus H145 level-D FFS to Helsinki, Finland-based Coptersafety using the Odyssey H platform. The FFS earned EASA level-D certification in October 2017, one month after the German Federal Aviation Office certified the "world's first H145 FFS" at Airbus Helicopters Training Academy in Germany. TRU is scheduled to deliver four more level-D FFSs to Coptersafety this year representing Airbus H125 and Leonardo AW139, AW169, and AW189 airframes. ■

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Piaggio Aerospace outlines five-year plan | by Ian Sheppard

The board of Italy's Piaggio Aerospace has approved a strategic industrial plan that will cover the next five years and will, according to the company, "secure the long-term financial and operational stability of the business."

The plan is based on two main pillars: comprehensive financial restructuring and "operational commitments and developments."

Piaggio is reiterating its commitment to the civil aviation sector, for which it manufactures the P.180 Evo.

The former will include a £255 million ($342 million) cash injection by Mubadala Investment Company "to support Piaggio Aerospace's financial needs" combined with a "total bank debt repurchase and conversion to equity by the shareholder in support of Piaggio Aerospace's balance sheet."

On the operational side, there are four key elements: an "increased focus" on the P.1HH Hammerhead medium-altitude long-endurance UAV, first deliveries of which are due to take place this year; a strengthening of the industrial relationship with Leonardo, covering the defense and security sectors; the development of a "new production and commercialization strategy" for the P.180 business turboprop, "including the assessment of potential partner opportunities;" and, finally, the sale of Piaggio's engines and civil aviation MRO activities.

Piaggio Aerospace CEO Renato Vaghi commented, "The industrial plan...lays the foundation to deliver long-term security built around our core programs, while creating opportunities for growth in new areas of development."

Piaggio has had a difficult recent history. In September 2015 Mubadala became 100 percent owner of the company, but this was some 17 years after the UAE company headed a consortium to rescue the Italian OEM from bankruptcy.

In 2016 , it was forced to reassure the business aviation sector that it was still committed to the P.180 Avanti, especially having launched the Evo upgraded version, after it stated 17 months ago that the primary focus of its new industrial plan would be military programs.

Deliveries of P.180s have dwindled to a handful a year, and there were concerns about support, according to operators contacted by **AIN** in 2016. This was exacerbated after the company appeared to indicate it was about to walk away from the civil aerospace sector. The latest plan indicates divestment of the company's remaining engines and MRO businesses, while this time supporting renewed focus on Avanti production and support. ■

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Fighting California's wildfires | by Garrett Reim

There was no avoiding wildfire in California last year.

Five years of drought left acres and acres of wildlands strewn with dead vegetation at the beginning of 2017. That combined with rain that caused record amounts of more vegetation growth, particularly grass crop, created a tinderbox, and those conditions led to the worst fire season in California history.

"Early on in the year we were having significant-sized grass fires," said Cal Fire deputy chief Scott McLean. "As we moved through the year, the higher elevations started to dry out as well due to the continuous dry weather."

A typically hot California summer did little to improve the situation.

"In October, we dealt with winds in excess of 60 mph promoting wildland fires like blow torches," said McLean. "The winds lasted a couple of days and then subsided. But due to the vegetation being so receptive to fire, the fires continued to burn."

At the peak of the battle in October there were 21 major wildfires—including blazes in Napa, Sonoma, Mendocino, and Solano counties—that burned more than 245,000 acres in total. Some 11,000 firefighters were called in to contain and extinguish the infernos, which forced 100,000 people to evacuate, destroyed an estimated 8,900 structures, and killed 43 people.

By December wildfires had started up again. The Southern California fires spread due to high winds, namely the hard-blowing and dry Santa Ana winds coming down from the arid Great Basin in Nevada.

"The speeds of these winds were similar to the October siege; however, they lasted for a couple of weeks, where the winds of the October siege lasted for only a couple of days," said McLean.

The result was several more large and fast-moving wildfires, including the Thomas Fire in Santa Barbara and Ventura County, which in less than a month became the state's largest fire ever, destroying more than 280,000 acres.

Such enormous fires flaring up in winter as well as summer months means Cal Fire has little downtime anymore, said McLean.

"Due to fires starting year round, especially in Southern California, there is not really a fire season," he said. ■

During last year's California wildfires this Boeing 747-400 operated by Global SuperTanker Services supported Cal Fire's efforts.

Boeing SuperTanker proves a workhorse

Global SuperTanker Services' Boeing 747-400 is finally taking a rest after a busy firefighting season.

The jumbo jet tanker sitting on the tarmac at Sacramento McClellan Airport last month dropped almost a million gallons of water or fire retardant on a host of wildfires in the fall.

The airplane worked overtime from September to December—flying 51 sorties and making 71 drops—to combat one of California's most-destructive wildfire seasons ever.

The jetliner, dubbed *The Spirit of John Muir*, holds approximately 19,000 gallons of liquid and dwarfs its nearest competition, the DC-10 Air Tanker. Not surprisingly, heads and television cameras turn wherever it goes.

"When you see a 747 the first thing you think of is a lumbering aircraft that doesn't maneuver well. Nothing could be further from the truth," said Jim Wheeler, chief executive of Global SuperTanker. "This aircraft performs beautifully."

In fact, its four powerful General Electric CF6 engines can propel it at a top speed of nearly 520 knots—fast-enough that when stationed at McClellan Airport in October it reached fires burning to the north of the San Francisco Bay in about 15 minutes and, in December, reached fires burning around Santa Barbara County, such as the state's record-breaking Thomas Fire, in 35 minutes.

The aircraft has a far-reaching range, and can fly approximately 4,500 miles (3,910 nm) loaded and 8,000 miles (6,952 nm) empty.

"We can be on a scene of a fire anywhere in the world in 20 hours with one fuel stop," said Wheeler.

The SuperTanker can also reload quickly despite its massive capacity.

"Our goal is 30 minutes. Our average is between 23 and 27 minutes, and we have done it in as little as 13 minutes," said Wheeler. From touchdown to takeoff, the airplane turns around in as little as 35 minutes to 40 minutes, depending on airport traffic, he added.

Yet, the air tanker's heft and speed doesn't come cheap. It costs $16,500 per

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McClellan Airport bustles during 2017 fire season

Traffic at Cal Fire's base of operations, Sacramento McClellan Airport, doubled this fall to as many as 400 flights a day as air tankers from around the country converged to load up on fire retardant and water to drop on raging wildfires burning throughout California.

That's according to Titus Gall, chief executive of mobile air traffic control service Tower Tech Inc., who was called in to manage the sudden influx of traffic to and from the former U.S. Air Force base. Traffic during the off season has not yet justified a full-time air traffic control tower, so aircraft—some 40 business jets call the airbase home—typically coordinate landings and takeoffs among themselves using a common traffic advisory frequency, he said.

The 1,100-acre airport, located 20 minutes from the state capital's downtown, is one of the largest privately owned facilities in the country and boasts a 10,600-foot runway designed to handle large military aircraft, which for decades used the base for maintenance.

The Air Force closed the base in 2001, but it is now used by Cal Fire as its maintenance hub and as a fire retardant reload base.

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DynCorp provides maintenance for Cal Fire's fleet of firefighting aircraft. When the season is over it strips them down for maintenance and overhaul.

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McClellan bustles during fire season

Cal Fire operates 22 S-2T air tankers, 12 UH-1H Super Hueys, 15 Rockwell OV-10A Broncos, and two Air King A200s. And when fire season smolders, it sends the aircraft back to McClellan to be stripped down for overhaul by its maintenance company DynCorp, said Scott McLean, deputy chief of Cal Fire.

"Our S-2s and Hueys go in there when we have a 'winter,'" he said. "Just think of the type of flying they do. It's not just straight-and-level flying. They go through a lot of stress."

When the base is used as a launching pad for aerial firefighting, it's usually to support DC-10 Air Tankers or the 747-400 SuperTanker, which guzzle enormous quantities of water and fire retardant. McClellan is the country's largest aerial retardant reload base.

During October of last year, when fast-moving fires were raging in Northern California, the base pumped more than 4.3 million gallons of retardant into air tankers, including 366,000 gallons in one day—a Cal Fire record, Gall said.

"They were taking off every seven minutes," he said. ■

At the peak of fire season Cal Fire was fighting 21 major wildfires.

Busy fire season for DynCorp crews

The feet of DynCorp International's air tanker pilots hardly touched the ground this October, the peak of California's aerial firefighting season.

The company has been providing support to the California Department of Forestry and Fire Protection since 2001, but during this extended fire season it found its personnel working more hours than usual.

DynCorp's aviators, who provide flight operations for Cal Fire's fixed-wing air tankers, flew 700 hours in seven days as part of aerial firefighting efforts in Northern California from October 9 to October 15, according to a press release. One pilot even made 21 drops on a fire in one seven-hour period. As an explosion of fires spread across California this fall, DynCorp's maintenance service teams also had to work overtime. The firm provides maintenance services for Cal Fire's fleet of more than 50 fixed-wing aircraft and helicopters from McClellan Airport outside Sacramento.

Attempting to put out multiple large, fast-moving fires at once required Cal Fire to spread out DynCorp's maintenance staff and move them close to the front lines.

"We had to check if roads were open to allow them to get to the bases," said Jeff Cavarra, DynCorp program director for Cal Fire, in a statement. "These mechanics went to the bases knowing they may have to sleep on the floor, as all of the local lodging was filled by evacuees." ■

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Boeing SuperTanker proves a workhorse

flight-hour and $55,000 a day to have the airplane on stand-by, according to Cal Fire deputy chief Scott McLean.

Cal Fire hasn't concluded if that's an effective use of the agency's budget and will continue to evaluate the 747-400 through the end of this year before making a judgment, he said.

"It's not a done deal yet," McLean said. "But we've definitely given it plenty of business."

Wheeler contends that the aircraft is a good deal for Cal Fire.

"This is the lowest cost per gallon dropped aerial firefighting aircraft in existence," he said. "The speed, range, and tank size make it a force multiplier for any aerial firefighting situation."

Global SuperTanker's 747-400 is relatively new to the aerial firefighting scene, debuting as an air tanker over wildfires in Israel in November 2016. However, the concept of using a Boeing 747 in firefighting originated years ago with the now-defunct Evergreen International Aviation of McMinnville, Oregon.

Evergreen was a former aerial firefighting, cargo, and charter flight service provider founded by adventurous businessman Delford Smith. Smith was known for chartering airplanes on behalf of the Central Intelligence Agency, including the flight that evacuated the Shah of Iran to Panama in 1979. He was also known for his purchase of Howard Hughes's "Spruce Goose." Evergreen went bankrupt in 2014 shortly before Smith's death.

It took Evergreen an initial $50 million investment to design, receive FAA approval, and install the tank system on the first SuperTanker, a converted 747-200 air freighter, said Wheeler, who was the chief executive of Evergreen from 2012 to 2013. Global SuperTanker Services of Colorado Springs, Colorado, later bought the intellectual property.

While the Boeing 747-400 is a better airplane for aerial firefighting than its predecessor, the 200-variant, it still requires a closely coordinated and highly skilled team to conduct water or fire retardant drops, said Wheeler.

The aircraft flies with two pilots and a drop-system operator, whose job is to set the dials and air pressure on the tanks. The SuperTanker sprays water or fire retardant using a pressurized system, as opposed to dropping it. Such a system prevents damage to cars, homes, and trees, as well as injuries to humans, said Wheeler.

The SuperTanker can fly approximately 3,910 nm loaded–to its 19,000-gallon capacity–and 6,952 nm empty.

Drop areas are marked for the SuperTanker by a pilot in a lead airplane flown by Cal Fire, which either points out landmarks such as large boulders or trees, or releases puffs of colored smoke. The SuperTanker can slow to about 145 kt while spraying retardant from only about 200 feet above the ground, according to the company's website.

The jumbo jet has been observed laying down a fireline two miles long and 125 feet wide, said Wheeler. It can also make eight separate drops.

Flying a heavy water bomber close to the ground requires the ability to make a quick escape, Wheeler said.

"When you are in a situation where you are going into a valley and flying into steep terrain you want to be able to climb out," he said. "When we drop a load we can climb out at 6,000 feet per minute. We are a virtual rocket."

Controlling all that power requires skilled pilots. The company requires all its aviators to demonstrate that they can fly at low altitude with a full load of water and only two engines, said Wheeler.

"They have to be able to get rid of the full load and climb out of a pretty deep hole," he said. "The aircraft does have sufficient power to do it, yet it still requires significant pilot skill to handle it." ■

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The super-midsize jet offers a smooth, quiet ride

by Matt Thurber

Although the G280 traces its heritage to North American Rockwell, Galaxy Aerospace and Israel Aerospace Industries (which manufactures the airframe), the super-midsize jet is all Gulfstream, from the design of the wing to the elegantly equipped cabin and the outstanding performance that pilots have come to expect from the Savannah, Georgia, manufacturer.

Ultimately, the G280 doesn't share much with the G200/Galaxy except the size and shape of the fuselage. The engines, wing, empennage, avionics, and systems are all new and improved, and thus the G280 required its own new type certificate.

It's not surprising that Gulfstream chose to model aspects of the G280 after its larger airplanes. The company's wing designs are famously clean, with no leading-edge devices, flow fences, or flap track canoes to add complexity and hamper efficiency. The G280 wing, which is swept more than the G200's and has newly engineered winglets, was designed nearly in parallel with the G650's, according to G280 vice president, mid-cabin programs Rick Trusis, and it features a high-profile aerodynamic design and efficient airfoil, he said, "with performance born out of the GV/G550."

The other big difference compared to the G200 is the T-tail, which is more efficient than the G200's cruciform-style empennage and also makes the G280 slightly longer. "We wanted it to look more like a Gulfstream," he said.

The G280's spoilers are fly-by-wire-controlled, and this allows for automatic spoiler deployment, which facilitates steep-approach capability and the G280's certification for London City Airport. The rudder is also fly-by-wire controlled.

The G280 is Gulfstream's first design certified with an autobraking system, which is a natural addition to the jet's brake-by-wire system. (The G650 also has autobrakes, but that was certified later, as a follow-on.) Autobrakes help improve runway performance, shortening balanced field length, and adding to overall safety and comfort. "The avionics and performance of this aircraft allowed us to take advantage of this technology," Trusis said. "They've been really well received."

What buyers get with the $24.5 million G280 is a cabin nearly as wide as the classic Gulfstream fuselage, but obviously not as long. The G280 cabin measures 25 feet 10 inches in length and is typically outfitted for 10 passengers. The G450 (no longer in production) is about 15 feet longer. At 7 feet 4 inches, the G450/G550 cabin is just two inches wider than the G280's.

When comparing height between the classic large-cabin Gulfstream fuselage and the G280, the smaller jet is one inch taller, but that's because it retains the drop aisle from the G200, not the flat-floor found in the larger jets. Trusis explained that a flat floor wouldn't work in the G280. "[The drop aisle] allows for a much larger volume," he said. "The airplane feels more spacious for its cabin width. Having that slight step-down allows for the [taller] height in the center. And we were also able to put the seats into better proximity to the windows at the wider part of the fuselage. The seats align well with the outside view."

The G280's 19 cabin windows (four more than the G200) are larger than the G200's, although not the same size or configuration as those in the large-cabin Gulfstreams. "We would have had to redesign the fuselage," he said. "They align well with the cabin interior," and due to the large number of windows, add lots of natural lighting. The lavatory has its own window, too.

One design goal was to provide access to the aft baggage compartment during flight, and this was achieved by adding an auxiliary bulkhead. The G280 has a limitation for in-flight access, which is not allowed above 40,000 feet. Trusis explained that the limitation helped simplify the certification process, but Gulfstream is now working with the FAA and EASA on removing that limit. This would enable baggage compartment accessibility up to the G280's maximum altitude of 45,000 feet.

The pressurization system delivers a more comfortable 7,000-foot cabin at maximum altitude.

The G280 cabin can be outfitted for eight, nine, or 10 passengers. Completions are all done at Gulfstream's Dallas factory-owned service center.

Cabin Arrangements

In late 2016, Gulfstream unveiled new cabin configurations, with two layouts offering 10 seats available for takeoff and landing without having to use the lavatory seat. One of these configurations features a double-club forward and four seats on the left side opposite a three-seat divan (only the outboard two divan seats are available for takeoff and landing). The other 10-passenger configuration replaces the divan with two individual seats in single-club orientation. An earlier popular option was eight seats, with two double-clubs, but now the most-selected option is the nine-seat configuration with the divan in the aft seating area. Club seats are berthable to create beds; the maximum sleeping capacity is five for the two 10-seat configurations. The eight- and nine-seat cabins can sleep four.

The lavatory features a vacuum toilet, a 10-cu-ft (0.28-cubic-meter) closet large enough to hang garments, and additional storage compartments in the vanity. The baggage compartment encloses 120 cu ft (3.4 cubic meters) and can handle up to 1,980 pounds (898 kilos).

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Opposite the main door is the galley, which was recently redesigned. Buyers can replace the standard convection oven with a microwave. Standard features include cold storage, coffee maker, ice drawer with a manual drain to the exterior, sink and hot/cold faucet, solid-surface countertop with pullout extension, plenty of storage, lighted display compartment, and large waste container. The Gulfstream cabin-management system (CMS) can be controlled from a master panel in the galley.

A 14-cu-ft (0.4-cubic-meter) storage area is fitted next to the main door, just to the right after entering the cabin. Once in flight, an acoustical curtain can be closed, covering the main door entry and further silencing the G280's amazingly quiet cabin. The acoustic design was accomplished by Gulfstream's lead acoustician, who used to work for submarine-maker Electric Boat, a sister company of Gulfstream. Part of this design effort included cooling the airframe to evaluate noise performance when gaskets and rubber seals are cold-soaked to extremely low temperatures. Contributing to the cabin's low noise levels are gaspers with built-in noise baffles. Externally, the G280 has a near-20-decibel margin over Stage 4 noise standards.

Gulfstream's CMS is controllable via an iOS app, which operates settings for temperature, lighting, and entertainment. IFE features include a forward HD monitor, dual Blu-ray/DVD players, and Gulfstream's CabinView moving-map flight information system. Options include an additional 19-inch (48-centimeter) HD monitor on the rear bulkhead, 12-inch (30.5-cm) plug-in monitors at the seats, XM satellite radio, and Gogo Business Aviation air-to-ground and/or SwiftBroadband connectivity systems.

All G280 completions are done at Gulfstream's facility in Dallas.

Engine Technology

The G280's engines are Honeywell's HTF7250G, each delivering 7,624 pounds of thrust, flat-rated to ISA +15 degrees C. The engines are built with dual-channel Fadec, nacelles, and thrust reversers all in an integrated propulsion package.

With a wide-chord damperless fan measuring 34.2 inches (86.9 cm) in diameter, the HTF7000 series has a 4.4 bypass ratio. The engine's compressor airfoils were designed using straight-line-element technology, a design technique that delivers more consistent performance for machined airfoils. The combustor is a low-emissions, effusion-cooled design, and high-pressure turbine blades are transpiration-cooled.

One of Honeywell's goals for the HTF7000 series was ease of maintenance, which helps keep costs down and improves reliability. According to the company, "Individual LRUs can be replaced on average in 20 minutes or less with no shimming, rigging, or adjusting, using standard hand tools with nothing more than an idle-power leak check." The engine is fitted with 39 "strategically placed borescope ports for 360-degree visibility" when inspecting gas path components.

Flight Deck

It's not unusual for an airframer to opt for avionics from different manufacturers for various airplane models, but Gulfstream is keen on consistency across product lines and branded the G280's Rockwell Collins avionics with the same PlaneView name as the Honeywell avionics in the large-cabin jets. The PlaneViewG280 avionics are the latest iteration of Rockwell Collins's Pro Line Fusion flight deck, and a big improvement over the Pro Line 21 avionics in the G200, with three 15-inch (38-cm) displays providing much more screen real estate.

PlaneView isn't just an exercise in branding, however, as the engineers put a lot of design effort into matching Honeywell PlaneView conventions in the G280 interface. The cursor-control devices, for example, are nearly identical, with an inverse hat switch in the center for moving the cursor, three buttons for selecting the display, and a rotational knob for moving up and down checklists or ranging in and out on the moving map.

The center moving map looks a lot like the Honeywell equivalent, too, with similar drop-down menus, synoptic diagrams, and checklists.

"We tailored the look and feel with PlaneView," said Trusis, "including the symbology and the look and feel and functionality. We spent a lot of time trying to make sure this airplane had that familiarity with other Gulfstream products. A lot of the look and feel and operational features of the large-cabin aircraft have been designed into this avionics system." Like the large-cabin jets, the G280 is equipped with autothrottles and the same head-up display (also a Rockwell Collins product) and Kollsman enhanced vision system as the G650.

The third FMS is optional, but a popular choice. Pilots used to programming a Honeywell FMS in the larger Gulfstreams will notice some user-interface differences with the Rockwell Collins FMSs in the G280. This is no big deal, but I find the Rockwell Collins FMS a bit more intuitive.

Synthetic vision is also an option on the G280, and most buyers select this, according to Trusis. Both Honeywell's and Rockwell Collins's synthetic vision are tremendously beneficial situational awareness tools, and most business jet pilots I've asked prefer it. The Rockwell Collins version adds a useful feature, an opaque airport dome that highlights the destination airport. The dome gradually becomes less opaque as the airplane gets closer to the airport.

Large-cabin Gulfstream pilots should find the G280's guidance panel familiar, but the standby multifunctional controllers (SMCs) have a G650-like twist: the large Rockwell Collins SMC display also doubles as an integrated standby instrument, driven by a remotely mounted L3 standby instrument. This is a much better design than tiny standby instruments mounted elsewhere in some airplanes, and, during an emergency situation, allows the pilots to align their viewpoint forward instead of down inside the cockpit. In case of total electrical failure, the SMCs, the integrated standby instruments, and the autopilot are powered by the standby battery.

The SMCs have many other functions, including the ability to manage single-point refueling from the cockpit, instead of having to access the refuel/defuel panel mounted aft of the fueling port. Other functions include PFD settings, weather radar, chart selection, HUD settings, checklists, nav sources, avionics configurations for each phase of flight, and more.

The G280 PlaneView caution and advisory system (CAS) messages are displayed in a more intelligent fashion, and overall, the G280 flight deck is thoroughly modern, uncluttered and without too many switches and knobs. Circuit breakers are all consolidated on one overhead panel and laid out in a simple grid pattern.

The Gulfstream PlaneView280 flight deck features three 15-inch displays and unique standby multifunction controllers that double as standby displays.

Performance and Systems

Pilots appreciate the G280's strong performance, especially the ability to fly coast-to-coast in the U.S. at Mach .84 (3,000-nm/5,556-km NBAA IFR range with four passengers) or even farther at Mach .80 (3,600 nm/6,667 km, also with four passengers). With a balanced field length of 4,750 feet at mtow (thanks to the autobrakes), the G280 can access a huge number of airports. Sea level landing distance at maximum landing weight is 2,740 feet.

"We wanted to achieve class-leading performance for its size," said Trusis, "and we have no problem meeting the stated performance numbers." The G280 has secured speed records for more than 55 city pairs.

The G280 can climb directly to FL430 after taking off at its 39,600-pound mtow. Chief demo pilot Brett Rundle said he has climbed to FL430 in just 20 minutes at maximum weight.

The G280 has a fuel-jettison system, something not found on any other business jets (those that aren't derived from airline airframes). This system can also be used for defueling via a special adapter that attaches to the jettison port mounted between the flaps and ailerons.

The G200's fuselage bladder tank was not retained in the G280, which has seven fuel tanks. These include tanks in both wings, three in the center section (forward, center, aft) and two feed tanks in the aft tank, each serving one engine.

A single air-cycle machine supplies the environmental control system, using bleed air from the engines or APU. The Honeywell GTCP36-150 APU can be operated up to 40,000 feet. Thankfully, Gulfstream opted for a selection between Imperial and metric units on the temperature displays in the cockpit and cabin.

Ailerons are mechanically driven and supported by the multifunction spoilers (the middle and outboard spoiler panels), and either flight control is sufficient for full lateral control. The force required to move the ailerons is reduced by geared tabs that help reduce aileron hinge moment.

Elevators are hydraulically controlled via dual hydro-mechanical servo actuators, one for each elevator, and each with dual push rods. Separate hydraulic systems operate each servo, and each elevator is separately connected to each pilot's control wheel. A "Q-feel" actuator in the right-side elevator control loop increases control force as speed increases. In case of total failure of the hydraulic system, the elevators can be operated manually.

The fly-by-wire rudder incorporates a thrust-compensation mode in case of engine failure, and this removes 80 percent of the rudder pedal force needed to maintain the proper trajectory on one engine. This leaves some remaining rudder adjustment for the pilot, to help keep the pilot in the loop during an engine-out situation.

Weight-and-balance capabilities are generous on the G280. Even with the

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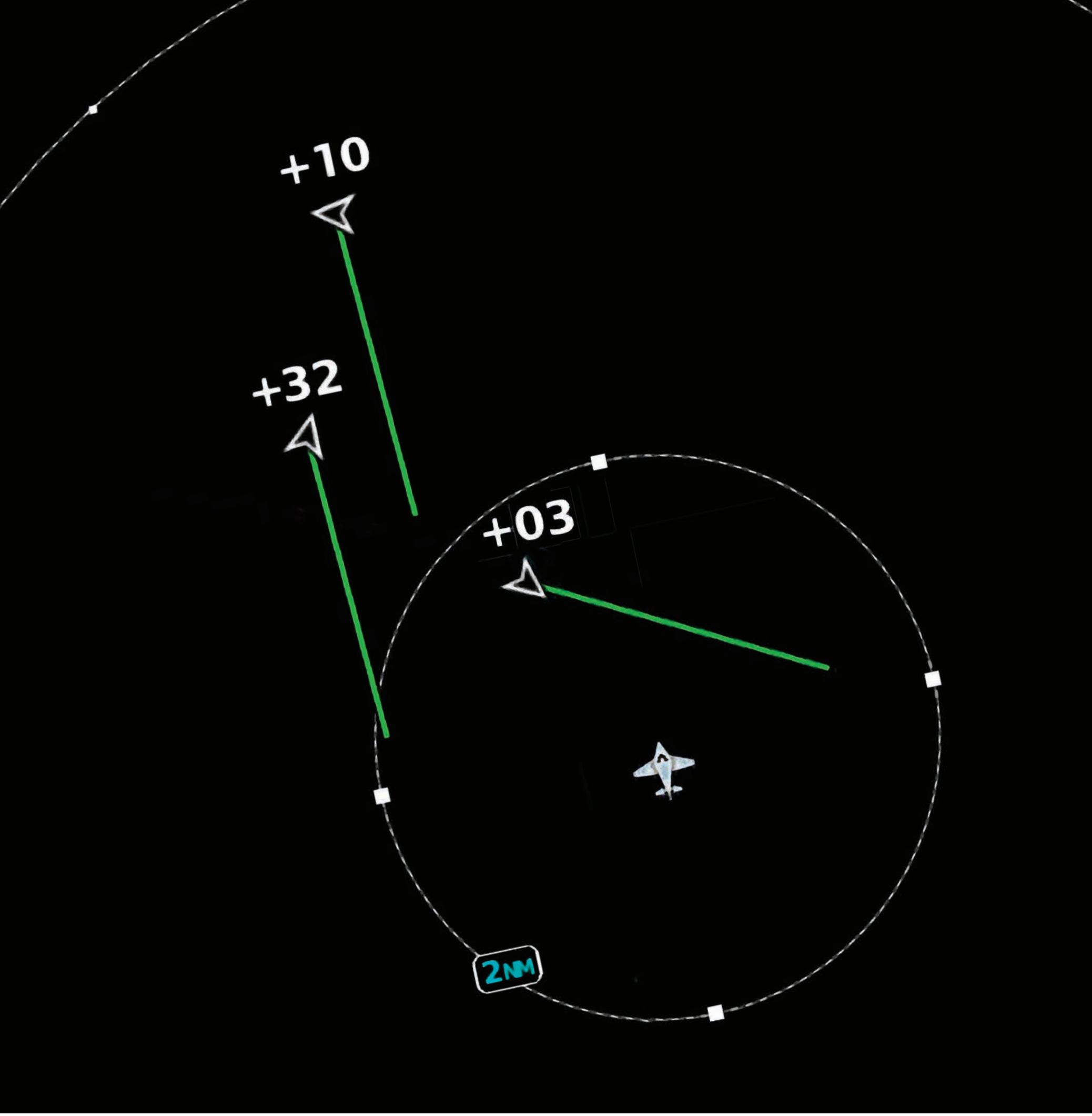

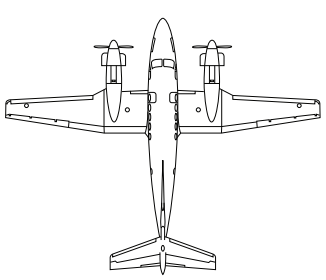

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Gulfstream G280

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large aft baggage compartment filled to its nearly 2,000-pound (907-kg) capacity, the G280 will stay within its CG limits with no passengers onboard. "If you take off in c.g., you'll land in c.g.," Rundle said.

The G280 cabin door is electro-hydraulically actuated, an upgrade from the G200's electrically driven cable and reel system. When open, the G280 door sits on the ground for maximum stability, protected by a Teflon pad where it contacts the surface.

Flying the G280

As is typical with a Gulfstream demo flight, our plan was for me to fly jumpseat for the first leg, in this case from the company's Savannah, Georgia, headquarters to Columbia Metropolitan Airport in South Carolina, then switch seats so I could fly the return trip. We briefed the flight, then Rundle and I walked around the G280 while he showed me some of its attributes.

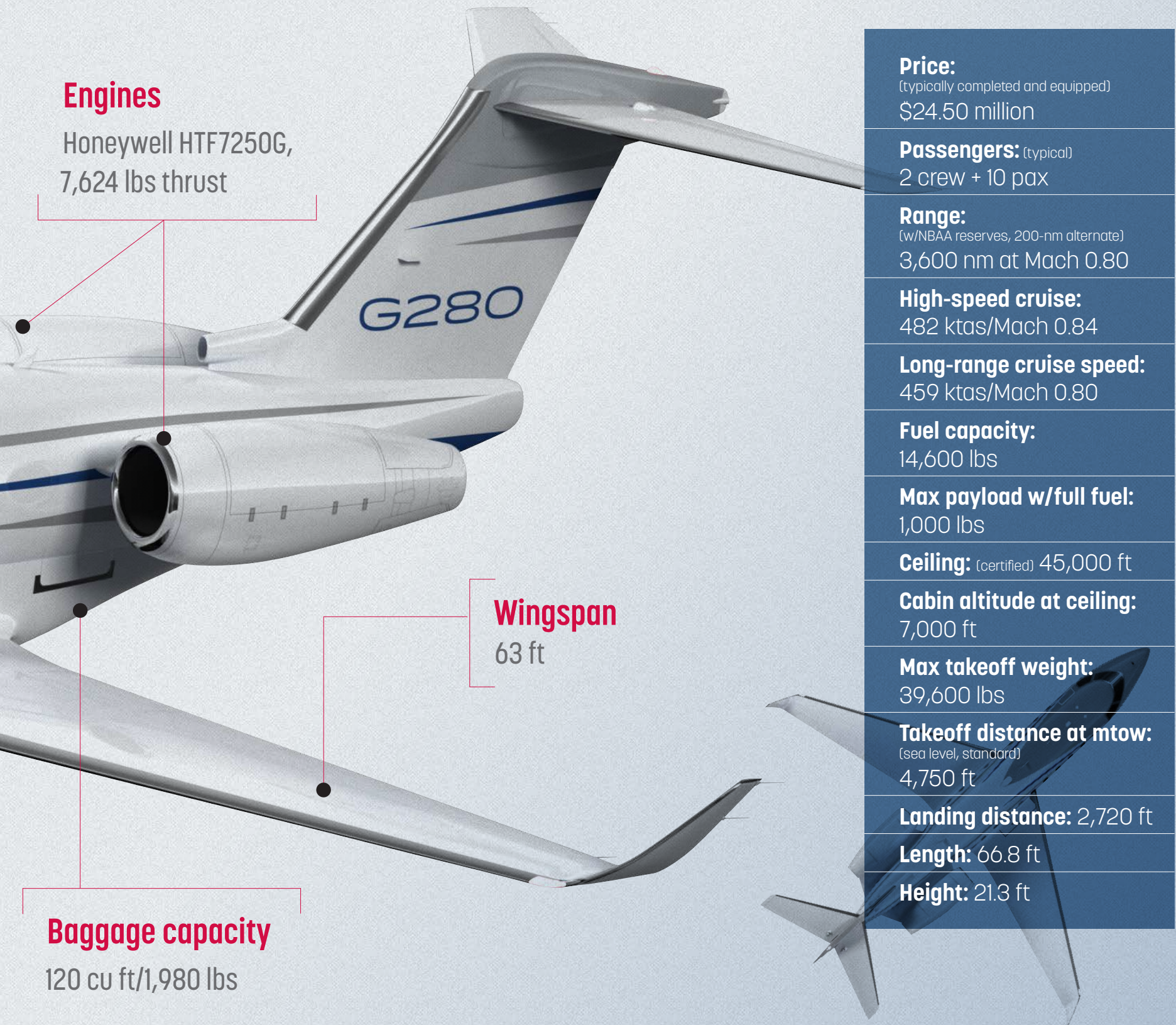
Rundle flew right seat and domestic captain Jeffrey Dyrhaug flew left seat for the leg to Columbia. It was a typical warm summer day in the southeast U.S., with thunderstorms popping and threatening to join up later in the afternoon.

The short flight to Columbia was smooth, and we didn't climb higher than 16,000 feet. Dyrhaug demonstrated the ease of landing the G280 with a gentle touchdown at Columbia, showing me how easily the nose drops after touching down and the smoothness of the carbon-ceramic brakes. We taxied to the ramp and stopped for the seat switch.

For the takeoff at Columbia, the G280's weight was 31,833 pounds. Outside temperature was a balmy 32 deg C. The FMS showed balanced field length required of 3,554 feet, and rotation speed was 117 knots, V2 127 knots. At this weight, according to the FMS, we would be able to climb directly to FL450.

To a person sitting in the cockpit, the G280 feels lower to the ramp compared with the larger Gulfstreams, and it is somewhat closer to the ground due to its trailing-link landing gear. Nosewheel steering (also electronic steer-by-wire) via the tiller was easy to operate smoothly; either I'm getting more used to tiller steering or the G280 just is more tolerant of a ham-fisted pilot, because we didn't experience any of the herky jerky motion that I imparted when I flew the G550. Rundle explained that it's better to use just the left thrust reverser to slow down while taxiing, to prevent exhaust smell from the right engine entering the cabin through the APU inlet.

I taxied to Runway 11 at Columbia, remembering what Rundle had warned me during the briefing: "This thing clearly



Engines

Honeywell HTF7250G, 7,624 lbs thrust

Wingspan

63 ft

Baggage capacity

120 cu ft/1,980 lbs

Price:
(typically completed and equipped)
$24.50 million

Passengers: (typical)
2 crew + 10 pax

Range:
(w/NBAA reserves, 200-nm alternate)
3,600 nm at Mach 0.80

High-speed cruise:
482 ktas/Mach 0.84

Long-range cruise speed:
459 ktas/Mach 0.80

Fuel capacity:
14,600 lbs

Max payload w/full fuel:
1,000 lbs

Ceiling: (certified) 45,000 ft

Cabin altitude at ceiling:
7,000 ft

Max takeoff weight:
39,600 lbs

Takeoff distance at mtow:
(sea level, standard)
4,750 ft

Landing distance: 2,720 ft

Length: 66.8 ft

Height: 21.3 ft

has a lot of power," he said, recalling a flight from Charlotte, North Carolina, where he was given an unrestricted climb at mid-weight and held V2 after liftoff, bursting through 10,000 feet by the time the G280 reached the end of the runway.

Airspeed built rapidly as I rotated, while I tried to bring the nose up smoothly and not pull too hard. The G280 responded promptly to my control inputs, and I was able to keep from pitching the nose too high as Rundle retracted the landing gear; then the flaps.

ATC wasn't able to give us an unrestricted climb, and we ended up leveling off briefly four times, but still made it to FL450 in just over 19 minutes. Temperature during the climb averaged about ISA +5 degrees C, and once at FL450 was about -5 degrees C. We climbed at 300 ktas after 10,000 feet then transitioned to a Mach 0.80 climb. At FL400, the G280 was still climbing rapidly, at 2,900 fpm.

Our route of flight took us north to Spartanburg, South Carolina, then northwest past Asheville, North Carolina, where we turned back and flew over Augusta, Georgia. While in cruise, I stepped out of the cockpit to assess the noise in the cabin, and with the acoustical curtain covering the main entry, the noise level was extraordinarily low. Both Rundle and Dyrhaug could easily hear me talking in a normal tone from the back of the cabin, as I could also hear them. Closing the pocket door at the forward bulkhead cut the noise even further. The door has a porthole so crew can look into the cabin without opening the door.

On the way back down, we stopped for a brief cruise performance check at FL410. Speed settled on Mach 0.82 (467 ktas), and the engines each were burning 900 pph.

After descending to a cleared block of airspace below 15,000 feet, I slowed the G280 to get a feel for slow-speed handling, then flew a steep turn. By this time, the thunderstorms were looming larger and generating some turbulence, which the G280 simply plowed through firmly with no effort needed on my part to mitigate any disturbances. In the distance, we could see the growing thunderstorm painting the Rockwell Collins MultiScan radar picture red.

We flew back to Savannah for the RNAV 28 approach, and I put the head-up display and autothrottles to work while hand-flying the final leg and down to a smooth touchdown in a 10-knot crosswind. The medium setting on the autobrakes brought the G280 to a firm and well-aligned stop, followed by an uneventful taxi to the Gulfstream ramp. ■

ALL PHOTOS: MARIANO ROSALES

Heli-Expo Preview

This month's event on pace to break records in Vegas

by Kerry Lynch

The Helicopter Association International's 2018 edition of Heli-Expo in Las Vegas (Feb. 26 - March 1) is shaping up to be another record-breaker with the floor nearly sold out by mid-January, association executives said. President and CEO Matt Zuccaro emphasizes that the final numbers will not be known until "we're sitting in Vegas"—early metrics such as registrations, floor space, and hotel rooms booked by mid-January were all pointing to a show that could surpass last year's tallies.

The 2017 Heli-Expo, held at the Kay Bailey Hutchison Convention Center in Dallas, Texas, drew 17,788 people, 731 exhibiting businesses and 62 aircraft on display. In addition, the entire available floor space was sold, spanning a Heli-Expo record of 322,800 net sq ft of exhibits and displays.

"We have some great benchmarking capability to give us an indication as to how the [2018] show is developing," Zuccaro said. "And right now it looks like we're tracking toward the largest exhibit floor that we've ever had."

Las Vegas has traditionally been a strong draw for conventions such as Heli-Expo, but Zuccaro believes that is only a small part of the growth. "All the comments we're receiving are extremely positive. The show on its own is creating a buzz," he said, adding the mood is upbeat, given the uptick in economic indicators.

"We've always looked at Heli-Expo as a bellwether to measure how the industry overall is doing. As the show produces the numbers—the participation and business activity on floor—it tells us in an indirect way how industry is doing," he said.

The show has expanded in various metrics in recent years, he believes, on the strength of the diversity of the industry. "When a particular element in the industry is having a difficult time, we have the ability to take those aircraft and those resources and staff to move them to other mission profiles and use them to their maximum capability," Zuccaro said.

He acknowledged the struggles of the oil-and-gas segment over the past several years. But this year, it looks as if it is on the verge of recovery, he said. "The price of oil is going up. The overall economic situation worldwide and in the U.S. over the last year has done quite well. We're just experiencing that."

In addition to the improving economy, the industry is gathering following one of the "greatest humanitarian challenges that we've ever seen in terms of earthquakes, fires, floods, and hurricanes," Zuccaro said, expressing pride in the industry's response. "The helicopter industry has responded to those in a phenomenal manner. It was a real highlight over the last year. People were in awe of what we did."

Safety Education

Heli-Expo will serve as a venue to recognize some of those involved in responses and continue to highlight the value the industry overall provides to society, he said. But at the same time it will serve as a venue to review lessons learned. The activities will be reviewed in various meetings to discuss how the industry can become even more effective, Zuccaro said. "We always try to take advantage [of events] as learning experiences and improve our efficiencies."

The Helicopter Foundation International (HFI) is bringing back the Rotorcraft Safety Challenge events hosted every year at Heli-Expo. The challenge, involving dozens of topic-specific safety forums that provide opportunities for certification credit, is always a top draw, and events are often standing-room only, he said. In Dallas, 1,500 attendees participated in 62 Rotor Safety Challenge sessions.

The safety sessions will include discussions both from the operator's and the pilot's standpoint on the HFI "Land and Live" program. Launched during the 2014 Heli-Expo, the program is designed to train operators to "land the damn helicopter" when they encounter problems, Zuccaro said. "We can land helicopters anywhere and we do it every day. You name it and we put helicopters there and we're really good at it," he said. "But when we fly in deteriorating weather, encounter low fuel, or run into maintenance issues, we don't land the helicopter. In this day and age, we are still running out of fuel. That's a classic example of bad decision-making."

> **"... we're tracking toward the largest exhibit floor that we've ever had."**
>
> – HAI president and CEO Matt Zuccaro

There is no cost to following a protocol to landing the helicopter, he said, but it can save lives. Zuccaro was pleased that the program has begun to take root with a number of operators subscribing to the practice. He noted the response he's gotten from operators, including one email from an emergency medical services pilot who thanked him, saying he chose to land the helicopter, adding he was convinced that had he kept flying, it would have had fatal consequences to all aboard.

The program is part of a cultural shift that Zuccaro believes needs to take place and is part of what gets highlighted at Heli-Expo. "Safety has all kinds of elements: there's regulation, there's technology, there's policies and procedures like safety management systems, there's accreditations and there's training. All those are critical to achieve our safety goals. But the most critical thing that is going to get us over the line is a cultural change. It's a philosophical change."

Regulatory Issues

Beyond safety, a host of other operational, regulatory, and political issues will be discussed through committee meetings and other sessions and forums. These cover nearly every aspect of the varied helicopter operations, Zuccaro said. One of the foremost issues is the effort to separate the air traffic organization from the FAA. HAI is aligned with the general aviation community in opposition to that effort, he said, noting the association has grave concerns about such a prospect.

Also industry and regulators are expected to discuss the potential of a rewrite of some of the Part 27 and Part 29 regulations governing helicopter certification to incorporate some of the risk-based and consensus standards approaches recently adopted for Part 23 general aviation aircraft certification rules. An informal committee has been reviewing Parts 27 and 29 certification procedures, but Zuccaro is hoping that this year's Heli-Expo can serve as a "benchmark to get to the next step" with a more formal approach, such as an Aviation Rulemaking Committee.

Another potential issue facing the industry as it gathers for Heli-Expo is ADS-B equipage. Zuccaro expressed concern about a "crunch" for helicopter operator equipage as the 2020 deadline approaches, with shop space anticipated to become limited.

Helicopter operators were among the earliest of adopters, he said, referring to the work of the alliance of Gulf of Mexico operators involved in the Helicopter Safety Advisory Conference. Thanks to that coalition, more than $100 million in services and equipment were installed and operators now have ADS-B benefits with real-time weather and communications down to the rigs, he said. That effort has produced results, Zuccaro said, noting 2016 data shows that members of the HSAC did not have an accident of the Gulf of Mexico. He would like to see that further adopted throughout the industry.

HAI's next effort, he said. is to implement lower-level IFR dedicated routing and approaches in the air ambulance environment. Individual operators and hospitals have established their own approaches, but the program would take it to the next level, he said. The technology already exists to take Helicopter TAWS and terrain and obstacle data and overlay that with FAA data, providing the possibility to be able to pull up instrument approaches at accident scenes. The possibility is under study with the FAA and NASA.

In addition to discussion about safety and other issues, Heli-Expo will have an increased focus on maintenance and maintenance technicians. "We want to make sure we give the same attention to the maintenance side, which is absolutely

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Heli-Expo 2018 could see more than the 62 static aircraft that appeared at last year's show.

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Leadership changes and ATC debate

organization, in early January announced his decision not to run for re-election in November, saying, "It has been one of my life's greatest honors to serve and represent the citizens of the Ninth District for 17 years. It has also been a tremendous privilege to have been selected by my congressional colleagues to be chairman of the Transportation and Infrastructure Committee for the last five years."

However, he said that rather than focus on re-election, he wants to focus on working to pass "a much needed infrastructure bill to rebuild America," and added, "we have much still to do."

While his statement focused on an infrastructure package, the T&I Committee maintained that both infrastructure and the pending FAA reauthorization bill remain major priorities, and Shuster intends to move on both fronts. "The chairman will be 100 percent focused on working with his colleagues and the administration to get these initiatives over the goal line," the committee stated.

Shuster will depart Congress as he is set to relinquish the reins of the T&I Committee at the end of the year. He is facing a term-limit for number of years he could serve at the helm of the committee. One of his first actions after taking control of the committee was to quickly push through the last FAA reauthorization bill, the FAA Modernization and Reform Act of 2012, which was enacted within his first month as chairman.

The ATC proposal had become the centerpiece of the most recent House FAA reauthorization proposal, H.R.2997, the 21st Century AIRR Act, but also has been the main stumbling block to progress on that bill. Shuster has been a fierce proponent of the bill, engaging in a major push that included old-fashioned horse-trading and grass roots lobbying, to win votes. He has come as close as any other previous lawmaker to getting the ATC proposal through the House.

But his decision to step down at the end of the year has quietly raised questions on whether his focus will need to shift more to infrastructure, given persistent opposition in the Senate to the ATC proposal, in addition to a lack of Democratic support in the House. Also a massive infrastructure proposal, if successful, could also position his colleagues for success in an upcoming election.

FAA on ATC Organization Plan

Many opponents to a new ATC organization were hopeful that, if unsuccessful this year, the push for the proposal would quiet. But the changeover at the helm of the FAA could strengthen that push this year and continue it well beyond Shuster's retirement.

Transportation Secretary Elaine Chao in January announced that Elwell, who had been deputy administrator, would step into the position on an acting basis as Michael Huerta's five-year term as administrator ended.

Elwell brings a deep knowledge of both the aviation industry and government workings to his new role. He also brings a long background of pushing for ATC reorganization and has advocated user fees for business aviation

"Dan's background as a military and commercial pilot and past leadership positions in FAA and the aviation sector ensure a seamless transition to continue the important mission of the FAA," Chao said.

A former airline executive with industry, government, and association experience, he returned to the FAA as deputy administrator last summer, after originally serving as assistant administrator for aviation policy, planning, and environment from 2006 to 2008.

Before rejoining the agency, Elwell had been president and managing partner of his own consulting firm, Elwell & Associates, and involved with the Trump administration on issues such as the independent air traffic control organization proposal.

He has also served as senior v-p for safety, security, and operations for Airlines for America, as well as managing director, international and government affairs for American Airlines. And he was in the manufacturing sector as vice president of the Aerospace Industries Association.

Further, Elwell has served in the U.S. Air Force, and has collectively amassed 6,000 hours of military and civilian time as a pilot.

Elwell's knowledge has drawn praise. National Air Traffic Controllers Association (NATCA) president Paul Rinaldi agreed that his selection would ensure a seamless transition. "Dan has brought to his roles at the FAA a tremendous wealth of experience in aviation, first as a military and commercial pilot, then as a devoted advocate for aviation safety in government and in the private sector," Rinaldi added.

"NBAA has always had a good relationship with the FAA's leadership, and we will continue that relationship with the new acting administrator," added NBAA president and CEO Bolen, noting that the association has worked closely with Elwell in his various capacities for a long time.

But Elwell in the past has been at odds with the business aviation community not only over the organization of the ATC system, but also how users contribute to the system.

In 2007, while assistant administrator for the FAA, Elwell testified before Congress about how the passenger in the middle seat of a crowed airline flight "is subsidizing the corporate CEO flying in the company jet and, yes, the general aviation pilot flying his Cessna as well" and cited statistics—disputed by NBAA—that commercial aviation "foots 95 percent of the bill" and general aviation pays just 3 percent. "This inequity becomes all the more glaring as our airspace braces for one billion passengers in 2015," he said.

Following a hearing on ATC reform in the House, he noted that a question was raised about whether the U.S. has the best governance and funding structure in place to deliver the most efficient, modern ATC system while ensuring safety. "Good question," he said, and added, "The answer is no. And because the U.S. doesn't have the best governance and funding structure for its ATC system, it risks ceding its 100-year title as the global gold standard in air traffic services." More recently, Elwell played a role on the White House transition team and met with industry leaders, discussing the need for reform of the ATC organization.

He now has the role of managing that system that he questioned and advocated for change.

While Elwell has been on the opposite side of the ATC issue, General Aviation Manufacturers Association president and CEO Pete Bunce called him a friend, who is not only a military and commercial aviator, but also now in business jets. Elwell recently was type rated in a Citation, Bunce noted. "We have a philosophical disagreement on ATC privatization, but then again, we have this disagreement with Secretary Chao and the White House," Bunce said. "Decisions pertaining to this issue will be made by Congress, so Dan's views on privatization are just one of many. This philosophical difference, in my opinion, is greatly outweighed by his aviation experience, passion for NextGen, expertise within industry and knowledge about how Washington and the FAA works. Dan is a good guy."

While Elwell has the job on an acting basis, it is uncertain how long he will be in that role. Serving as the acting administrator does not automatically mean he will be nominated in that role on a permanent basis. But he could serve indefinitely.

Given his background, he would be among the strongest candidates for the job permanently, if nominated. Few other names have surfaced in the Washington rumor mill. In fact one of the only other names that has been discussed as a possible nominee is President Donald Trump's personal pilot John Dunkin. ■

Huerta's tenure ends

Michael Huerta last month completed his five-year term as the U.S. FAA administrator, leaving the agency in early January. He departed following a more-than-seven-year run with the agency, beginning in June 2010 as deputy administrator, then acting administrator in December 2011 and ultimately as administrator beginning in 2013. Industry leaders praised Huerta's efforts to build consensus and forward safety during his tenure.

"Michael has been a steady leader at the FAA during a time of significant change," said NBAA president and CEO Ed Bolen. "Under his stewardship, the agency has shown demonstrable progress in implementing NextGen, to ensure America's continued global leadership in aviation; in rewriting Part 23 certification standards, to ensure the safety and affordability of small aircraft; and laying the groundwork for the safe introduction of unmanned aircraft into the National Airspace System. These important priorities will be among the pillars of his legacy."

Bolen further highlighted his role in aviation safety through government/industry collaboration, backing efforts such as the "Compliance Philosophy" that emphasizes correction of unintentional violations rather than enforcement.

"A hallmark of this tenure was his commitment to building consensus around major decisions and willingness to always listen to the needs of the aviation business community, most recently demonstrated by his support of initiatives related to regulatory consistency and a compliance philosophy that emphasizes making the world's safest system even safer," agreed National Air Transportation Association president Martin Hiller.

The National Air Traffic Controllers Association also credited Huerta for enhancing the collaboration between the controllers' union and the agency, and as a result, benefiting from modernization efforts, improving working conditions, and enhancing safety overall.

The departure of Huerta resulted in a few other personnel changes, including the naming of deputy administrator Dan Elwell as acting administrator. Filling in for Elwell at the deputy's post in an acting capacity is Carl Burleson, who has been FAA deputy assistant administrator for policy, international, and environment. In addition, Tina Amereihm, FAA deputy assistant administrator for information and technology, was named the FAA chief of staff. **K.L.**

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Heli-Expo Preview

critical to operations," he said. Among other activities, the show will include an inspection authorization renewal program for technicians.

Along with technician development will be partnerships with local high schools, technical schools, and colleges to provide orientation sessions for students interested in entering the industry. In addition, Heli-Expo will continue to host a clinic that is designed to help transition military veterans to the civilian service side. That session also tends to be standing room only, Zuccaro said.

The educational efforts are particularly important as the rotorcraft industry worries about pilot and technician shortages. HAI is expecting to unveil the results of a workforce study during Heli-Expo. Conducted by the University of North Dakota, the study will explore future requirements for pilots and technicians and the anticipated potential supply coming into the industry. "We have a shortage, and it is getting worse," Zuccaro said. HAI will discuss steps it can take with industry, government, the military, and schools to alleviate the problem. ■

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U.S. company rekindles search for MH370 wreckage

by Chris Pocock

In an unusual "payment by results" contract, the Malaysian government has turned to a young American company that specializes in high-tech seabed exploration to resume the search for Malaysia Airlines Flight MH370 starting January 21. The contract calls for Ocean Infinity to earn up to $70 million, depending on the size of the area that it searches. The Malaysian Airlines Boeing 777 vanished March 8, 2014, while flying from Kuala Lumpur to Beijing with 239 people on board.

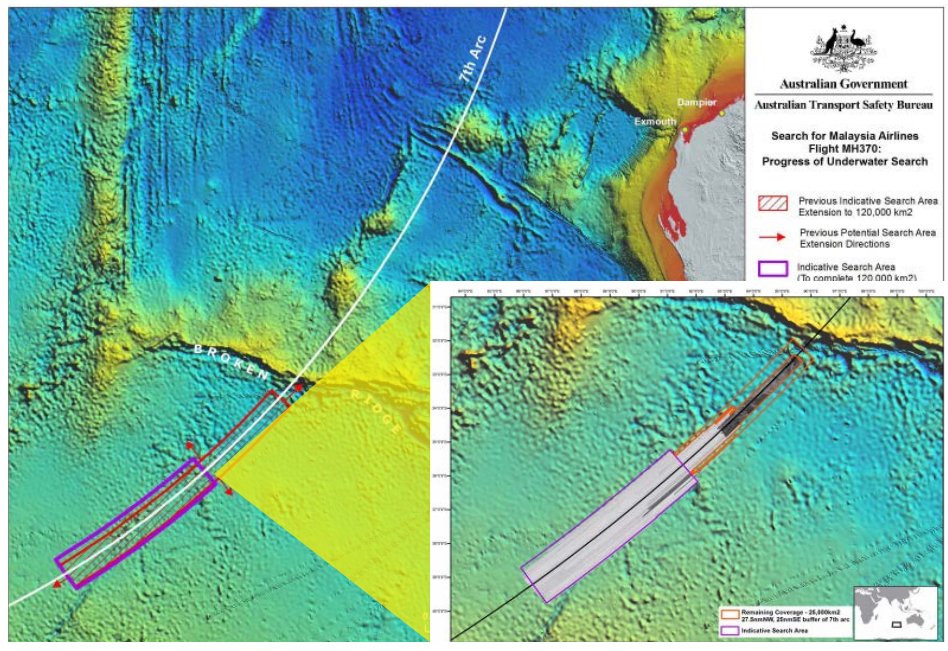
Ocean Infinity plans to begin its search in a 9,600-sq-mi area determined by additional research sponsored by the Australian Transportation Safety Board (ATSB). The search will occur farther north and wider than the two-year search of 46,300 sq mi that ended in January 2017. If Ocean Infinity does not find the debris field in that area, it will continue searching northeast along the so-called seventh arc, in the Indian Ocean off western Australia. The aircraft likely ran out of fuel along that arc, where the last "handshake" occurred between the airliner and an Inmarsat ground station in Perth, via its satellite over the Indian Ocean. All other contact with MH370 had ceased hours earlier.

Plans call for Ocean Infinity to concurrently deploy up to eight multi-sensor, untethered autonomous underwater vehicles (AUVs) made by Kongsberg Marine, from a host ship leased from Norwegian company Swire Seabed. Unmanned surface vessels (USVs) also play a part in the operation. The AUVs will search 460 sq mi per day at depths up to nearly 20,000 feet, or 10 times the rate achieved by the previous search and nearly 5,000 feet deeper. "Whilst there can be no guarantees of locating the aircraft, we believe our system of multiple autonomous vehicles working simultaneously is well suited to the task at hand," said Oliver Plunkett, CEO of Ocean Infinity.

Don Thompson, a member of The Independent Group of volunteer engineers and scientists who have advised the authorities investigating the disappearance, said he thinks that the new search has "at least a 70 percent chance" of finding the wreckage of MH370. The chances increase the farther north that the search extends, he told **AIN**.

The ATSB has concluded that the Boeing 777 made a steep final descent toward the ocean, although it still hasn't determined whether or not it broke up before impact. So far authorities have recovered 27 pieces of aircraft wreckage from beaches in East Africa, La Reunion, Madagascar, and Mauritius, most of which likely came from MH370, including the right flaperon and the immediately adjacent section of the outboard flap.

The ATSB has worked with oceanographers who performed drift analysis, and geospatial analysts who examined satellite imagery of possible wreckage on the ocean surface, to help define the new search area. But continuing doubt about when, and where exactly over the Andaman Sea, the airliner made its final turn towards the Indian Ocean, means that there is still no guarantee of success. If the turn happened later, then the wreckage of MH370 could lie on the seabed farther north along the seventh arc. ■



The search area for MH370 is in the Indian Ocean off western Australia, along the seventh arc. The light and dark gray shading in the closeup map shows the areas previously searched. The outer orange-lined box shows the area that is now being searched.

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New rotorcraft 2018

Stagnating civil market begins to show signs of a return to life

by Mark Huber

Oil topped $60 per barrel at the end of last year, a harbinger of optimism for new rotorcraft sales. Growing geopolitical uncertainty combined with OPEC crude oil production cuts should send the price of oil and gas climbing further this year, benefiting the leading offshore operators as that sector consolidates and rebounds. However, expect to see more offshore activity in Austral-Asia and a growing shift from heavies to super-mediums to service that market, a development that bodes well for Airbus, Bell, and Leonardo—companies with available or soon-to-be available new models in that sector. Those models also will benefit from the global trend to privatize helicopter search-and-rescue operations.

What oil couldn't do for market optimism, Mother Nature did, lashing the Continental United States and the Caribbean with an unprecedented array of hurricanes, floods, and fires, reminding everyone with access to a video screen that, in times of disaster, there is no substitute for a helicopter commanded by a competent crew. Concurrent with these unfortunate events, new helicopter orders and deliveries, while not surging, showed marked improvement. Data released by the General Aviation Manufacturers Association (GAMA) revealed, that for the first three quarters of 2017, shipments of piston helicopters increased by 13.1 percent with 190 delivered in the first three quarters, while turbines rose by 5.6 percent, to 471. Rotorcraft billings increased 8.8 percent, to $2.7 billion.

In that quarter, Textron's Bell Helicopter reported a 13.1 percent operating margin on the delivery of 39 commercial helicopters, up from 25 in the same period last year. The deliveries include five 412s and the start of 407GXP deliveries to China's Shaanxi Energy Group as part of a 100-ship order. Largely on the strength of increased commercial deliveries, revenues at Bell were up $78 million in the quarter and segment profit increased by $9 million from a year ago. However, backlog slid to $5 billion, down by $413 million from late June. Textron chairman and CEO Scott Donnelly said the increased civil orders were broad-based, both from a sector and geographic perspective, "which is good frankly." He added, "I think the overall market is still weaker than it has been in previous times, but it's much better than it was couple of years ago."

Airbus Helicopters posted mostly good news throughout the year, starting with a strong first quarter that saw new orders surge. Overall first-quarter helicopter orders at the company climbed 41 percent year-over-year, to $1.55 billion and civil helicopter deliveries increased to 78 in the quarter, up from 56 in the same period last year. For the first nine months of the year net helicopter orders totaled 210 units, including 14 super-medium H175s in the third quarter. Airbus Helicopters' revenues were slightly higher with deliveries of 266 units; however, earnings before interest and taxes fell sharply as the result of continuing blowback from the post-crash grounding of Airbus H225 heavies in 2016. Airbus continues to hold its share of the North American civil market at 50 percent and is making a new push into the corporate sector, last year unveiling Airbus Corporate Helicopters (ACH), a unit that will be dedicated to its private and business aviation customers. The new organization will provide concierge-style end-to-end support, from purchase, through training, ownership and even possibly resale.

Likewise orders grew by 11.2 percent in the first nine months of the year for Leonardo Helicopters.

Overall, the civil helicopter market should continue to experience modest growth this year, led by demand for light singles and regional strength outside North America in Europe and Asia. Honeywell's helicopter forecast pegged demand for light singles at 58 percent of total units over the next four years, while demand for light twins shifts to medium twins and super-mediums. While virtually all new helicopter programs have experienced development delays, there is no shortage of new product in the pipeline, primed and ready for an ascending market.

Piston Singles

Enstrom TH180

The company announced the TH180 in 2014 and plans to use the type certificate basis and rotor system of the larger three-seat 280FX to speed development. The TH180 will be powered by a 210-hp Lycoming HIO-390 piston engine and feature an engine governor and electric clutch switch, robust landing gear and a useful load of 700 pounds, a maximum gross weight of around 2,250 pounds, including a standard 40-gallon fuel capacity. Target price is less than $400,000. Company officials said the TH180 should post direct operating costs of around $175 per hour and burn less than 12 gallons per hour. Enstrom's modernized Menominee, Michigan production plant has the capacity to build 100 TH180s per year. Last year, Enstrom announced that a second TH-180 prototype had joined the certification test program and that it was closing in on FAA certification.

Cicare Model 12

Argentine kit helicopter maker Cicare plans to enter the certified market with a variant of its Model 12 two-seater within three years. The Model 12 kit currently sells for $189,000. It is powered by a Lycoming HIO-360G1A four-cylinder engine that delivers 180 hp; empty weight is 948 pounds and mtow is 1,543 pounds; cruise speed is 89 knots with a Vne of 110 knots. The Model 12 has a two-blade composite main rotor system lifted on condition, monocoque cabin construction and tube skid gear, and a cabin that includes a T-bar cyclic, bullet-shaped instrument cluster, and toggle switches. It is stylistically similar to the smaller 992-pound mtow, 130-hp, 80-knot Model 8, which already has been certified under ULM rules in Europe and Argentina.

Turbine Singles

Bell 505 Jet Ranger X

Bell Helicopter received type certificate approval from Transport Canada for its new five-seat Model 505 Jet Ranger X light single in late 2016 with FAA approval following in June 2017 and EASA approval in November. Customer deliveries are under way worldwide.

Bell unveiled the 505 in 2013. The helicopter is powered by a 504-shp Safran Arrius 2R turboshaft with dual-channel Fadec (3,000-hour TBO) and features the Garmin G1000H avionics suite. In March, Safran detailed plans to offer 505 customers support-by-the-hour maintenance coverage in cooperation with Bell's Customer Advantage Plan, with no minimum annual flight-hour requirement, for approximately $300 per flight hour. Bell used much of the main rotor system of the Bell 206L4 LongRanger in the new single, reducing development time and costs.

The 505 will have a maximum cruise speed of 125 ktas, a maximum range of 340 nm, a useful load of 1,470 pounds, a wide-opening double-door, and an open layout with flat cabin floor and 61 cu ft of rear cabin volume for passengers or cargo. Initial price of the base aircraft was set

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Enstrom TH180


Bell 505 Jet Ranger X

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New rotorcraft 2018

at $1.017 million with typically equipped models costing $1.2 to $1.4 million. Bell currently holds letters of intent for more than 400 Jet Ranger Xs.

The company plans to offer a number of kits for the 505, some of which are very mature in certification testing, for a variety of executive, utility, and law enforcement missions. Additionally, the Mecaer Aviation Group (MAG) is developing a high-end VIP interior it says will feature multiple storage consoles and "trim options" to create "an added level of comfort and technology that is unique for each customer." In early 2016, United Rotorcraft unveiled an EMS interior for the 505. The simple quick-change system weighs less than 60 pounds and uses existing aircraft hard points.

Leonardo AW009

Leonardo's AW009 light single, the rebranded SW-4, was originally developed by Polish airframer PZL-Swidnik beginning in 1981. The design first flew in 1996 and has undergone several refinements since Leonardo acquired a majority stake in the company in 2009. Recent improvements include new Genesys avionics, an improved hydraulics system and a mass vibration absorber for a smoother ride. The standard 113-knot 009 is powered by the Rolls-Royce 250-C20R/2 and has an mtow of 3,968 pounds. AAL USA in Huntsville, Alabama, has been subcontracted to provide the avionics and integration of the powerful Rolls Royce -C30P engine into the helicopter.

While a firm price for the helicopter has not been set, Leonardo executives said it would be in the $1.2 to $1.5 million range. The aircraft will be built in Poland and shipped to the U.S., with completions and deliveries out of AAL Huntsville.

Innova/Composite Helicopters C630

Last February, Innova Composite helicopters filed for liquidation in New Zealand. Attempts to contact the company to inquire about the program's current status have been unsuccessful. The company's bankruptcy auction included two prototype fuselages and various production machinery.

Composite Helicopters claimed its rotorcraft is the first with a full monocoque fuselage fabricated entirely from rigid composite materials. U.S.-based Innova Aerospace had been looking to fly a fully conforming prototype of the Composite Helicopters C630 five-place light single powered by a production Rolls-Royce RR300 turboshaft in 2016. The helicopter was to be one of two used in a parallel certification program with the New Zealand CAA and the U.S. FAA with the target of achieving full certification this year. Privately held Innova said it had adequately capitalized the program to see it through certification and initial production in New Zealand. Innova acquired the intellectual property rights to the program in 2015.

Preliminary specifications for the carbon-fiber rotorcraft include a cruise speed of 125 knots, a range of 450 nm (no reserve) and 1,350 pounds of payload.

MD Helicopters 6XX

The large 5,500-pound single is slated to be powered by an upgraded Rolls-Royce C47 E3 and could be certified by year end. Specifications call for a maximum speed of 160 knots, with a range of 500 nm and a 20,000-foot ceiling. It will feature a Genesys Aerosystems flight deck, MacroBlue tactical displays, mission management system from TekFusion Global, all-new S411 main rotor blades from HTC, a four-blade tail rotor, boosted flight controls, and digital three-axis autopilot. The 6XX will share a cockpit with the company's latest generation 530G.

Marenco Swisshelicopter SKYe SH09

Marenco unveiled the $3.5 million SKYe SH09 single-turbine utility helicopter in 2009, but the program has experienced delays and schedule slippages. The first prototype did not take flight until 2014. Flight-testing was halted while the main rotorhead and rotor blades were redesigned and fitted to the second prototype, which then took flight in February 2016.


Russian Helicopters VRT500

Meanwhile, the certification timetable has slipped from 2016 to 2018. A third prototype (P3) was rolled out in June 2017 and began test flying shortly thereafter. Plans call for a P4 aircraft to be added to the test fleet early this year, and the company is still aiming for 2018 certification and 2019 deliveries. Currently, the company holds "more than 100" international purchasing commitments.

The SH09 features all-composite construction, a flat-floor cabin, and rear clamshell doors. It is a large single designed to carry one pilot and up to seven passengers. Power comes from a single Honeywell HTS900-2 turbine with Fadec. The SH09 also will be equipped with the Honeywell HUMS, enabling operators to continuously monitor mechanical rotating components and subsystems and become aware of potential problems before they occur. Other features include a five-blade bearingless main rotor system and a shrouded tail rotor. Performance targets include a 5,842-pound mtow, 140-knot cruise speed, and 430 nm range.

Russian Helicopters VRT500

Russian Helicopters unveiled a mock-up of the long-awaited VRT500 new light civil utility single in late July. Developed by Russian Helicopters subsidiary VR-Technologies, the coaxial design features two three-blade main rotors with shaped carbon-fiber blades to reduce noise, extensive composite construction, glass-panel avionics, and sliding rear-cabin doors. Plans call for its turboshaft engine to be Western-sourced, possibly from Safran. The five-seat helicopter is intended to compete with the Bell 505 and the Robinson R66.

Russian Helicopters plans to market it in the U.S. and Europe and pursue EASA and FAA certification, with serial production projected for 2020 or 2021. The Russian manufacturer indicated it will develop the VRT500 with unidentified European partners.

Preliminary specifications call for the VRT500 to have a maximum takeoff weight of 3,527 pounds, a payload of 1,600 pounds, a cruise speed of 124 knots, a service ceiling of 20,000 feet and a maximum range of 410 nm. Russia's past efforts to develop an indigenous light single have fallen flat for lack of expertise and resources and differing national priorities.

Kaman K-Max (K-1200)

Kaman delivered its first new-production K-Max single-seat, single-engine K-Max utility external-lift helicopter in June. Powered by a single Honeywell T53-17 (flat-rated 1,500 shp) and characterized by its intermeshing, dual main rotors, the K-Max found favor with commercial operators,


MD Helicopters 6XX


Marenco Swisshelicopter SKYe SH09


Kaman K-Max (K-1200)

Airbus H160

notably in the logging industry, in no small part because it can lift more than its own empty weight (6,000 pounds versus 5,145 pounds). The company previously built 38 before shutting the line in 2003.

The U.S. Marine Corps and Lockheed Martin operated two unmanned K-Maxes in Afghanistan on an extended trial. These aircraft successfully supported the U.S. Marine Corps in Afghanistan from 2011-2014 carrying more than 4.5 million pounds of cargo. That demonstration helped to rekindle interest in the helicopter, and two years ago Kaman announced that it would restart production. Kaman intends to keep its new K-Max production line open through at least 2019.

Kaman builds K-Max airframes in Jacksonville, Florida, and installs systems and wiring at its final assembly and flight-test facility in Bloomfield, Connecticut.

Additional unmanned firefighting and humanitarian missions for K-Max are also being developed and tested. During a demonstration in 2014, an unmanned K-Max lifted and dropped more than 24,000 pounds of water onto a target fire in an hour.

Twins

Leonardo AW109 Trekker

Leonardo's AW Trekker light twin received EASA certification on December 26 with deliveries set to begin in the first quarter of 2018. The Trekker is a skidded version of the company's AW109S Grand/GrandNew and features advanced single-pilot IFR Genesys Aerosystems avionics and a pair of Fadec-equipped, 815-shp Pratt & Whitney Canada PW207C engines that deliver a maximum speed of 168 knots. The Trekker has a maximum takeoff weight of 7,000 pounds and an endurance of four hours, 20 minutes or 445 nm with a modular, five-cell fuel system.

The helicopter is aimed primarily at the EMS and utility markets. The cabin can accommodate up to six passengers or one stretcher with three to four medical attendants or two stretchers with two medical attendants. The aircraft features a cocoon-type airframe, a crash-resistant fuel system, Cat. A/Class 1 performance in hot/high environments, and a 30-minute "run-dry" main gearbox. Available equipment includes cargo hook, external rescue hoist, searchlight, external loudspeakers, FLIR camera, video downlink, snow skis, and emergency floats. Leonardo holds orders for 40 of the helicopters.

MD Helicopters MD969

This updated version of the 902 Notar-equipped light twin is slated to feature a Genesys Aerosystems glass cockpit, four-axis autopilot, more power for the Notar (no tail rotor) anti-torque system and upgraded Pratt & Whitney Canada engines.

Avicopter AC312e

The Aviation Industry Corporation of China (Avic) began flight-testing its new AC312e light-medium twin helicopter in 2016 and is aiming to have it certified this year. This new model is derived from the previous "A" model, itself a descendant of the Harbin Z-9, which was based on the Airbus Helicopters AS365 and manufactured in China under license since the early 1980s and in service since the early 1990s. A substantially upgraded model featuring Arriel 2C engines was introduced in 2002. Cumulatively, Avic has produced more than 200 Z-9s.

According to Avic, the 312e will feature improved high/hot performance thanks to a pair of Safran Helicopter Engine Arriel 2E engines (1,000 shp each) and Rockwell Collins Pro Line 21 avionics to support growth for synthetic vision, helicopter TAWS and EFB. Options also include the RTA-4112 MultiScan weather radar and the TTR-4100 TCAS II traffic surveillance system. The 312e will be able to carry nine passengers, have a maximum cruise speed of 165 knots, a maximum takeoff weight of 9,921 pounds/4,500 kg and a service ceiling of 19,685 feet.

Russian Helicopters Ka-62

More than a year after it performed its first hover, Russian Helicopters's Kamov Ka-62 medium twin made a limited test flight—a 15-minute orbit—on May 25 at speeds up to 60 knots from the Progress test facility at Arsenyev. Since the helicopter first hovered on April 28, 2016, Russian Helicopters said the Ka-62 has been "gradually" subjected to increased systems and equipment testing as it prepares for certification testing on the ground and in the air. The company said "several" Ka-62 test aircraft have been produced. Announced in 1992, the program has been beset by multiyear delays.

The Ka-62 is expected to cost in the $10 million range, seat 12 to 15 and be aimed primarily at the offshore energy and search-and-rescue markets. Russian defense and law enforcement agencies appear to be early customers for the model.

The 14,000- to 15,000-pound-mtow helicopter features a hybrid airframe that is 60 percent polymer composite by weight; a ducted tailrotor; five-blade main rotor system; twin hydraulics systems; and bird-resistant windshield. Power comes from a pair of 1,680-shp (max continuous) Safran Ardiden 3G engines. The avionics were developed locally by Russia's Transas. Initial performance targets include a 156-knot cruising speed a maximum range of 389 nm or 613 nm with auxiliary tanks. Announced launch customers outside Russia include Atlas Taxi Aereo in Brazil and Vertical de Aviacion in Colombia.

Harbin Z-20

This medium twin is basically a Chinese copy of the Sikorsky S-70 with fly-by-wire flight controls, a five-blade main rotor system, and slightly more powerful Chinese WZ-10 turboshaft engines (2,145 shp). First flight occurred in 2013 and the program remains in development. The Z-20 is said to have slightly more cabin space and range than the S-70. The People's Liberation Army Air Force (PLAAF) could place Z-20s into operation by year-end.

Avicopter AC352

The Avicopter AC352 remains in flight test with the goal of CAAC certification by the end of 2018. The AC352 is the Chinese-manufactured version of the super-medium Airbus Helicopters H175. The H175 was jointly developed by Airbus Helicopters and Avicopter, with Avicopter responsible for manufacturing the fuselage and certain subassemblies.

The H175 is powered by a pair of Pratt & Whitney Canada PT6C-67Es and was certified in 2014. The AC352 can be sold only in China and a small number of countries close to China where Airbus would be unlikely to sell any H175s. The AC352 is powered by a pair of WZ16 engines, the Chinese variant of the Safran Ardiden 3C.

Safran said the new-generation 1,500- to 2,000-shp turboshaft features compact modular architecture, a best-in-class power-to-weight ratio, low cost of ownership, and 10 percent lower fuel consumption than competitive engines. The new engine was a joint development and production project by Safran Helicopter Engines, CAPI and Dongan, parts of the new Aero Engine Corporation of China consortium.

Airbus H160

The H160's schedule has slipped to the right, with first deliveries now scheduled for 2019. Airbus executives blamed the delay on the need to redesign unspecified "mechanical parts." The third flight-test aircraft made its first flight in October.

Airbus Helicopters unveiled the all-composite H160 medium twin in 2015. The successor to the AS365/EC155, it is targeted at the market segment currently served by the Leonardo AW139. Airbus estimates the H160 will have a fuel-burn advantage of 15 to 20 percent over the AW139. The Safran Arrano engines are 10 to 15 percent more efficient than previous-generation engines and feature a two-stage centrifugal compressor associated with variable inlet guided vanes reducing specific fuel consumption at all flight phases, particularly at cruise power.

The H160 features Blue Edge main rotor blades for quieter operation, a canted Fenestron tail rotor for increased payload and the house-developed Helionix avionics suite that can be found on other newer Airbus models. The Helionix flight deck is similar to that of the H175, using four six-by-eight-inch displays.

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New rotorcraft 2018

Other innovations include a full composite airframe, a biplane stabilizer—for improved main rotor efficiency—and an electric landing gear.

For the offshore oil-and-gas mission, the H160 will offer Class 1 takeoff performance for 12 passengers and a 120-nm radius of action with an mtow of 12,566 pounds. Other performance goals include maintaining hover out of ground effect at up to 5,000 feet; and 450 nm of range with a 20-minute reserve. The smooth cruise speed will be 160 knots, without any counter-vibration system. A de-icing system is not planned yet, although provisions have been made. The H160 will pioneer a brand new assembly model at Airbus Helicopters that will enable manufacture in just 18 weeks. Each H160 will consist of just five major component assemblies that are fully completed and tested before they reach the final assembly line.

Bell 525

Bell resumed test flying the 525 in July and plans to certify its super-medium 525 Relentless twin using four test aircraft. The flying part of the test program had been stood down since the fatal crash of the first prototype, FTV1, registered as N525TA, on July 6, 2016. The NTSB recently completed its investigation as to why the main rotor blades struck both the tailboom and the nose during the in-flight break-up sequence that destroyed the helicopter and killed both test pilots. (*See article on page 14.*) FTV1 was one of three 525 prototypes in the flight-test program, which at the time was budgeted for five aircraft.

Bell is continuing to assemble the next two flight-test aircraft and has started to build the first several customer aircraft. FTV4 is heavily kitted with search-and-rescue equipment and more flight-test instrumentation than originally planned. It should be ready to fly early this year. FTV5 will have a lot of the oil-and-gas kits on it. Between those two aircraft, approximately 50 kits will be certified as part of the initial flight-test program. Aircraft six through nine were in structural subassembly late last year.

The 525 is a 20,500-pound super-medium with passenger capacity of up to 20 (high-density), a maximum range of 570 nm (no reserve), a maximum cruise speed of 162 knots, and a ceiling of 20,000 feet. The 525 is powered by a pair of GECT7-2F1s (1,800 shp each) driving an all-composite five-blade main rotor system and a four-blade tail rotor. The airframe is a hybrid aluminum composite design. The aircraft incorporates a triple-redundant fly-by-wire flight control system with a BAE flight control computer and sidesticks in place of conventional cyclics linked to a four-screen Garmin G5000H touchscreen avionics suite with Telligence voice command capabilities. Bell has not set a published price for the 525.

Russian Helicopters Mi-171A2

Russian Helicopters obtained type certification last August for its medium-twin Mi-171A2 from Rosaviatsia, the Federal Air Transport Agency of the Russian Federation. This clears the way for serial production and commercial deliveries. Testing had begun in 2014 with four flying prototypes and two static test items.

This updated version of the Mi-8/17 features more than 80 upgrades and changes from the legacy helicopter, including VK-2500PS-03 engines with Fadec (2,400 shp each), a more robust transmission to accommodate the engine power increase, digital avionics with a health usage and monitoring system (HUMS), and a reconfigured cockpit for two-man crews. The new engines provide a 400-shp increase over the power of the Mi-8/17, increase cruise and maximum speeds by 16 knots, and boost range from 320 to 430 nm.

The helicopter also features a new rotor system that includes aerodynamically redesigned, all composite main rotor blades and an X-shaped tail rotor, which together provide 1,543 pounds of additional thrust and improved performance. The Mi-171A2 is certified for VFR/IFR, overwater, and Category A operations, including continued OEI flight at mtow.


Airbus LifeRCraft

Airbus Helicopters X6

The replacement for the H225 family remains in the concept stage. Entry into service is expected in the mid-2020s. Airbus has given out a few clues on the new helicopter. Expect full fly-by-wire digital flight controls, all-weather capability including full de-icing, extensive use of composites and advanced manufacturing, and a twin-engine design. Airbus has also hinted that there will be commonality, most likely in the avionics, between the X6 and the H160 and the H175.

Russian Helicopters Mi-38-2

The long-delayed replacement to the Mi-8 has been redesigned once again, this time with all Russian content. The heavy (34,400-pound) twin with seating for up to 30 will now feature power from a pair of Klimov TV7-117V turboshafts (2,800 shp each) and a cockpit with a Russian-designed IKBO-38 glass avionics suite with five LCDs. Four prototypes have flown so far and Russian Helicopters hopes to have the model ready for customers late this year or early next.

Avicopter AHL

Last year China and Russia entered into a joint venture to develop the AHL (Advanced Heavy Lifter) a scaled-down version of the massive Russian Mi-26 Halo, the world's largest helicopter. Mtow is estimated at 88,000 pounds with seating for up to 60. First flight could come as early as next year. Performance targets are maximum speed of 162 knots, range of 391 nm, and ceiling of 18,701 feet. The AHL will require two 8,000-shp engines driving a seven-blade main rotor system and a five-blade tail rotor.

Russian Helicopters Mi-26T2V

The latest upgraded version of Mother Russia's monster ship features advanced navigation and handling systems and a new autopilot as part of the BREO-26 glass cockpit avionics suite as well as advanced video capabilities to assist in monitoring external loads.

Compound Helicopters

Airbus LifeRCraft

LifeRCraft builds on Airbus's compound X3 research demonstrator, which debuted in 2010 and has since been retired. The X3 dashed at 255 knots in level flight in 2013. LifeRCraft is being built as part of the Clean Sky 2 European research program. First flight could come as early as 2019 and the design could result in a commercial product by 2030.

Sikorsky S-97 Raider

The lone flying prototype of this proof-of-concept aircraft sustained substantial damage during a hard landing in August

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Bell 525


Russian Helicopters Mi-171A2

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Swarm of eVTOLs, drones invade CES

by Mark Huber

Prototype electric vertical takeoff and landing (eVTOL) aircraft and UAS and related technology swarmed this year's Consumer Electronics Show (CES) in Las Vegas last month.

Bell Helicopter unveiled its concept for an urban air-taxi at CES. (*See article on page 1.*)

Last year, global ride-sharing service Uber and Bell announced plans to partner and accelerate the eventual large-scale deployment of electric vertical takeoff and landing (eVTOL) vehicles. Scott Drennan, Bell director of engineering innovation, said his company's design would be robust enough to fly 2,000 hours per year; be "modular, adaptable, and scalable"; be able to use a variety of powerplants; have both civil passenger and military logistics applications; and likely be certified under the FAA's powered-lift category, a new section of the Federal Aviation Regulations developed for tiltrotors. Uber believes urban air taxis can be operated for a cost near $1.32 per mile, about one-third of the price of operating a turbine helicopter.

Volocopter announced that its 2X eVTOL flew Intel CEO Brian Krzanich on a remotely piloted passenger flight in December. "That was fantastic. That was the best flight I have ever had. Everybody will fly one of these someday," said Krzanich after completing the flight, which took place inside a German exhibition hall. Florian Reuter, CEO of Volocopter, noted that the Volocopter "is a flying super computer creating a pleasant and safe ride."

The Volocopter is designed to operate as an autonomous air taxi and leverages Intel microprocessor and other technology in its flight control solutions with redundancy and safety features. Dozens of microprocessors monitor the environment for turbulences, winds, etc. and send signals in milliseconds to the rotors. These can react and perform the slightest adjustments instantly due to their battery powered electric motors. The Volocopter made its first manned flight in 2011 and recently completed autonomous flights in Dubai.

In 2016 the German aviation authority granted Volocopter provisional licensing for a two seat-model, and in 2017 the aviation start-up entered into an agreement with RTA Dubai. Investors in the company include Intel and automaker Daimler. Intel has made significant investments in the drone industry with its UAV group, which develops products and software designed to promote further use of Intel technology by promoting drone development. The Intel Aero Compute Board drone system fits onto an electronics package the size of a playing card and runs a Linux operating system and Intel's RealSense technology.

During the show, Boeing unveiled a prototype unmanned eVTOL cargo air vehicle (CAV) capable of carrying payloads of up to 500 pounds. The CAV is powered by an electric propulsion system and eight contra-rotating blades allowing for vertical flight. It measures 15 feet long, 18 feet wide, four feet tall, and weighs 747 pounds.

The CAV will be used to test and evolve Boeing's autonomy technology for future aerospace vehicles. Boeing HorizonX, with its partners in Boeing Research & Technology, led the development of the CAV prototype, which complements the eVTOL passenger air vehicle prototype in development by Aurora Flight Sciences, a company acquired by Boeing late last year. The CAV was developed in less than three months under this leadership by a project team of engineers and technicians across the company and successfully completed initial flight tests at Boeing Research & Technology's Collaborative Autonomous Systems Laboratory in Missouri.

"Our new CAV prototype builds on Boeing's existing unmanned systems capabilities and presents new possibilities for autonomous cargo delivery, logistics and other transportation applications," said Steve Nordlund, Boeing HorizonX vice president. "The safe integration of unmanned aerial systems is vital to unlocking their full potential. Boeing has an unmatched track record, regulatory know-how and a systematic approach to deliver solutions that will shape the future of autonomous flight."

Workhorse brought its SureFly hybrid eVTOL to CES and intended to fly it there, but was shut down by opening day rain. The company said the two-seat prototype would fly "soon."

In early January, Workhorse received an experimental airworthiness certificate and approval for the flight from the FAA. SureFly, the world's first electric hybrid helicopter, features a drone-like octocopter design, a two-person, 400-pound payload capacity and a range of approximately 70 miles. The aircraft is powered by a fossil-fueled generator engine linked to a parallel bank of battery packs offering redundant power and eliminating the need for long battery recharging between flights. The electrical system powers motors linked to four propeller arms, each with two contra-rotating propellers. The batteries can power the motors if the generator fails. The airframe also has a ballistic parachute. SureFly was unveiled at the Paris Air Show in June 2017. The company is currently accepting SureFly pre-orders at www.workhorse.com.

In late December 2017, Workhorse announced its intention to spin off SureFly into a separate company. Under terms of the deal, Workhorse plans to issue $5.75 million worth of notes that it anticipates can be exchanged for preferred stock and common stock warrants of SureFly, Inc. with a valuation of $33 million. The

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Workhorse is accepting orders for its SureFly eVTOL electric hybrid (left). The Volocopter (below) is an autonomous air-taxi concept.

News Update

Bell V-280 in the Air

Bell Helicopter's V-280 Valor next-generation tiltrotor prototype made a brief first flight on December 28 in Amarillo, Texas. Bell declined to provide specifics related to the flight. The V-280 program is part of the Joint Multi Role Technology Demonstrator (JMR-TD) initiative, a science and technology precursor to the Department of Defense's Future Vertical Lift (FVL) program. V-280 specifications include a maximum speed of 280 knots, combat range of 500 to 800 nm, maximum self-deployable range of more than 2,100 nm and 13,000-plus pounds of useful load. It features fly-by-wire flight controls and a pair of GE Aviation T64-GE-419 engines.

FAA Urges Mandatory Drone Tracking

The FAA's UAS aviation rulemaking committee (ARC) has released its final recommendations. The ARC calls for remote ID and tracking of drones with data sent to an internet database via both direct broadcast and network publishing. The data would include drone owner and pilot identification, a unique identifier for each drone, and tracking information. The report calls for the FAA to coordinate this information into the national air traffic control system and to safeguard the information and disclose it only to authorized parties. The FAA is expected to incorporate the ARC recommendations into its draft of a final UAS rule expected to be released later this year.

Cal Fire Firehawk Purchase Approved

Following a record-setting year for wildfires in the state, California's Department of Forestry and Fire Protection (Cal Fire) has been approved to acquire up to 12 new Sikorsky S-70i Firehawks. The deal is worth an estimated $240 million. The Firehawk features a belly tank that can hold 1,000 gallons of water and 30 gallons of foam and can be quickly refueled by a pump snorkel system at a rate of 1,000 gallons per minute.

U.S. Army To Expand Lakota Fleet

The U.S. Army is looking to expand its fleet of Airbus UH-72A Lakotas (militarized EC-145s) by as many as 35 aircraft. The 2017 Defense Appropriations bill provides $187 million to procure 28 Lakotas to support the Army Aviation Center of Excellence at Fort Rucker, Alabama. In January, the U.S. Government General Services Administration issued a "sources sought" request for up to 35 EC-145s to supplement the Army's existing fleet of more than 400 Lakotas. A "sources sought" request is not the same as an RFP. More than 160 Lakotas are assigned to the training mission at Fort Rucker and more than half of all Army aviators train on the aircraft. In 2016 Airbus Helicopters signed a new five-year support contract to support the Army's Lakota fleet. **M.H.**

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AirSpaceX reveals eVTOL design at Detroit Auto Show

by Mark Huber

Prospective electric vertical takeoff and landing (eVTOL) entrant Airspace Experience Technologies (AirSpaceX) unveiled its design last month at the North American International Auto Show in Detroit. AirSpaceX, a subsidiary of Detroit Aircraft Corp. (DAC), displayed a subscale model of its autonomous eVTOL aircraft, dubbed "Mobi-One," at the show.

The aircraft is designed to autonomously take off like a helicopter, fly like an airplane, and transport passengers or cargo between urban centers, suburbs, and airports within 60 miles at speeds up to 250 mph. AirSpaceX chief commercial office JP Yorro said the company's goal is to "deploy 2,500 aircraft at the nation's 50 largest cities by 2026."

The company teamed with Camilo Pardo, the chief designer of the 2005 and 2006 Ford GT, to design Mobi-One, which was taken from clean-sheet to fabrication and assembly in just four weeks. AirspaceX plans to seek FAA Part 27 (rotorcraft) certification for Mobi-One.

Founded in 2011 to design pilot-optional aircraft systems for military and commercial applications, DAC has designed and licensed a series of multi-rotor aircraft for commercial data collection and package delivery. It has also provided contract manufacturing, testing, marketing, sales, training, and MRO for a leading U.S. defense contractor, and has built more than 70 small eVTOL aircraft since 2013. In 2015, DAC identified an automotive electric vehicle architecture that would make large-scale multi-rotor aircraft feasible for cargo and passenger transportation. ■

AIRSPACEX/DETROIT AIRCRAFT

AirSpaceX's Mobi-One eVTOL is designed to autonomously take off like a helicopter, fly like an airplane, and transport passengers or cargo between urban centers, suburbs, and airports within 60 miles at speeds up to 250 mph.

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New rotorcraft 2018

that was blamed on the flight control system. A second prototype could fly this year. The Raider features a rigid coaxial main rotor system and an aft thruster propeller and is being used to gather data for a larger aircraft with the same style dynamics, the SB-1 Defiant, which will compete in the Defense Department's Future Vertical Lift program.

Tiltrotors

Bell V-280

Bell Helicopter's V-280 Valor next-generation tiltrotor prototype made its first flight on December 18 from the company's facility in Amarillo, Texas. The V-280 program is part of the Joint Multi-Role Technology Demonstrator initiative, a science and technology precursor to the Department of Defense's Future Vertical Lift program. Bell said the V-280 can carry 14 passengers and four crew and eliminates the V-22's rear loading ramp in favor of six-foot-wide fuselage doors under the wings. The tiltrotor provides twice the speed and range of conventional helicopters. Specifications include a maximum speed of 280 knots; combat range of 500 to 800 nm; maximum self-deployable range of more than 2,100 nm; and more than 13,000 pounds of useful load. It features fly-by-wire flight controls and a pair of GE Aviation T64-GE-419 turboshaft engines.

Avic "Blue Whale"

Chinese state-owned aircraft company Avic is developing two variants of an "ultra fast" 270-knot tiltrotor code-named "Blue Whale," English-language newspaper China Daily reported in December 2016. Unlike tiltrotors such as the Bell Boeing V-22 Osprey or Leonardo AW609, the Blue Whale is a quad-proprotor design. A medium variant is said to have an mtow of 44,090 pounds/20 metric tons and a heavy variant will have twice that capacity. Initial targeted range is 1,674 nm/3,100 km. Avic has not yet set a timetable for the program, with a company official saying only that he expects development to take "a long time."

Leonardo AW609

Leonardo Helicopters maintains that its AW609 civil tiltrotor program remains on track for entry into service in 2019. This past spring, the third AW609 test aircraft (AC3) successfully completed an artificial icing campaign in Marquette, Michigan, laying the groundwork for future testing in natural icing conditions. The company is beginning fuselage fatigue test certification and additional supplier component certification tests are proceeding as planned, the company reported.

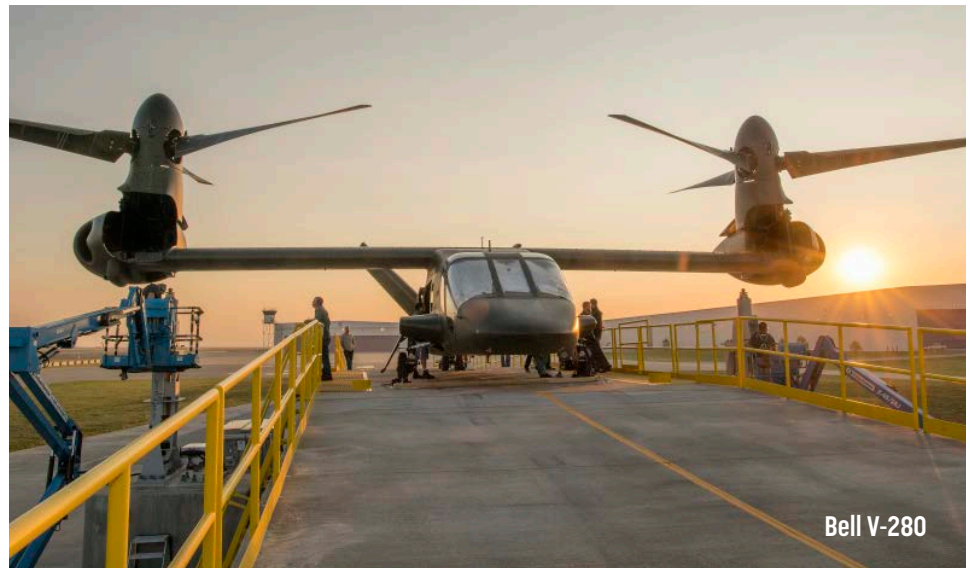
In October Transport Canada certified the AW609's 2,000-shp Pratt & Whitney Canada PT6C-67A powerplant. A production engine was retrofitted onto AC3 last fall to complete the integration and ready the aircraft for certification testing. AC1 will return to the test fleet this year after retrofit and will start certification "load level" surveys. Assembly of test AC4 is progressing and Leonardo anticipates rolling it out this year. Following ground runs, it will be dedicated to avionics development and certification, leveraging the integrated lab results and testing already in progress. Rockwell Collins Pro Line Fusion touchscreen avionics will be available on board AC4 for its first flight.

Announced aircraft performance includes a maximum forward speed of 275 knots, a ceiling of 25,000 feet, a hover out of ground effect of 5,000 feet, hover in ground effect of 10,000 feet, and a useful load of 2,500 pounds. Short-takeoff capability will be added to the certification basis to increase the helicopter's maximum takeoff weight to 18,000 pounds from 16,800 pounds. The extra weight could be used to boost fuel capacity and range, now estimated at 700 nm; up to 1,100 nm with auxiliary fuel. The AW609 will be assembled in Europe and the U.S.

Leonardo AW CTR

Leonardo is developing a larger commercial tiltrotor expected to seat 25 to 50 passengers. It is partially funded by the European Union's Clean Sky 2 environmental initiative. If the program progresses, the machine could fly in 2020 and enter production in 2025. ■

Sikorsky S-97 Raider


Bell V-280

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Drones, eVTOLs swarm CES

warrants will be exercisable into a number of shares of common stock equal to 30 percent of the shares issuable upon conversion of the convertible preferred stock and have an exercise price equal to 125 percent of the conversion price on the convertible preferred stock. Last year Workhorse executive Patrick Connors told **AIN** that he expected the SureFly certification program to cost around $40 million and that individual SureFly aircraft would have a target price of $200,000.

Safety and Regulations

Drone software provider Kittyhawk said it is adding an automated flight system to its Flight Deck feature that works in conjunction with secure, encrypted streaming live audio and video. The new automation features allow operators to plan missions in the Kittyhawk mobile application and then execute the entire flight from takeoff to landing with unlimited waypoints. The app has incorporated safety features to ensure that operators are not able to initiate an automated flight to a place beyond the range of the radio and drone, and the software uses the geolocation of the operator to show only flights that are possible to complete.

Kittyhawk said the new features in its mobile app have a variety of practical applications such as enabling law enforcement to access video and audio feeds while automatically flying a scene perimeter and allowing filmmakers to get more precise shots with consistent speed and altitude. "Enterprise customers are constantly asking the Kittyhawk platform to do more and more across the entire workflow," said company CEO Jon Hegranes. The automated flight feature is the first of several new features the company plans to unveil in 2018.

The FAA also made news at CES, announcing that the number of U.S.-registered drones with the agency topped one million in January. It includes 878,000 hobbyists, who receive one identification number for all the drones they own, and 122,000 commercial, public and other drones, which are individually registered. Registration is required by law and the FAA maintains that the registration process helps educate drone operators who are new to aviation by having them agree to the FAA's operating rules; and increases airspace security by identifying drones with their owner.

Registration was originally required under the FAA's small drone registration rule effective December 21, 2015. The rule provided that aircraft weighing more than 0.55 pounds (250 grams) and less than 55 pounds (approximately 25 kilograms), including payloads such as onboard cameras, must be registered. While that rule was overturned by a 2017 federal court decision, it was reinstated in the National Defense Authorization Act passed by Congress last December. "The tremendous growth in drone registration reflects the fact that they are more than tools for commerce and trade, but can [also] save lives, detect hazardous situations, and assist with disaster recovery," said U.S. Secretary of Transportation Elaine Chao, speaking at CES. "The challenge is to remove unnecessary hurdles to enable the safe testing and integration of this technology into our country's airspace." ■

Hensoldt's Xpeller system can detect UAVs from several miles away.

Anti-UAS systems move closer to deployment

by Mark Huber

As governments worldwide continue to refine their regulatory approach to counter-UAV technologies, more companies are jumping into the market and advancing their programs. In December, Germany's Hensoldt demonstrated its Xpeller counter-UAV system at the Airbus airfield in Hamburg.

Xpeller uses a suite of radar, RF, optical sensors, and a targeted jammer. The system can be integrated into existing airport systems. During the demonstration, Xpeller detected UAVs approaching from a number of locations and was able to identify a variety of UAVs, including small recreational models, from a distance of several miles away. Xpeller can assess a UAV's threat potential, analyze its control signals, and then activate a jammer that disrupts the link between drone and operator or interfere with the drone's navigation. The Xpeller system is modular and can be technologically tailored to meet individual customer requirements and local conditions.

Market for UAS Abatement

Hensoldt has plenty of company. Almost two dozen other companies are working on technologies to defeat drones, spurred on by the FAA's recently announced drone pilot program that includes "counter-UAS security operations" and ongoing U.S. Defense Department initiatives such as the use of directed energy weapons to defeat unmanned aerial vehicles.

Besides the system enunciated by Hensoldt, companies are working on a variety of ways to deliver similar and other technology, including lasers and high-powered microwaves, devoted to UAS abatement. Among the companies and organizations working on such systems are Boeing, Raytheon, BAE Systems, Lockheed Martin, CACI, the Dubai Civil Aviation Authority, Sanad Academy, Sensofusion, SystemsGrok, Batelle, Blighter Surveillance Systems, DroneShield, Dedrone, CTS Technology, Theiss UAV Solutions, MCTech, Malou Tech, Guard from Above, SAAB, UMS Aero Group, OpenWorks Engineering, Advanced Ballistics Concepts, Snake River Shooting Projects, Department 13, DeTect, Drone Defence, and Liteye Systems. Methods include jamming and ballistic interception with munitions and nets.

Some of these systems are very mobile and compact and can be fitted to delivery devices the size of hunting long guns. Some systems, such as Amtec's Sky Net "less lethal" Mi-5 ballistic shells, can be fired from a 12-gauge shotgun. Amtec is the largest volume producer of 40 mm grenade ammunition and fuzing in the world, and is the current sole prime contractor to the U.S. Department of Defense for the 40 mm family of grenade ammunition. The Mi-5s cost $20 for a three pack. The rounds contain five-foot wide capture nets and can down drones up to 55 pounds. The nets travel toward the target, attach to it, and cause it to crash.

Of course there is no shortage of high-tech and dramatically more expensive anti-UAS solutions. The most dramatic of these are targeted laser weapons that are virtually impossible to detect or defend against, exemplified by Boeing's Compact Laser Weapons System that successfully downed a drone during testing in 2015 by burning a hole in it. The laptop-controlled Boeing system is about the size of four suitcases, can be field assembled quickly and operated by two technicians, and operates off 220-volt field power. Lockheed Martin also has an anti-drone laser system, as does Raytheon. The latter also continues to refine its "Phaser" high-powered microwave system that can also be operated off field power such as a diesel engine. The company claims it is faster and therefore more effective than a laser and could be operational within two years.

The U.S. Department of Defense is moving quickly to fund and evaluate counter-drone systems. The department has budgeted $700 million toward rapid development of effective technology and last February hosted a "hard kill challenge" in White Sands, New Mexico, to evaluate prototype systems.

The challenge's focus was on technologies that could hard kill a UAS beyond a range of 250 meters. During the challenge, teams had the opportunity to hard kill a combined 30 rotor- and fixed-wing Group I UASs (mtow less than 20 pounds, altitude under 1,200 feet agl, speed below 62 mph) in scored events and four additional UASs in non-scored events. For the most part, the technologies evaluated at White Sands were less mature and effective than the Pentagon had hoped and left lingering questions with regard to how well they would work against UASs, especially swarming drones. And while the need for anti-UAS in a combat environment is indisputable as groups such as ISIS begin to weaponize drones, widespread deployment of such systems by civil law enforcement creates the possibilities for misidentification and erroneous destruction/damage of UAVs. ■

Gogo Bizav unveils lower-cost connectivity

by Matt Thurber

Gogo Business Aviation last month unveiled Avance L3, a lower-cost, lighter, and smaller version of its newest air-to-ground connectivity system targeting turboprops and light jets. Avance L3 delivers 3G airborne connectivity via Gogo's network of ground stations in the continental U.S., and parts of Canada and Alaska, while also offering services similar to Gogo's Avance L5 system for larger aircraft, but not L5's 4G LTE throughput.

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Gogo Business Aviation's Avance L3 is a lower-cost, lighter, and smaller version of its newest air-to-ground connectivity system targeting turboprops and light jets.

News Update

Honeywell Expands GoDirect Datalink Testing

Honeywell has launched a new service as part of its GoDirect Datalink offerings that allows aircraft operators to run tests of their new Future Air Navigation System (FANS) installations. This helps operators and pilots verify FANS performance before departure.

Pilots can schedule testing with GoDirect Flight Service, which provides a preflight FANS check, inflight testing, and troubleshooting support. According to Honeywell, "The system also provides a final, additional verification by giving pilots a report showing results and required communication performance before they fly."

No additional hardware is required to participate in the FANS test, just the GoDirect Datalink service. This service provides worldwide datalink communications, including free text messaging, pre-departure clearances, oceanic clearances, terminal weather information, custom short codes, and Controller Pilot Data Link Communication.

Garmin STCs G500 for Cessna 172/182

The FAA has issued an STC to Garmin for its low-cost GFC 500 autopilot on many Cessna 172 and 182 models. STCs for the Piper PA28 series and Beechcraft 35S/35V are expected this year.

The GFC 500 retails for $6,996 for a two-axis autopilot, but it is designed to work with Garmin's G5 electronic flight instrument. Both can be purchased for less than $10,000, according to Garmin.

GFC 500 features include altitude hold and preselect, vertical speed, indicated airspeed and heading modes, coupled approaches and go-arounds, built-in GPS roll steering, flight director and optional pitch-trim servo. Garmin also added the Level mode and its Electronic Stability and Protection.

Trig Intros Audio Panels

Trig is now shipping two new audio panels, featuring dual com, dual nav, and entertainment options. Both interface with Trig's TY96 and TY96A radios as well as other manufacturers' radios, and they both include a marker beacon receiver and intercom.

The stereo TMA45 includes Bluetooth wireless support and can accommodate two to six seats. It also features Trig's digital noise reduction, which automatically selects optimum intercom squelch and mic threshold levels, as well as Trig active mute to reduce background noise from radio static. The TMA45 is plug-and-play compatible with Garmin's GMA340 audio panels.

The TMA44 is designed for two- to four-seat aircraft and offers mono audio entertainment and communication options, according to Trig. **M.T.**

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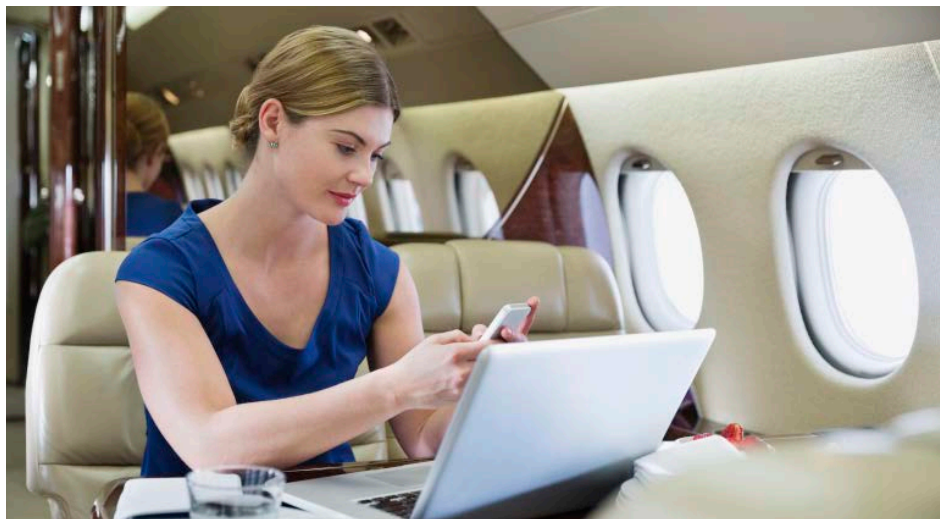
The main difference between Gogo's ATG systems and Avance is that the new systems operate on the software-centric Avance platform, which allows customers to purchase service upgrades or downgrades without having to add new hardware. Changes to the service levels can be done remotely by Gogo.

Avance L3 provides access to all of Gogo's Smart Cabin data, voice, maps, entertainment, and cabin management system (CMS) features. With a built-in smart router, Avance L3 connects to the Gogo Biz data network, and available services include connectivity for email, Gogo Text & Talk (additional service plan required), and voice calls. Customers can also opt for Gogo Vision (separate service plan) to access moving maps, weather, flight information, movies, and TV shows.

Three Avance L3 configurations are available: Core, for email, voice, and light Internet browsing for up to five devices; Plus, with full Internet connectivity and email for up to seven devices; and Max, same as Plus but for up to 25 devices. On the Avance platform, a customer could easily switch between any of the three configurations, for example, a customer who decides that Plus is too expensive could switch to Core with Gogo's assistance, including an hourly service program to save on connectivity costs.



Hardware Requirements

Avance L3's smart router delivers 802.11ac dual-band Wi-Fi in the cabin, multi-bearer data and voice management, integration with existing CMS, remote diagnostics, service activations, and changes; and a 4G/LTE terrestrial modem that connects to cellular networks for free Internet access on the ground in more than 120 countries. The built-in router eliminates the need to add a separate Cabin Telecommunication Router (CTR) as on the original ATG system. The Avance L3 uses less power and its LRU weighs 15 pounds, 3.5 pounds less than the two-LRU ATG with CTR setup.

While Avance L5 requires two dual-directional antennas, L3 works with the original Gogo omni-directional antennas. Avance L3 still operates on the original Gogo Biz 3G network, but L3 owners can upgrade to L5 later by installing new hardware, and in this case the dual-directional antennas will also be required. A buyer can also opt to install the dual-directional antennas with an L3 Avance installation, then later upgrade to L5 without having to replace the antennas.

Avance L3 retails for $39,995 for hardware and software, but not including installation. L3 units will begin shipping later this quarter, according to Gogo Business Aviation. While the Avance L3 system is ideal for turboprops and light jets, it can be installed in larger aircraft.

"We designed Avance L3 to provide a robust, high-performance Wi-Fi experience at an affordable price that gives customers the flexibility to add or reduce system capabilities as their business needs evolve," said Mike Syverson, the senior vice president of development for Gogo Business Aviation. "Avance L3 gives the ability to move seamlessly to different service offerings without being constrained by the hardware itself." ■

French researchers aim to optimize airborne Wi-Fi

by Matt Thurber

Transmitting radio waves to and from aircraft is one part of the airborne connectivity equation, but if the Wi-Fi network inside the cabin isn't optimized for that particular aircraft, the quality of the service can suffer. Grenoble, France,-based Leti, a research arm of CEA Tech, has measured Wi-Fi signal propagation in a Falcon jet as part of a proof-of-concept test to see how cabin configurations affect wireless signal propagation in business aircraft.

The research is not just designed to improve the passenger experience, but also to lay the groundwork for networks of wireless sensors that are finding their way into modern aircraft. For a wireless sensor to provide reliable service, it must be able to connect to onboard networks without fail. Already, wireless tire-pressure monitoring systems are installed as retrofit and forward-fit applications, and wireless sensors could replace wired systems for engine parameters, cabin pressurization systems, smoke detection, temperature monitoring, and more.

Leti researchers first evaluated conditions in a Falcon airframe, then used that information to build a cabin environment model and propagation channel emulator that allow lab testing of the Wi-Fi configuration before installation of the network in the aircraft.

"This is new, what we did with Dassault; how to test Wi-Fi for deployment in the aircraft, without immobilizing the aircraft," said Lionel Rudant, Leti strategic marketing manager. "With this emulator you have the actual behaviors of wave propagation that you would have in the aircraft."

The channel emulator is a device developed by the mobile phone industry, and it is also employed in automotive Wi-Fi installations, according to Rudant. "The environment around cars is complex and expensive to test on the road, with high-speed mobility. In the auto industry, such an emulator is used to test connectivity before integration."

Modeling an aircraft cabin presented new challenges. Using sounding equipment to measure the impulse response of the radio frequency environment in the cabin, researchers investigated multiple points in the cabin, especially near seats and around wireless access points (Wi-Fi transceivers).

A variety of factors affected the Wi-Fi signals in the cabin, such as curtains, plastic coverings, bulkheads, passengers, etc. The geometry of the cabin also affects received signal strength. "The most important point," he said, "is that there are multiple paths for propagation of radio waves in the metallic environment of the cabin, and with different path lengths, the pulse response can be spread out. This delays the spread of propagation, and causes fading of the signal due to the interference."

The measurements allowed the Leti team to develop a model of the cabin environment, using a statistical approach or stochastic modeling. As Rudant explained, "You want to describe with your model an aircraft cabin environment, but you have a lot of different situations in this cabin, so you need a statistics approach to cover all the configurations."

Of course the aircraft manufacturer does provide guidelines for suitable Wi-Fi installations, but there are so many variations after the interior completion, he said, that questions remain about how to ensure a consistently high level of Wi-Fi performance. "With the model we can play the environments in the emulator and make sure that Wi-Fi performance is good enough."

From the testing, Leti determined that Wi-Fi antenna location is a critical factor, in part because of the constraints on installing the several antennas needed inside the cabin. "One of the open questions was how to install different antennas," Rudant said. "[Do we] separate them at different locations, or install all antennas in one array in the cabin? This is a very difficult question. The final performance of multi-antenna Wi-Fi strongly depends on the propagation environment. It's about the ways radio waves can reach each of the different antennas with independent properties but equal power. That is what is required for such Wi-Fi systems."

Having completed the research project with Dassault, Leti hopes to apply the testing method to other airframe types, to optimize their Wi-Fi installations. "We want to work with different players to finalize the test method," he said, "and have standardization, then deploy it in industry." Rudant also sees an opportunity to work with manufacturers of onboard Wi-Fi systems to optimize Wi-Fi terminal installations.

"Aircraft manufacturers need a standard test method for the end user. These are critical questions, and it will probably pay for the testing services to insure there is very good Wi-Fi service in their aircraft," he concluded. ■

Pilots embrace aviation apps

by Matt Thurber

For this year's **AIN** Special Report on Aviation Apps, we conducted a survey of **AIN** readers who are pilots, to learn what apps they use regularly while flying. The survey was open from Dec. 26, 2017, through Jan. 8, 2018, and generated 589 responses.

The following three questions aren't shown in the charts in this article:

- What is your primary type of flying?
- What accessories do you regularly use with your mobile device while flying?
- Which mobile device operating system do you use regularly for aviation apps?

The majority of respondents, 69 percent, fly in Part 91 (non-commercial) operations, while 15 percent fly under Part 135 (charter), and 11 percent Part 121 (airline). About 5 percent of respondents selected the "other" category, and these responses included a variety of operational types such as fractional, flight training, flight test, public use, and others.

In the question about accessories, almost 58 percent of respondents said they fly with a GPS receiver, which drives the own-ship position display on moving maps. Many fewer, just 22.5 percent fly with a combined ADS-B In receiver with AHRS sensors, which allows display of synthetic vision and attitude information. Nineteen percent fly with ADS-B In alone.

Although the subscription to Sirius XM WX isn't free, as is ADS-B In weather and traffic information, and the Sirius receivers are a fairly recent addition to the aviation mobile device ecosystem, this tallied 17 percent of responses to this question. (ADS-B In and Sirius XM work primarily in the U.S.) Just over 5 percent said they fly with an action camera.

There are three primary operating systems in use on mobile devices: Apple's iOS, Google's Android, and Microsoft's Windows 10. As expected, most pilots are flying with iOS-powered devices such as Apple iPads, with 94 percent responding thusly. Android users accounted for nearly 11 percent of the responses, while Windows garnered nearly 5 percent.

The majority of aviation apps are available for iOS, with many also available on Android. The Windows platform has a lot of catching up to do in the aviation world, although it is supported by a major developer, Jeppesen, as well as FltPlan Go.

REGULAR USE

While ForeFlight has made huge gains in the professional pilot ranks, the majority of respondents indicate that they are flying with Jeppesen's Mobile FliteDeck or FliteDeck Pro, followed by ForeFlight. However, it may be likely that many pilots are flying with both apps, using ForeFlight for preflight planning and moving-map display and Jeppesen's apps to display charts.

Jeppesen came later to the game with own-ship position display (geo-referencing) on maps and approach charts. Now, the company not only offers that feature but also the unique ability of geo-referencing on SID and STAR charts.

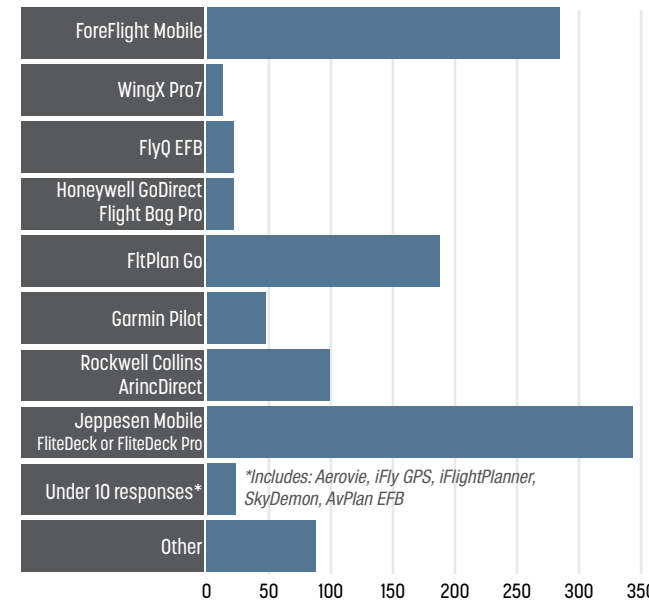
Another factor here is that Jeppesen and ForeFlight are working together on new products. The first fruit of this partnership is the ability of ForeFlight buyers to download Jeppesen charts (with a subscription to Jeppesen) in ForeFlight, so it isn't necessary to use a separate app to display Jepp charts. Jeppesen also supplies navigational, terrain, and obstacle data to ForeFlight. The two companies are working jointly on a new app that is targeting the professional pilot market, and it will be interesting to see how this turns out, especially given ForeFlight's purchase of flight planning software developer AviationCloud in 2015.

FltPlan Go received the third-highest number of responses to this question, and clearly pilots are using this free app, which is tightly tied to FltPlan's online flight planning service.

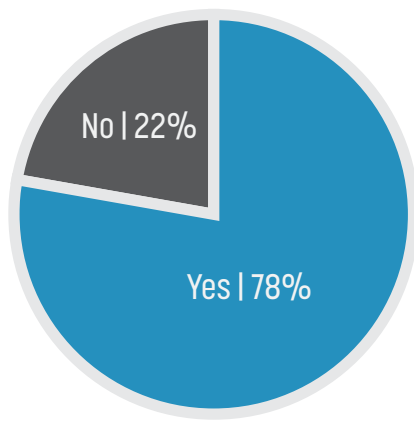
Respondents indicated that they are also using apps such as Honeywell's GoDirect Flight Bag Pro and Rockwell Collins's ArincDirect, although the number of respondents on these apps was much lower than hugely popular ForeFlight and Jeppesen apps. Among professional pilots, ForeFlight clearly has outpaced its rivals, which include Hilton Software's WingX Pro7, FlyQ EFB from Seattle Avionics, Garmin Pilot, and those that garnered fewer than 10 responses each: Aerovie, IFlyGPS, iFlightPlanner, SkyDemon, and AvPlan EFB.

In the "Other" category, some of the apps that were mentioned include WSI Pilotbrief, AeroWeather Pro, Lido/RouteManual, Droid EFB, Air Navigation Pro, RocketRoute, Avare, and more.

Which EFB apps do you regularly use while flying?



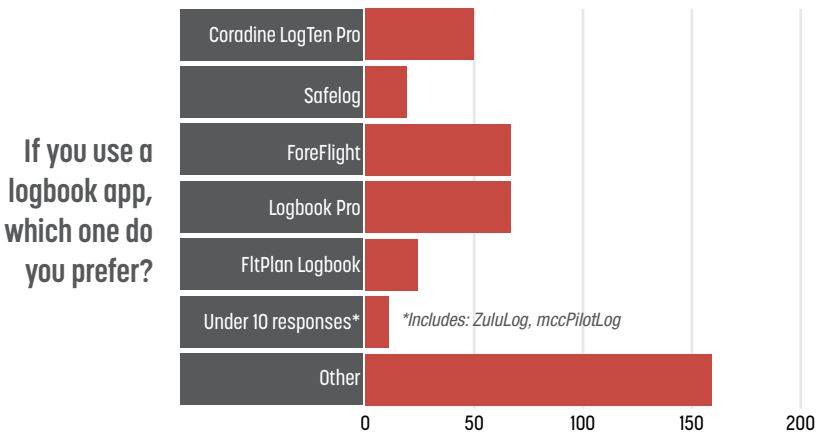
Do you use own-ship display on EFB apps with moving-map displays?

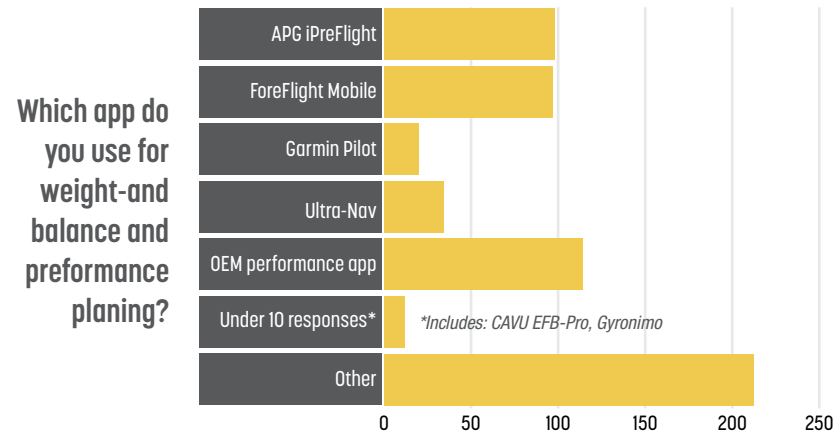


OWN-SHIP DISPLAY

Clearly, pilots are using geo-referencing (aka own-ship display) to show their aircraft's location on moving maps, with 78 percent of respondents indicating they use that feature.

Until recently, the FAA frowned on such behavior, except for airport ground operations, and even instructed commercial operators to turn off own-ship display on their mobile device apps when in the air. However, late last year, the FAA issued an updated advisory circular (AC120-76D) that now supports own-ship display in all phases of flight. The AC applies to Part 91, 91K, 121, 125, and 135 operators, but only 91K through 135 operators are required to seek FAA approval of their EFB programs. Part 91 operators can use EFBs as they wish, without formal approval. Although that has always been the case, the FAA's new attitude seems to encourage the use of this vital safety benefit for all pilots.





LOGBOOK APPS

There are a huge number of pilot logbook apps available, but we tried to narrow the question to the most popular apps. Logbook Pro and ForeFlight topped the respondents' choices, followed by Coradine's LogTen Pro. Safelog and FltPlan also saw significant responses. Those that received fewer than 10 responses include ZuluLog and mccPilotLog. The "Other" category generated a number of responses, indicating the following as some of the options in the logbook arena: MyFlightbook, Pilot Pro, and plain old spreadsheets. Many respondents indicated that they still use paper logbooks.

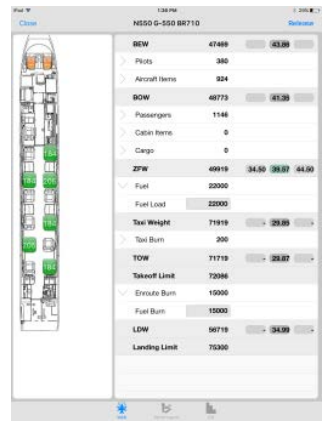
WEIGHT-AND-BALANCE, PERFORMANCE

We asked pilots which apps they are using for preflight planning (weight-and-balance and performance calculations), and this question received the most answers in the "Other" category.

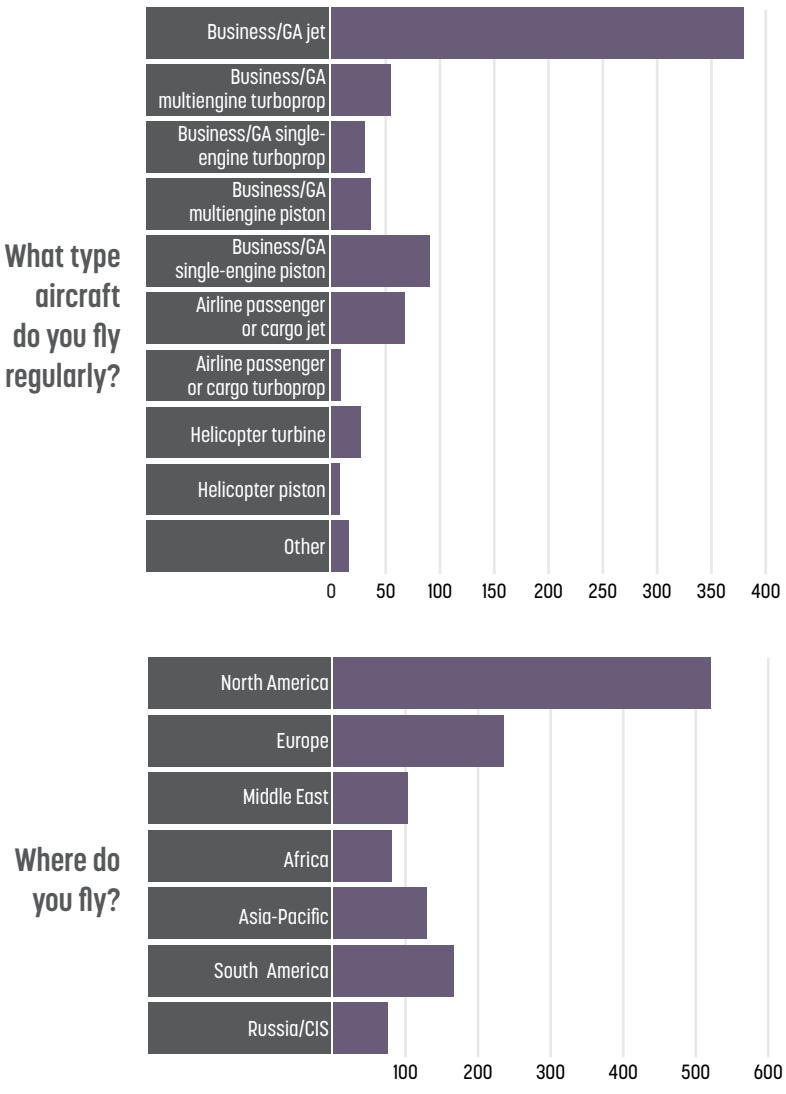
Aircraft manufacturers' own apps received the next-most responses, not surprising in that most business aircraft OEMs publish apps that incorporate the latest flight manual performance data.

Aviation Performance Group's iPreFlight ranked high among respondents, just slightly ahead of ForeFlight, which has recently made performance calculations a big part of its menu. The iPreFlight app is a key part of APG's runway analysis service, which many airlines and business jet operations use to calculate optimum flight profiles in case of engine failure. ForeFlight's performance planning features came into play after it bought AviationCloud and started adding type-specific aircraft into its database. Ultra-nav and Garmin Pilot are also highly ranked.

In the "Under 10" category, developers include: CAVU EFB-Pro and Gyronimo. Companies mentioned in the "Other" category, which generated a large number of responses, include Rockwell Collins ArincDirect (which can be bundled with APG's iPreFlight runway analysis), FltPlan Go, NavBlue, iFlyGPS, SkyDemon, iFlightPlanner, RocketRoute, and others.



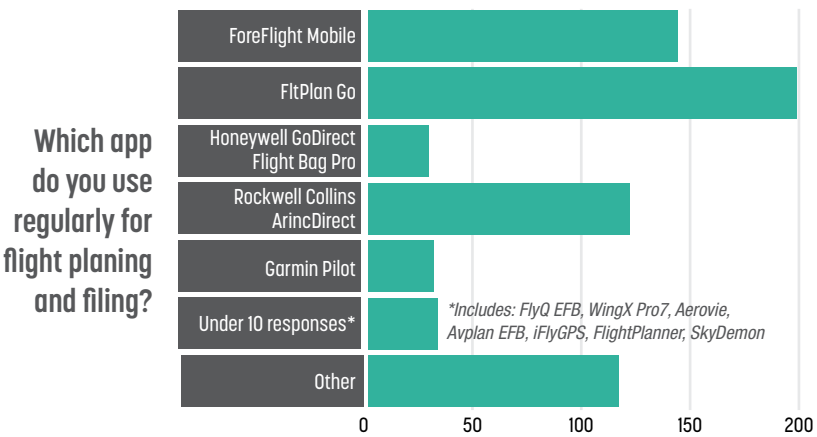
APG iPreFlight



AIRCRAFT TYPES AND REGIONS

The majority of survey takers fly business jets, with 380 respondents in that category. The next-highest levels of respondents indicate that they fly Part 91 multiengine turboprops, single-engine pistons and turboprops, and airline or cargo jets. Turbine helicopter pilots outnumbered piston helicopter pilots.

Most of the respondents fly in North America, followed by Europe, and the remainder were spread among all the other regions of the world. This seems to indicate that the use of mobile device apps has gained ground worldwide and isn't just a phenomenon associated with parts of the world where business aviation is strongest and most well-served.



FLIGHTPLANNING AND FILING

FltPlan Go is the clear favorite for flight planning and filing, likely having to do with the app's integration with FltPlan's free web-based services. But FltPlan Go has another advantage: its ability to run on a variety of mobile devices, including those running operating systems such as iOS, Android, and even Windows 10. The key advantage here is tight integration with performance profiles for the aircraft flown by the user. FltPlan has been focused on this integration for a while, and ForeFlight, which came in second in this question, has made it a priority and is continually adding more aircraft to its database.

Garmin Pilot, Rockwell Collins ArincDirect, and Honeywell GoDirect Flight Bag Pro were also well represented.

The app developers with fewer than 10 responses were FlyQ EFB, WingX Pro7, Aerovie, AvPlan EFB, iFlyGPS, iFlightPlanner, and SkyDemon. Some mentions in the "Other" category include Universal Weather UVGo, FlightStar, SkyVector, RocketRoute, Air Navigation Pro, EuroFPL, and more. ■

The Airbus A320 final assembly line in Tianjin now produces four airplanes per month.

Airbus to hike A320 rates in Tianjin by 50 percent

by Gregory Polek

Airbus has committed to raising A320 production at its factory in Tianjin, China, from four to six per month as part of an agreement reached in Beijing last month with China's National Development and Reform Commission (NDRC). Signed during French President Emmanuel Macron's state visit to China last month, the memorandum of understanding also calls for the sides to strengthen their cooperation "with regards to technical innovation, engineering capabilities, and supply chain expansion."

The agreement calls for the Tianjin final assembly line (FAL) to accelerate production to five aircraft by early 2019 and six per month by early 2020. Since its inauguration in 2008 the line has assembled a total of 354 A320-family jets. Deliveries to Chinese customers and to operators throughout the Asia-Pacific region included the first A320neo in the second half of last year.

"The industrial cooperation between Airbus and China and its continued success are a true role-model of a winning partnership between China and Europe," said outgoing Airbus COO and president of Commercial Aircraft Fabrice Bregier. "Together with our Chinese partners we are proud to lift our cooperation to new heights."

The deal came as several news outlets reported that unidentified sources said that Airbus and the Chinese government have entered negotiations over a work-share pact on the A380 in exchange for orders for the superjumbo. However, neither side officially acknowledged the existence of talks to help resuscitate prospects for that program, until late last month widely seen as imperiled by a lack of recent sales.

During November's Dubai Airshow, a highly anticipated order from Emirates Airline for 36 A380s failed to materialize despite positive signals sent by the airline and the manufacturer just before the event. Originally expected on the show's opening day, the announcement about the A380s hinged on a demand by Emirates that Airbus issue a guarantee that production of the superjumbo would continue for at least another 10 years, confirmed the airline.

Then, on January 18, Emirates signed a memorandum of understanding calling for an eventual firm order for at least 20 A380s and options on another 16. (*See related story on opposite page.*) If converted, the deal would increase Airbus's A380 firm order backlog from 95 to 115 and extend production for several more years.

Neither party indicated that the deal accompanied any production guarantees, although Emirates CEO Sheikh Ahmed bin Saeed Al Maktoum said the order would provide "stability" for the line. ■

Boeing sets new delivery record in 2017

Boeing delivered a record total of 763 commercial airplanes last year and registered net firm orders for 912, the company reported las month. The delivery total fell precisely within its start-of-the-year guidance of 760 to 765, thanks to an increase in production rate for the 737 narrowbody to 47 per month and a new record delivery total for the 787 Dreamliner, to 136.

Valued at $134.8 billion at list prices, the orders for 912 airplanes came from 71 customers. The total extended Boeing's backlog to a record 5,864 airplanes at year-end, equating to about seven years of production.

"The strong sales activity reflects continuing strong demand for the 737 Max family, including the ultra-efficient Max 10 variant that we launched last year, and the market's increasing preference for Boeing's family of twin-aisle jets," said Boeing Commercial Airplanes CEO Kevin McAllister. "Our planned production increases over the coming years are designed to satisfy this robust demand."

Speaking January 9 with reporters on a conference call from Seattle, Boeing Commercial Airplanes vice president of marketing Randy Tinseth noted that of the 529 deliveries of 737-family narrowbodies, the new 737 Max accounted for 74, a total he characterized as "spot on" in terms of early projections. He also reported "close to 200" orders for widebodies, including 40 current-generation 777s, marking what he called significant headway in building a production bridge to the new 777X, which Boeing expects to start delivering in 2020.

Addressing the less robust order total of twenty 777Xs, Tinseth chose to highlight the fact that Boeing has drawn more than three times the number of orders for the new 777 than it had collected at the same phase of the 777-300ER's development. "We have more work to do, but I think now is the time—2018, 2019—we'll be focusing more on 777X," he said. "We'll be putting the bridge behind us and that's our future."

Less certain appears the future of the 747-8, whose backlog of 12 airplanes represents just two years of production. The quadjet suffered a loss of net orders of two airplanes last year, even while cargo markets gained strength. Still, Tinseth expressed a positive perspective on the prospects for the airplane in the coming year. "We have a number of customers that fly the 747-400 freighter, we have customers that fly the 747-8 freighter, and they've seen their cargo operations turn around," said Tinseth. "There is interest in the 747-8. The question is when will they be in a position to buy?" **G.P.**

News Update

Egyptair Converts LOI for CS300s

Bombardier and Egyptair in late December converted a letter of intent to a firm order involving 12 CS300s and inked a deal granting the Egyptian flag carrier purchase rights for an additional 12. The parties announced EgyptAir's letter of intent on November 14 during the 2017 Dubai Air Show. Bombardier values the firm order at $1.1 billion based on list prices.

With the order, Egyptair becomes Bombardier's second C Series customer in the Middle East, a market where it historically has struggled to place its CRJ regional jets and Q400 turboprops.

Egyptair has not revealed delivery schedules, but Egyptair chairman and CEO Safwat Musallam reported that the airplanes would fly with the company's Egyptair Express unit and eventually serve as replacements for some small narrowbodies at the mainline.

Bombardier's other Middle Eastern customer—Iraqi Airways—holds a firm order for five CS300s and options on another 11.

Airbus Acquires U.S. Training Center

Airbus last month acquired the Strategic Simulation Solutions flight training center in Aurora, Colorado, marking the opening of its first such facility in the western U.S. The center primarily supports Frontier Airlines and carries what Airbus calls significant room for growth. The company said it plans to at least double capacity at the facility in the next few years.

Before the acquisition Airbus provided training to the North American market primarily from its Miami, Florida-based training center. Over the past two years Airbus has expanded its training capacity for customers in the Americas with the addition of training centers in Mexico City and in Campinas, Brazil. Globally, Airbus expanded its training network more than threefold in the past three years, growing from five locations in 2015 to 17 locations today.

Indonesia To Step Up Drug Screening of Flight Crew

Indonesia's Ministry of Transport and the National Narcotics Agency (NNA) will step up checks on pilots and flight attendants operating in the country as part of their effort to curb drug abuse among airline employees. This initiative follows the arrest of a 34-year old Malindo Air pilot at Nang Hadim International Airport in Batam on December 30. The Malaysian national tested positive for methamphetamine during a random check carried out on 69 air crew by NNA at the airport. A Malindo spokesman in Kuala Lumpur confirmed the arrest.

The arrest marks the third drug apprehension by the local authorities since 2016. **G.P.**

Mitsubishi undergoes more organizational changes

by Gregory Polek

Mitsubishi MRJ90 FTA-3 takes off on its first flight from Nagoya, Japan, on November 22, 2016.

Mitsubishi Aircraft underwent organizational chances on January 1 that saw MRJ program director Alex Bellamy take over the company's new program management division. Established to "reinforce the development and management of the MRJ program," the division encompasses the newly established integrated product team (IPT) execution department, the governance management office, and the product strategy office.

Mitsubishi has also decided to restructure its engineering division from four departments (aircraft integration, mechanical system design, electrical system design, and airframe design) and the office dedicated to MRJ70 development into five departments; adding "software design," along with three new offices dedicated to interiors, test rig integration, and electrical wiring interconnect design. Mitsubishi said it expects the reorganization to achieve "more efficient communications and quicker decision-making."

In a recent interview with **AIN**, Bellamy reported that program teams had flown four flight-test airplanes a total of some 1,500 hours, while production crews had attached wings and begun painting the fifth flight-test airplane.

Following no fewer than five major program delays, the MRJ has reached a point at which the company can integrate several design upgrades through the rest of this year and test the effects of temperature extremes on the reconfigured avionics bay. Meanwhile, another six airplanes have entered various stages of assembly, laying the foundation for a plan to accelerate production "in a phased manner" until eventually reaching a rate of 10 per month.

First, however, engineers must endure what Bellamy described as an extremely busy year of test flying in 2018, culminating in installation of the final avionics bay configuration in the fourth flight-test example. Bellamy detailed the status of the flight-test program at Moses Lake, Washington, where the four existing flight-test airplanes have completed more than 50 percent of their duties ahead of expected certification in late 2019. Targeting first delivery in mid-2020, managers now expects the MRJ flight-test airplanes to clock as many as 3,000 hours, some 500 hours more than first allocated. ■

Emirates throws lifeline to Airbus with A380 deal

Emirates Airline ended months of speculation about the immediate fate of the Airbus A380 program last month as the Middle East carrier signed a memorandum of understanding calling for an eventual firm order for at least 20 of the superjumbos and options on another 16. Valued at $16 billion based on list prices, the deal would increase Airbus's A380 firm order backlog to 115 from 95 and, assuming a production rate of six per year, ensure the line's survival for another decade. After delivering 15 of the airplanes last year, Airbus planned to cut the A380's production rate to 12 this year, eight in 2019, and to six a year starting in 2020. Emirates itself, which took delivery of its 100th A380 late last year, plans to take six this year and another six next year.

During a January 15 briefing to discuss last year's orders and deliveries, Airbus Commercial Aircraft COO for customers John Leahy warned that a lack of orders threatened to close the A380 line in the near future. He noted that Airbus had engaged in talks with "a few key airlines" to support an aim to eventually return to producing 25 A380s a year, but he also characterized Emirates as "probably the only one in the market that has the capacity to take six to eight aircraft [a year] over several years."

Originally expected at last November's Dubai Airshow, the announcement about the A380s hinged on a demand by Emirates that Airbus issue a guarantee that production of the superjumbo would continue for at least another 10 years, the airline confirmed to **AIN**. "I'm personally convinced more [airlines] will follow Emirates' example and that this great aircraft will be built well into the 2030s," added Leahy.

"This order will provide stability to the A380 production line," said Emirates chairman and CEO Sheikh Ahmed bin Saeed Al Maktoum. "We will continue to work closely with Airbus to further enhance the aircraft and onboard product, so as to offer our passengers the best possible experience. The beauty of this aircraft is that the technology and real estate on board gives us plenty of room to do something different with the interiors."

Airbus unveiled a raft of measures at the Paris Airshow last June aimed at boosting the flagging order book with the A380plus. The improvements, in what Airbus terms a "development study," would include new large winglets and other wing refinements to provide "up to 4 percent fuel burn savings," and 13 percent cost reduction per seat versus the current A380. Engineers would achieve the benefits by increasing maximum takeoff weight to 578 tonnes and adding 80 seats in a new nine-abreast premium economy layout and an 11-abreast economy configuration. **G.P.**

Emirates plans to take delivery of six Airbus A380s this year and six in 2019.

Bombardier delivers 17 C Series jets in 2017, missing target as a result of engine delays

Bombardier fell short of its most recent delivery target for its C Series last year, ferrying 17 of the narrowbodies out of the 20 to 22 it cited in a November estimate, the company confirmed. In fact, delivery targets became progressively less ambitious as the year wore on, as delays associated with the airplane's Pratt & Whitney PW1500G turbofans forced management to revise the numbers from 30 to 25 and, finally, to the most recent estimate.

A Bombardier spokesperson told **AIN** that the company would reveal more information about the specifics behind the adjustment when it announces earnings results this month. The company's current delivery target for 2018 amounts to 40 CS100s and CS300s.

Speaking in early November during the company's third-quarter earnings call, Bombardier CEO Alain Bellemare explained that Pratt & Whitney had held back delivery of the geared turbofans for new-production airplanes to concentrate on shipping spares to existing Airbus A320 operators that have experienced endurance deficiencies involving the engines' combustor liners. Pratt & Whitney planned to finish testing fixes for the engines during November and December and begin applying them early this year.

Of 24 C Series airplanes delivered since the start of the program, Bombardier shipped seven during the first two quarters of last year, followed by five in the third quarter and five in the fourth quarter. Korean Air took delivery of its first two CS300s on December 22 and December 30. Given the original expectation of between 30 and 35 deliveries for 2017, Bombardier had expected to see at least a $300 million revenue shortfall resulting from the adjustment to between 20 and 22 deliveries, reported Bombardier CFO John Di Bert, who added that Pratt & Whitney has promised cash advances for the fourth quarter to support excess aircraft inventories generated by the engine delays. **G.P.**

UK Pilatus Dealer Buys Biggin Hill MRO

With an eye toward solidifying its status as a major European Pilatus PC-12 repair station, as well as the exclusive Pilatus dealer for the British Isles, Oriens Aviation has purchased the Avalon Aero MRO facility at London Biggin Hill Airport and will rebrand it as Oriens Aviation Limited. The purchase will give the Pilatus Aircraft-authorized service center the ability to also support the Cessna 421/550/551 and 560, Hawker 1000, and Piaggio P.180 Avanti.

The deal includes the transfer of Avalon's existing lease on an 18,000-sq-ft hangar. Avalon's seven employees will join the Oriens staff.

Avalon founder and chairman John Glancy will concentrate his attention on the company's facility at Cranfield Airport, where it provides line and base maintenance for the BAe 146.

Study: AMT Schools Must Boost Enrollment

Technical schools that produce most of aviation's new mechanics are running at about 50 percent capacity, according to a new Aviation Technician Education Council (ATEC) study. The 170 FAA-certified aviation maintenance technician (AMT) schools had approximately 18,000 students as of mid-November, but they have capacity for more than 34,000, ATEC said. These schools produce some 60 percent of new aircraft mechanics, with the rest coming from the military or on-the-job training.

According to FAA data analyzed by ATEC, 27 percent of aircraft mechanics are age 64 or older, but AMT graduates entering aviation represent only about 2 percent of the total workforce annually, which is not enough to offset anticipated retirements. Add in demand for replacements—Boeing projects demand for 120,000 new aircraft mechanics in North America in the next 20 years—and the need for a fuller pipeline is clear.

Another tactic to help boost the mechanic population is keeping more students on an aviation career path, the study says. ATEC found that approximately 20 percent of AMT school graduates leave for other industries that hire trained technicians. Creating stronger workforce-development programs that link schools to employers is one way to address this challenge. Attracting more women is another potential growth area. FAA data shows that only 2.3 percent of the 286,000 FAA-licensed mechanics are female.

FSI Gets Nod for Maintenance Training in India

FlightSafety International (FSI) obtained CAR 147 approval from India's Directorate General of Civil Aviation to provide maintenance technician training at Deccan Charters' facility on Jakkur Airfield in Bangalore. The initial training will encompass a range of courses for Pratt & Whitney Canada turboprop, turboshaft, and turbofan engines, as well as auxiliary power units. FSI expects to add avionics and airframe maintenance technician courses for Cessna, King Air, and Sikorsky aircraft in the future.

"This is...in line with the recently announced government initiative of skill development, to make aviation integral to infrastructure development and economic growth and reflects the potential growth of corporate and regional aviation in India and the surrounding countries," said Deccan Charters CEO Sanjay Saihgal.

The training programs will include classroom and hands-on instruction. The facility is equipped with advanced technology training systems that include a FlightSafety graphical flightdeck simulator.

Deccan Charters provides a variety of services, including maintenance, management, training, and charter. The company has a fleet of more than 50 aircraft based at 15 locations.

The number of students entering A&P training is not enough to replace the retiring workforce, according to a study by the Aviation Technician Education Council.

Jet Aviation's new 41,000-sq-ft hangar at Singapore's Seletar Aerospace Park can accommodate up to five widebody G550s.

Jet Aviation Debuts Hangar at Singapore MRO

The third hangar at Jet Aviation's Singapore MRO and FBO facility is now operational. The 41,500-sq-ft/3,850-sq-m structure at the company's Seletar Aerospace Park location is already being used to provide scheduled base maintenance to an Airbus ACJ, Boeing BBJ, and Gulfstream G550.

"We built this new hangar to help meet strong demand for local business aviation services, especially for more mature long-range aircraft," explained John Riggur, the facility's vice president and general manager.

The new hangar features a larger upgraded interior shop, new soft goods area, and a wood shop. Its official grand opening will be held this month at the Singapore Air Show. The facility was recently designated as an upholsterer of Rockwell Collins 16g seating, making it the only such facility in Asia.

Advent Expands STC for King Air Anti-Skid Brakes

Oklahoma-based Advent Aircraft Systems continues to add to the tally of King Air type approvals for its Advent eABS anti-skid braking system. The latest is an FAA STC for all Beechcraft King Air 300 and 300LW variants. The 300LW, with its lower gross takeoff weight, was designed to comply with European regulations. Between the two models, the airframer built 230 of the turboprop twins.

The company expects EASA, TCCA, and other certifications to follow shortly for the eABS on the 300/300LW, as they did for the King Air B200 and B300. The system is available through all Textron Aviation company-owned service centers, as well as select independent authorized King Air service facilities.

Since the system's initial certification in 2013, 120 aircraft owners have installed Advent's eABS, which is also certified in the U.S., Canada, and Europe for the Pilatus PC-12, Eclipse EA500/550 and Textron T-6 Texan II military trainer.

Daher CDG Spares Base To Boost Falcon Support

French aerospace group Daher has been awarded a contract by Dassault Aviation to construct and operate a new third-party logistics center at the Aerolians Paris business park near Charles de Gaulle Airport. The contract builds on an industrial and supply-chain partnership that has covered spare parts provision for Dassault Falcons for almost 20 years. Daher has already established a similar spares distribution operation near Le Bourget Airport, the French capital's main center for business aviation.

The new center will be highly automated and designed by Daher engineers "to handle the flow of spare parts and aircraft repairs, with the Falcon fleet's long-term outlook in mind," said Daher. "It will feature innovative storage facilities and a coordinated management system," added the company, which confirmed that current operations would be transferred to the new center "by the end of 2018."

At the new CDG center, Dassault Falcon spare-parts teams will work alongside Daher and the forwarding agent to ensure efficient parts availability, especially for AOG assistance, "with a two-hour turnaround, 24/7."

Gulfstream Beijing Celebrates Five Years

Gulfstream marked the fifth anniversary of its China service center, Gulfstream Beijing, noting that the operation has supported more than 800 maintenance events. The company opened the center in November 2012 through a joint venture with HNA Technic.

Based at Beijing Capital International Airport, the facility spans nearly 70,000 sq ft of hangar space, offices, and back shops, along with training and warehouse space. The venture has secured maintenance approvals from China, the U.S., Hong Kong, Macau, and the Cayman Islands for large-cabin Gulfstreams, as well as for the G280 and G200.

"As the Gulfstream fleet in the Asia-Pacific region continues to grow and mature, we will enhance and add to the services we provide at Gulfstream Beijing," said Gulfstream product support president Derek Zimmerman.

The Gulfstream fleet in Greater China has grown to more than 190 aircraft, and the Gulfstream Asia-Pacific fleet numbers more than 330. In addition to serving aircraft in Beijing, center technicians have traveled to support customers in China, Hong Kong, Taiwan, Japan, South Korea, and the Philippines.

UK Mx Training Provider Receives UAE Approval

UK-based training provider Resource Group has been approved by the UAE's General Civil Aviation Authority (GCAA) to conduct basic aviation maintenance training and knowledge examinations under CAR 147. The company, which holds EASA Part 66 approval, provides basic courses for new entrants to the aviation maintenance field, in addition to modular courses for trained engineers. This latest certification allows it to deliver coursework for CAR 66 Cat A, B1, and B2 licenses for both fixed- and rotary-wing aircraft.

Mid-Canada Mod Centre To Relocate at CYKF

Mid-Canada Mod Centre is relocating its maintenance facility, as well as its Kitchener Aero Avionics business, to a recently built 50,000-sq-ft hangar on the north side of Region of Waterloo [Ontario] International Airport (CYKF). It will be co-located with the 5,000-sq-ft Chartright Air FBO.

"Following 40 years of progressive growth and development in the Kitchener and area markets, the time has come to relocate to larger facilities and commence the next chapter in our business," said company president Bill Arsenault. "This move will allow our Kitchener team and business to focus on and accommodate regionals, midsize to heavy corporate jets and turboprops, as well as helicopters." He added that the facility will continue to welcome aircraft of all sizes.

The new location at Hangar 53 offers direct taxiway and runway access, the company said.

Flying Colours Begins Work at New Paint Facility

Canadian MRO provider Flying Colours has begun work on a long-term contract it had signed with MHI Canada Aerospace to paint the center fuselage sections of the Bombardier Global 5000/6000 at its Peterborough, Ontario facility. MHI, a Tier 1 Bombardier supplier, delivers the shrink-wrapped fuselages to Flying Colours, where they undergo a pre-paint inspection before the eight-stage paint process, which includes priming as well applying corrosion inhibitors and fuel barriers, before the final paint applications.

In support of a recent contract with MHI Canada Aerospace, Flying Colours expects to paint more than 40 Global 5000/6000 fuselages each year in the new dedicated 4,000-sq-ft paint shop addition at its Peterborough, Ontario facility.

In support of the contract, Flying Colours built a $1 million, 4,000-sq-ft addition to the location's existing paint shop, featuring two separate spray bays, offices, and storage. The Flying Colours facility, a Bombardier authorized service location and preferred completion center, has developed a large degree of familiarity with the Global series.

Western Aircraft Joins Blackhawk's Dealer Network

Blackhawk Modifications has named Idaho-based Western Aircraft an authorized dealer. The service center, a Greenwich AeroGroup company, distributes parts for Cessna, Dassault Falcon, Beechcraft, Honeywell, Rockwell Collins, Universal Avionics and Pilatus, among others. Also operating as a certified aircraft repair station, Western Aircraft joins the other 83 authorized dealers in the Blackhawk Modifications dealer network.

At its Boise facility, Western Aircraft is completing a Blackhawk XP52 Engine+ upgrade on a King Air B200. The upgrade is expected to yield a 31 percent increase in available shaft horsepower and a 27-knot gain in cruise speed, as well as improved high/hot takeoff performance. Operating cost savings are expected to equal $45,000 per year with the upgrade, according to Blackhawk Modifications.

Texas MRO Launches Phenom Wheel Exchange

Texas-based MRO Aero Star Aviation has acquired a set of Embraer Phenom 100 and 300 wheel assemblies, which it will offer to customers through an exchange program. The exchange will permit the company, which specializes in the light twinjets, to reduce downtime for AOG with a change of about four hours and offer overhauled wheel repair at a competitive price.

Founded in 2013, the MRO, which also supports the Cessna Citation 500 and 600 series, is located in Dallas, with a mobile response team in South Florida.

East/West Industries Named Part 145 Repair Station

East/West Industries has been named an FAA Part 145 repair station. The company designs, manufactures and maintains aircraft seats, along with other products related to crew safety, at its 50,000-sq-ft facility in Long Island, New York. With its new FAA certification, East/West Industries can perform maintenance, inspection, and repair on aircraft components.

The FAA reviewed East/West Industries programs, practices, training, personnel, management, and quality control, among other factors. Manufacturers such as Bell Helicopter, Boeing, Lockheed Martin, Northrop Grumman, and Sikorsky install the company's seats on their aircraft.

UK Shop Now Services Honeywell RTA-4B Wx Radar

Muirhead Avionics, a division of Ametek Aerospace & Defense and one of Europe's largest independent repair facilities, now can service Honeywell's RTA-4B weather radar transmitter/receiver. The London-based MRO is an OEM-approved overhaul and repair station, and it can perform bench checks, as well as full overhauls on the RTA-4B.

"The need for MRO services on the RTA-4B is substantial and proving to be a viable and important addition to our capability," said Steve Wells, Muirhead's managing director and division vice president. "The RTA-4B system is widely installed onboard aircraft, and Muirhead Avionics is fully equipped to meet demand."

London-based Muirhead Avionics can now provide full servicing on the Honeywell RTA-4B weather radar transmitter/receiver.

The facility services a wide range of avionics—including flight data and voice recorders, radios, and cockpit instrumentation—and carries FAA, EASA, CAAC, and CAAS authorizations.

Rose Aircraft Signs On as PWI Cabin LED Lighting Dealer

Rose Aircraft Services, an Arkansas-based Part 145 maintenance provider and operator of the lone FBO at Mena Intermountain Municipal Airport, has signed an agreement that will make it an authorized installation center for aircraft cabin lighting specialist PWI. Rose will offer PWI's full product line. Among the offerings are PWI's LED reading lights, which feature heat-reducing technology that allows them to run cooler than incandescents, with a vastly increased lifespan, along with more directed light for better illumination.

The company's "plug and play" cabin lighting retrofits for the King Air 300, 200, 100, and 90 series will also be available. These can easily replace existing lighting fixtures without the need for removing or rewiring the interior.

Jet Aviation Singapore Designated BBJ Warranty Shop

Jet Aviation's maintenance facility in Singapore has been designated a Boeing Business Jet (BBJ) authorized warranty repair facility and authorized service center (ASC), which will permit the Seletar Aerospace Park location to provide warranty line and base maintenance support to the BBJ series. The company's facilities in Basel, Geneva, and Dubai also carry the BBJ ASC designation.

The location also received EASA approval to provide line and base maintenance support for Gulfstream G650s registered in EASA member states.

Champion Aerospace Names C&L a Distributor

Maine-based C&L Aerospace, the aircraft parts company of C&L Aviation Group, will serve as a distributor for Champion Aerospace's turbine ignition products. The agreement covers igniters, exciters, and leads for all general aviation aircraft types supported by C&L.

As a wholly owned subsidiary of TransDigm Group, Champion Aerospace designs, produces, and supplies aircraft ignition system technology and airframe power solutions for commercial, general/business aviation, and military aircraft. This agreement will increase C&L's engine product offerings and add to its OEM factory-new parts offerings. C&L is already an authorized distributor and installation center for Amfuel, Universal Avionics, and Dynamo Aviation, among others. ■

W Aviation Takes Over Aruba FBO

Fort Lauderdale, Florida-based W Aviation has taken over operations at the lone FBO at Aruba's Queen Beatrix International Airport, at the conclusion of Universal Aviation's 12-year lease on the 10-acre facility. The company, a sister to Windsor Jet Management, will commence a $1.8 million refurbishment of the 4,000-sq-ft terminal that will include an updated passenger lobby and customer service area, along with a new bistro bar, VIP passenger lounges, conference rooms, pilots' lounge, and flight-planning room.

"We are thrilled to announce our newest facility in Aruba and the continued expansion of our FBO network," said company CEO Ignacio Martinez, adding the island is the only non-U.S. possession in the Caribbean with U.S. Customs pre-clearance. "This is a milestone for our company, as it not only gives us the opportunity to support our existing global charter fleet in the Caribbean, but also allows for us to handle all of the GA traffic on the island." W also operates FBOs at Fort Lauderdale's Executive Airport and at Venezuela's Simón Bolívar International Airport.

Florida FBO Joins Paragon Network

Paragon Aviation Group welcomed Odyssey Aviation Kissimmee as the newest member of its network of independent FBOs. The facility, one of three service providers at Central Florida's Kissimmee Gateway Airport, offers an executive lobby, pilot lounge, flight-planning office and 100,000 sq ft of hangar space. Owned by Quantem FBO Group, the facility can handle aircraft up to a Boeing 737-400.

"Our Detroit location at Willow Run Airport has experienced growth through the Paragon Network," noted Quantem CEO Ken Allison. "The exceptional value we have seen made bringing this location into Paragon Aviation Group an easy decision." The Kissimmee location is part of the reconstituted Odyssey chain, which made its return to the U.S. earlier this year when Allison rejoined his old partner Steven Kelly, owner of Odyssey Aviation Bahamas, after a hiatus of several years from the FBO business.

New FBO Opens at London Southend Airport

London Southend Airport has a new FBO, run by Stobart, a trucking/transport company that also owns the airport. The official opening of the Stobart Jet Centre took place on January 18, although visiting business aircraft had been able to make use of the facilities since January 1.

AIN visited the FBO in late December as Stobart was putting the finishing touches on the facility. Stephen Grimes, the managing director of Stobart Jet Centre, said, "We're expecting an exciting year, with Luton full and Northolt [temporarily] closing." He added that despite it having a very small proportion of London's business jet traffic at present, Southend is one of only three London-area airports to operate 24/7 (the others are Stansted and Luton, which have significant low-cost carrier and other airline traffic). Southend has some airline traffic—for example, easyJet and Stobart's own Aer Arann services—but is comparatively quiet.

In 2016, Southend saw 900 business aircraft movements, but Grimes expects this to climb to at least 2,000 this year and reach 10,000 annually by 2022. He said it costs £1,000 ($1,354) to park a BBJ at Southend for 24 hours, compared with £7200 ($9,751) at Luton. Grimes is also making an arrangement with London City Airport to provide temporary parking for visiting aircraft to that airport, which has extremely limited parking space. The airport, which is 42 minutes by train from London's West End and even less into Liverpool Street Station in the city, has 12 stands that can accommodate bizliners and also a hangar that can house four more. Visitors can also take a helicopter to London Battersea Heliport via locally based Apollo Helicopters, which operates seven helicopters. A 127-room Holiday Inn adjacent to the FBO provides four-star accommodations for visitors, with another hotel being planned to boost on-site capacity.

Stobart Jet Centre is the newest FBO in the Metro-London area. Located at Southend Airport, it is less than an hour from the capital's business district.

With its purchase of the former Professional Air FBO at Oregon's Bend Municipal Airport, Leading Edge Aviation is now the lone services provider at two airports in the region.

Leading Edge Aviation Consolidates Again In Oregon

Oregon-based Leading Edge Aviation has acquired the assets of Professional Air, its competitor at Bend Municipal Airport, making it the sole fuel and service provider there. The purchase included the Professional Air FBO, as well as the company's maintenance, avionics, and flight school divisions.

"We are thrilled to announce this acquisition, which will continue to drive growth in Central Oregon's aviation industry," said company president Brad Fraley. "We have a tremendous opportunity to continue to serve our customers well with our expanded facilities and our growing team. This has always been our primary concern and we are excited to place the bar even higher."

The former Professional Air property consists of a 3,000-sq-ft terminal and 15,000 sq ft of storage and maintenance hangars, bringing the location to more than 33,000 sq ft of aircraft storage space. The facility will now be known as Leading Edge Jet Center Bend. The company made a similar deal last September, when it consolidated at Roberts Field Airport in Redmond, Oregon, acquiring rival Butler Aircraft Services and making it the lone aviation services provider on the field

Luxaviation Gives Paragon Network Global Boost

While the Luxaviation Group is one of the largest companies in private aviation, the Europe-based group has had little presence thus far in the U.S. This will change soon following its announcement of a strategic partnership that will see its ExecuJet chain of FBOs join the Paragon Aviation Group, a network of largely U.S., independent service providers. With 23 FBOs to phase into the Paragon network starting immediately, the ExecuJet addition will bring Paragon to more than 50 locations worldwide, according to Luxaviation Group CEO Patrick Hansen. "Today, most of our FBOs do not work like a network," Hansen told **AIN**. "This adds that piece to the puzzle."

The agreement will also make the Paragon network the preferred FBOs for Luxaviation and ExecuJet managed aircraft and clients, as well as those from Asian aviation services provider BAA. Wholly owned by China Minsheng Investment Group, BAA also owns a large stake in Luxaviation. "The agreement with Luxaviation Group, including BAA and ExecuJet, will increase the traffic in our FBOs," said Mike Delk, Paragon's president and CEO. "We are looking forward to bringing the expertise of two elite networks together to enhance the customer experience as they travel around the world." For Luxaviation this deal could eventually be leveraged into bringing ExecuJet FBOs into the world's largest business aviation market. "It's a good start in the U.S." noted Hansen. "This is dipping our toe in there."

Geneva Airport Implements New GA Slot and Parking Rules

Several recent changes in procedures at Geneva Airport are expected to improve its efficiency and capacity for aircraft, while cutting down on recurrent slot misuse. The revisions to the General Aviation PPR system, which took effect on December 1, reduce the period for slot reservations from 21 days to five days ahead of the flight. Users will still be able to view the available capacity up to 21 days in advance, and reservations will be available on a continued rolling basis.

To improve the use of the available capacity at the airport and avoid speculative slot reservations, a mandatory match between flight plans and PPR will be implemented during this year's first quarter and will require operators to file a valid flight plan with Eurocontrol before receiving an airport slot. Any PPR that does not correspond to a valid flight plan will be cancelled.

Last, due to construction planned for the P48 parking area, the airport will experience a temporary reduction in

aircraft parking. That may require private aircraft on the remaining north and south aprons to be towed into and out of their parking spaces due to the "densified" parking model. According to the airport authority, both areas will require a mandatory pushback operation for departures. Once the construction in P48 is completed in 2019, the airport will continue the high-density parking protocols as a means of increasing its overall aircraft parking capacity. "Taken together, these changes will be very helpful to business aviation," explained Olga Krasowska, the European Business Aviation Association's manager of airport operations. She added that the new procedures are being tested with operator input and might evolve over time to improve efficiency.

Sacramento McClellan Airport Sold To Private Entity

California's Sacramento County has completed the sale of Sacramento McClellan Airport (there are two McClellan Airports in California, named after different men) to real estate operator McClellan Business Park. The company owns the majority of land from the former McClellan Air Force Base, which was handed over by the military in 2000, and has transformed it into a business park. The county approved the sale of the 1,100-acre airport, located 20 minutes from the state capital's downtown, in September. It is one of the largest privately owned facilities in the country and boasts a 10,600-foot runway.

In addition to approximately 40 based turbine business aircraft, the airport is home to a Cal Fire base with the country's largest aerial retardant reload base, U.S. Coast Guard Air Station Sacramento, and the U.S. Forest Service C-130 program. McClellan Park has owned and operated the field's lone FBO, McClellan Jet Services, since 2001.

"The privatization of the airport allows us to be extremely nimble in accommodating our customers," said airport executive vice president and COO Scott Owens. "We're already making ground improvements, and so far the feedback has been very good."

Atlantic Consolidates at California's Carlsbad Airport

Atlantic Aviation has consolidated its position at California's McClellan-Palomar Airport in Carlsbad, with the acquisition of the neighboring Jet Source FBO. Atlantic arrived at the airport early in 2016 with the purchase of the former Premier Jet FBO, which included its 15-acre leasehold. The purchase of the adjacent Jet Source location adds another seven acres, along with 93,000 sq ft of hangars and 23,000 sq ft of terminal and offices, bringing the facility to a total of 308,000 sq ft of buildings on the airport.

"We are pleased to offer more options for hangar storage and ramp space to Atlantic's customers in the Southern California area," said Steve Hirschfeld, the company's regional vice president of operations. The move reduces the number of FBOs at the airport to three.

Harrods Offers Temporary Parking Fix at London Luton

With ramp space at a premium at crowded London Luton Airport, Harrods Aviation is offering a temporary solution by leasing an additional 53,000 sq ft of aircraft parking at its FBO there. Harrods invested in the space—room for five additional aircraft—to meet the growing demand for its FBO, one of two service providers at the airport.

"Customers can now take advantage of this extra parking capacity," said Kerry Besgrove, the company's operations director. While the lease on the additional space will expire on March 24, Will Holroyd, the company's sales and marketing director said, "We continue to seek a longer-term solution to meet the growing demand for the use of London Luton Airport by the larger Gulfstream, Bombardier, Dassault, and Embraer business aircraft." ■

Located 20 minutes from downtown Sacramento. Sacramento McClellan Airport is now one of the country's largest privately owned airports. The former Air Force base features a 10,600-foot runway, and is home to the air operations of several government agencies.

FBO PROFILE: Fontainebleau Aviation

FBO is South Florida gateway

While private aviation may be one of the most conspicuous parts of the luxury lifestyle, perhaps no FBO operator has gone to the lengths to embrace virtually all aspects of that lifestyle as Florida's Fontainebleau Aviation. The company began life more than three decades ago as Turnberry Aviation, the flight department for the family that owns the landmark Fontainebleau Miami Beach, as well as other high-end properties in the area. When it became a full-service FBO in 2011, it adopted the name of its well-known sister, and moved into a new $27 million facility at Miami-Opa Locka Executive Airport last year. The facility, one of three service providers on the field, sits on a 52-acre leasehold, with nearly 17 acres of ramp and nine hangars totaling 280,000 sq ft, including adjoining offices, which are home to 70 turbine-powered aircraft encompassing the full gamut of private jets from an A319 to an Eclipse. It still houses the owner's flight department, which consists of two jets and two turboprops.

The modern, two-story terminal is 10 times the size of the former "south side" terminal it superceded. That facility consists of a 1,500-sq-ft lobby that is now used as a hub for flights arranged by charter broker JetSmarter. The new terminal features a 12,000-sq-ft arrivals/departures canopy, a 12-seat glass enclosed conference room downstairs, an eight-seat meeting room with ramp views upstairs, and a 40-person training room, all A/V-equipped. The pilots' lounge offers its own A/V-equipped meeting space, along with four private snooze rooms, a flight planning room, and a swipe-and-go "micro-market" provisioned by on-airport, inflight catering provider Hangar 1. U.S. Customs is available at the airport from 9 a.m. until midnight seven days a week, but with proper advance notice, Fontainebleau's staff can arrange the processing of earlier flights.

The FBO, a member of the Paragon FBO Network, as well as a Corporate Aircraft Association exclusive property, claims one third of the business at the airport. Last year, the facility's NATA Safety 1st-trained staff pumped more than five million gallons of fuel from its tank farm, which has a capacity of 32,000 gallons of jet-A and 12,000 gallons of avgas. Customers at the Phillips 66-branded FBO are served by a quartet of 5,000-gallon jet fuel tankers and two avgas refuelers.

Unified Customer Service

The company has line service technicians who handle the fueling, airplane concierges who conduct the ramp marshaling and liaise with the crew for any aircraft-related services, and the CSRs who staff the service desk. The FBO plans to roll out a new lobby ambassador position dedicated to assisting customers with reservations. "When it comes to customers and our service philosophy, I believe that we must be unified as a team to provide our clientele with unparalleled support," noted Bobby Courtney, the company's vice president of aviation as well as the general manager of the FBO. "Our customers must feel secure in what we do, and our job is to provide them with safe, efficient, premium service, none of which can be done without team unification." The location, which has a staff of 80, also offers in-house aircraft servicing provided by sister company Precision Aircraft Maintenance, as well as aircraft detailing.

The company's diverse luxury holdings in the Miami area can provide additional benefits to the FBO's customers, such as special rates at the Fontainebleau Hotel, perks at the high-end Aventura Mall, and for yacht owners who dock their vessels at the recently refurbished Turnberry Marina discounted rates for aircraft overnight parking, facility fees, and even fuel purchases. According to Alexsandra Camargo, the FBO's marketing manager, the two properties, both headed by Courtney, work closely together. "We know that those guys fly, because the vessels are for them more of a hobby, while the airplanes are a form of transportation to their businesses," she told **AIN**. "Whenever they dock at the marina, they're also able to park their airplane here with us."

With Miami's status as a traditional winter vacation destination, the FBO sees its peak season from late fall until just after spring break, when it attracts not only the snowbirds from the northern U.S., but also a great deal of traffic from Latin America. During that time, major draws are Art Basel Miami and the Fort Lauderdale Boat Show. **C.E.**

by David Jack Kenny

PRELIMINARY REPORTS

Cessna Mustang Crash in Germany Claims Three

CESSNA 510, DEC. 14, 2017, SIEBERATSREUTE, WALDBURG, GERMANY

The chief pilot and managing director of Austrian charter operator Skytaxi Luftfahrt, his copilot, and their passenger were killed when their Cessna Mustang went down in wooded terrain near Sieberatsreute, Germany. The accident occurred near the end of the flight from the Frankfurt Egelsbach Airport. Though hampered by heavy snow, first responders located the wreckage about 10 miles northeast of its destination of Friedrichshafen. The client, a 79-year-old German businessman, has not been publicly identified.

A notice on Skytaxi Luftfahrt's website reported that the company had suspended operations indefinitely.

Three Killed in Florida Training Accident

BEECH KING AIR C90, DEC. 8, 2017, GENEVA, FLORIDA

A flight instructor and two commercially rated pilots under instruction died when their King Air C90 crashed into Lake Harney during a practice instrument approach. The aircraft was operated by the L3 Airline Academy and had just concluded a flight from the Baldwin County airport in Milledgeville, Georgia, to Sanford, Florida, by flying an approach to Runway 9L. After controllers switched the active runway to 27R, the King Air departed on an IFR flight plan to conduct an ILS approach to that runway.

Two minutes after providing a vector to join the localizer with an approach clearance, the controller issued a low-altitude alert and instructed the pilot to climb to 1,600 feet. Someone replied, "I am, sir, I am" just before radio and radar contact were lost. A fisherman on the lake reported hearing the airplane before he saw it below a 250- to 300-foot ceiling. After a rapid initial climb, it dived "vertically" into the lake.

Operator's Certificate Suspended Following Wreck

ATR42-320, DEC. 13, 2017, FOND-DU-LAC, SASKATCHEWAN

Nine days after its ATR-42 crashed just after takeoff from a remote village in northern Saskatchewan, West Wind Aviation's air operator certificate was suspended by Transport Canada, grounding all of the provincial airline's flights until further notice. All 25 occupants were injured, seven seriously, when the 44-seat twin-engine turboprop went down in the forest less than a mile west of the Fond-du-Lac airport. One, a 19-year-old who'd been pinned beneath the wreckage, died two weeks later in a Saskatoon hospital.

The investigation is ongoing, but the Transportation Safety Board has determined that both of the airplane's engines were operating up to the moment of impact. Transport Canada's December 22 press release cited "deficiencies in the company's operational control system" that were discovered during a post-accident inspection as grounds for the suspension. Conditions for a possible reinstatement were not specified.

FINAL REPORTS

Safety Culture Blamed in Heli-skiing Accident

EUROCOPTER AS350B2, AUG. 16, 2014, MOUNT ALTA, OTAGO, NEW ZEALAND

New Zealand's Transport Accident Investigation Commission (TAIC) suggested that a widespread "culture...of operating their aircraft beyond the published and placarded limits" likely contributed to a heli-skiing accident that killed one passenger, caused serious injuries to three more, and minor to moderate injuries to the remaining two passengers and pilot. Five of the seven occupants including the pilot were ejected when the aircraft hit downsloping terrain nose-low during an attempted escape maneuver after failing to establish an out-of-ground-effect (OGE) hover on approach to its intended landing zone.

While the TAIC's final report found the operator's procedures and training standards to be comparable to those of its competitors, it characterized the use of standardized passenger weights in flight planning as "inappropriate" for flights involving full passenger loads. Its investigation determined that the helicopter was outside its authorized weight-and-balance envelope at the time of the crash, with its center of gravity 3 cm (1.2 inches) forward of limits and weight about 30 kg (66 pounds) above the authorized maximum gross. The altitude of the landing zone was 245 feet above the helicopter's estimated OGE hover ceiling under that day's conditions.

The flight was the fourth of the day for the accident aircraft, one of five supporting heli-skiing operations between Mount Aspiring National Park and Lake Wanaka. Making a shallow approach to a landing zone near the summit of Mount Alta in very light winds, the pilot was unable to maintain his planned descent angle as airspeed decreased to near zero. He turned left toward his planned escape route down the mountainside and attempted to accelerate, but the helicopter "rapidly and unexpectedly" sank. It hit the slope before he could arrest its descent, tumbling some 315 meters (1,030 feet) downhill. One passenger was struck by the broken right skid and pinned beneath the wreckage; he died at the scene. The TAIC noted that he and three of the other four passengers ejected were wearing only three-point restraints fastened very loosely, compromising their effectiveness.

Overpressurization Damage Linked to Insect Nest

GULFSTREAM GIV, APRIL 10, 2015, OVER THE CARIBBEAN SEA

An overpressurization event during a positioning flight from Caracas, Venezuela, to Fort Lauderdale, Florida, was caused by a blocked static port for the cabin pressurization relief/safety valve (CPRV), according to a final NTSB report The jet was in cruise flight at FL430 about 200 miles south of Nassau, Bahamas, when the crew advisory system displayed a red "9.8 CABIN DFRN" warning followed by a red "DOOR MAIN" warning. The two pilots immediately donned oxygen masks and consulted the Quick Reference Handbook's emergency checklist. After hearing a loud bang they initiated an emergency descent, manually opening the cabin pressure dump valve. The flight levelled off at 12,000 feet and continued to Fort Lauderdale Executive Airport without further incident. No anomalies were found during their post-flight walk-around.

The airplane was flown to Boca Raton for scheduled maintenance the following day. Maintenance staff's discovery of damage to several floor beams and the frame below the right galley door prompted an inspection by Gulfstream engineers, who found deformation and fractures of floorboards, intercostal installations, wing links, and one floor beam. The overpressurization was attributed to obstruction of the CPRV's static port by dirt and insect parts from a mud dauber's nest, which prevented the CPRV from measuring the cabin-to-atmosphere pressure differential. The loudspeaker of the aural warning system was also found inoperative, possibly delaying the crew's becoming aware of the hazard.

No Evidence of Failure in Citation's Flight Instruments

CESSNA 525, JAN. 18, 2016, CEDAR FORT, UTAH

Investigators were unable to find any sign of pre-impact malfunction in the instruments of a Cessna Citation that broke up in flight after its pilot reported failure of the flight management system (FMS) and autopilot, followed by the loss of "different instruments." The NTSB's finding of probable cause listed the accident's defining event as "other or unknown" and specifically noted that "numerous avionics system components were tested with no evidence of any malfunctions or anomalies that would have precluded normal operation." In particular, examination of the standby attitude indicator by its manufacturer "revealed no evidence to indicate that the component was not operating normally prior to impact with terrain." The breakup itself was attributed to overload caused by the pilot's loss of control due to spatial disorientation in IMC.

Five minutes after departing from Salt Lake City on an instrument flight plan to Tucson, the pilot reported "a failure on my FMS" and advised that he would be exceeding his assigned altitude of 14,000 feet. Twenty-five seconds later he reported an autopilot failure and requested "a climb to whatever altitude straight ahead."

Two and a half minutes later, the pilot declared "MAYDAY...I do need to get up higher...I am losing different instruments, I'd really like to get into clear weather." The Citation reached a maximum altitude of 21,000 feet before entering a tightening right turn and disappearing from radar at 16,000 feet; its final descent rate reached 36,000 fpm.

The airline transport pilot had 1,587.5 hours of jet experience, all in the accident airplane, including 97.8 hours since its avionics suite had been replaced with independent dual Garmin GTN 750 GPS navigators.

Drone Pilot Faulted in Collision with U.S. Army Black Hawk

SIKORSKY UH-60M, SEPT. 21, 2017, HOFFMAN ISLAND, NEW YORK

The operator of a DJI Phantom 4 small unmanned aerial system (sUAS) that collided with a U.S. Army Black Hawk helicopter deliberately flew the aircraft some 2.5 miles from his location in violation of federal regulations limiting recreational drone flights to the operator's direct line of sight and was unaware of a temporary flight restriction (TFR) established for the U.N. General Assembly meeting.

The collision took place two minutes before the end of civil evening twilight at an altitude of 274 feet in airspace restricted by the TFR. The helicopter was returning to its base at Linden, New Jersey, after a local orientation flight in the TFR area. The sUAS operator had just transmitted a return-to-home command, tracking the aircraft's position via his tablet computer. He learned of the collision when contacted by the NTSB, having assumed the drone had crashed into the water following some malfunction.

The helicopter sustained damage to one main rotor blade characterized as "minor." The sUAS was destroyed. ■

The material on this page is based on the NTSB's report (preliminary, factual or final) of each accident or, in the case of recent accidents, on information obtained from the FAA or local authorities. It is not intended to judge or evaluate the ability of any person, living or dead, and is presented here for informational purposes.

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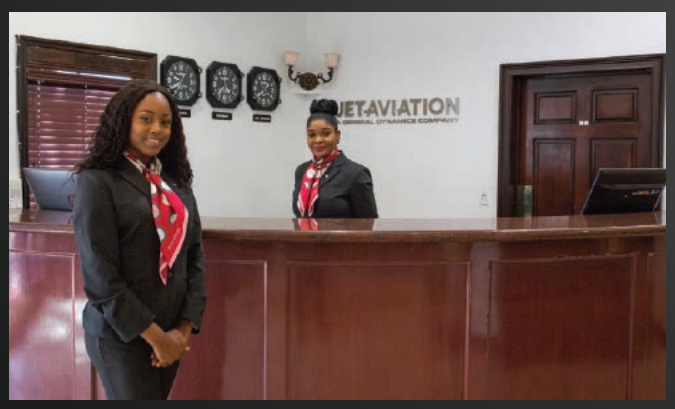


Jet Aviation - Nassau - MYNN

No FBO Alike!

Whenever we arrive at Jet Aviation Nassau they never cease to amaze us. They have made things happen when we thought it was not possible. The team makes you feel at home and assured!

Pedro Goldenstein
EJS Aviation
N401FT

Latin American and Caribbean Diamond Service FBOs

MBPV	Provo Air Center	Turks and Caicos Islands, BVI
MYNN	**Jet Aviation**	**Nassau, The Bahamas**
SCEL	FBO Aerocardal Limitada	Santiago, Chile
SDCO	World-Way Aviation	Sorocaba, Brazil
SEQM	Ecuacentair	Quito, Ecuador
SKBQ	Caribbean Support & Flight Services	Barranquilla, Colombia
TIST	St. Thomas Jet Center	St. Thomas, USVI
TJSJ	**Jet Aviation**	**San Juan, Puerto Rico**
TKPK	YU Lounge	Federation of St. Kitts and Nevis
TNCC	Jet Centre Curaçao	Willemstad, Curaçao

Discover the Diamond Difference at any of our 77 locations
AirEliteNetwork.com

World Fuel Services

by Sean Broderick

Market rebound may attract new sellers

As 2018 gets going, there is cautious optimism in the business-aircraft transaction world. Full-year 2017 deliveries, up just more than 1 percent at the three-quarter pole, according to GAMA's official numbers, are expected to be flat to up slightly when the final figures are tallied. The optimism stretches to the used market, where pockets of positive news and some encouraging data points have many looking to brighter days ahead.

Last year "was a success for the preowned business jet industry," declared Hagerty Jet Group in its 2017 fourth-quarter market update. "There was an uptick in transactions, inventory declined, and prices in many of the Gulfstream markets are stabilizing."

Figures shared by Hagerty underscore its view. Hagerty tracks several key metrics, including the highest and lowest numbers of aircraft on the market during a given quarter within the last 24 months. Among the eight Gulfstream models tracked in its update, five—including all three in-production models, the G650, G550, and G280—had their most recent quarterly lows sometime during 2017. Two, the GV and G150, were at 24-month highs as 2017 came to an end, while the high-water marks for the other six models took place during 2017's first quarter.

Another positive: the low number of in-production Gulfstreams on the market—inventory levels for the the G650, G550, and G280 were at 4 percent or less as of late December. "The lack of late-model aircraft for sale should help Gulfstream sell new positions," Hagerty suggested.

That's one possibility. Another is that the firming of the used market, particularly in-production aircraft, could attract more sellers—a pattern that could extend as market fundamentals continue to strengthen.

"We believe that as soon as we get any uptick in demand, there are additional used aircraft, often younger aircraft, that hit the market," wrote Canaccord Genuity analyst Ken Herbert. "We believe the strength in traffic should continue, and the fundamentals will eventually drive significant increases in this market, but we are still cautious heading into 2018."

Preowned-aircraft market gurus compile a lot of data, but none of it directly measures intent to sell. The closest indicators are arguably the figures that track the total number of aircraft on the market, how long they're there, and how many of them are removed from the preowned inventory before being sold.

AircraftPost, which compiles transaction data of about 55 business-jet models that make up the market's core—think Embraer Phenom 300s through Gulfstream G650s—tracks these numbers. Recent macro figures that focus on in-production aircraft, which typically move faster than their out-of-production counterparts, suggest that Canaccord's view is spot-on.

In each of the last three calendar years, the percentage of current-generation aircraft on the market that were removed from the preowned inventory has risen, AircraftPost figures show. The figure, just 5.7 percent in 2014, approached 15 percent in 2017, AircraftPost's preliminary full-year figures showed. The average number of days on the market rose along a similar trajectory, from 158 days in 2015 to 304 days last year.

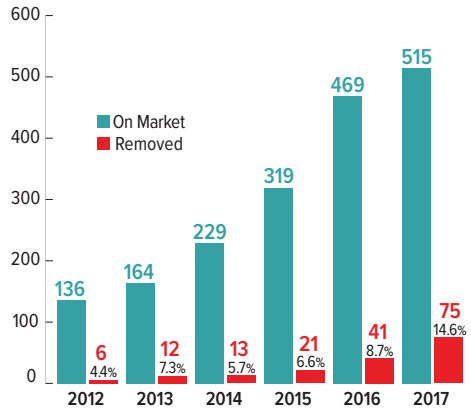
Among in-production models with in-service fleets of at least 100 aircraft, making them most likely to have active preowned feedstock, the only models that saw days-on-market declines were the Dassault Falcon 7X and 900EX/LX. The G450 and G550 were flat.

A deeper look into the numbers unveils signs of a slow turnaround. The percentage of current-production aircraft on the market that sold rose to 47 percent in 2017, climbing more than 13 points over year-earlier numbers and recording the first year-over-year increase since 2014. In addition, the percentage of the total in-production fleet that changed hands edged above 6 percent last year, up from 4.2 percent in 2016.

The percentage of in-production aircraft on the market reached 13 percent in 2017. Among the 22 models AircraftPost tracks that were in production in 2017, six showed year-over-year inventory declines.

While many of these data points suggest the preowned market is firming, the great unknown is whether this will pull more inventory out of the shadows. In 2016, 41 of the 469 aircraft offered for sale and tracked by AircraftPost were removed—just under 9 percent. The jump to nearly 15 percent last year was the largest-year-over-year jump in at least five years, suggesting that there are many owners of current-generation aircraft eager to sell. ■

Preowned Market
Current-generation Bizjets*



* AircraftPost's database of 55 business-jet models excludes the smallest light jets

Source: AircraftPost

by Gordon Gilbert

Within 6 Months

Feb. 27, 2018

Rudder Reversal Protection

A notice of proposed amendment to EASA Part CS-25 is intended to mitigate the safety risk stemming from pilots of large airplanes applying inappropriate rudder control inputs, in particular pedal reversals, which may create structural loads exceeding limits that could lead to the failure of primary structure and/or flight controls. The proposed changes are expected to ensure that large airplanes are designed with features protecting the structure against rudder control pedal reversals.

March 14, 2018 **NEW**

EASA Proposes Parts Approval Revisions

Aircraft parts approvals would be revised under this notice of proposed amendment from EASA. The notice mandates that parts and appliances need to be accompanied by an EASA approval form, particularly the so-called commercial parts that are often not designed exclusively for aviation use. This NPA also proposes to assign a criticality level for each part based on the safety consequences should the part fail to meet its design standards. Comments are due by March 14, 2018.

March 29, 2018 **UPDATE**

Performance-based Communications and Surveillance Implementation

Iceland, Portugal, and the United States continue with their PBCS implementations, as planned, on March 29, 2018. Due to different operating environments in the Gander and Shanwick operational control areas, Canada and the United Kingdom, different implementation paths might be needed to ensure accommodating non-PBCS authorized users without penalizing them unintentionally.

June 16, 2018 and Jan. 1, 2019

Upgraded CVRs and Underwater Locators Required

The European Aviation Safety Agency (EASA) will require upgraded CVRs and underwater locating devices (ULDs). Starting June 16, 2018, ULDs must be capable of transmitting for at least 90 days instead of 30 days. By Jan. 1, 2019, airplanes with an mtow of at least 59,500 pounds with more than 19 passenger seats and performing transoceanic flights must be retrofitted with an "additional ULD with a very long detection range." Also by Jan. 1, 2019, all CVRs with a 30-minute recording duration must be replaced by units with two-hour recording capability. Additionally, CVRs recording on magnetic tape must be replaced by solid-state units.

Within 12 Months

Nov. 8, 2018

ICAO Adopts 15-minute Position Reporting

The International Civil Aviation Organization Council adopted a tracking standard for certain international flights that requires crews to report their aircraft's position at least every 15 minutes. It will become applicable on November 8. The new requirement will be made formal as Amendment 39 to Annex 6—*Operation of Aircraft*, Part I. The new standard is the outcome of recommendations stemming from the disappearance of Malaysia Airlines Flight MH370 on March 8, 2014.

Jan. 31, 2019 **NEW**

Canada Revises CRM Requirements

Transport Canada has introduced so-called "contemporary" crew resource management (CRM) training standards applicable to commercial aircraft operations, including air taxis. The new requirements go into effect Jan. 31, 2019. This latest iteration of CRM now includes the concept of threat and error management (TEM). TEM "advocates the careful analysis of potential hazards and taking the appropriate steps to avoid, trap, or mitigate threats and manage errors before they lead to an undesired aircraft state."

Beyond 12 Months

Jan. 1, 2020 and June 7, 2020

ADS-B Out Mandates

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. The ADS-B Out retrofit requirement in Europe takes effect June 7, 2020.

Jan. 30, 2020

Expansion of Datalink Com in North Atlantic

Phase 2 of the North Atlantic datalink mandate began with Phase 2a in February 2015, at which time flights within the North Atlantic Tracks (NAT) between FL350 and FL390 were required to be equipped with FANS-1/A controller-pilot datalink communications (CPDLC) and ADS-C. The program expanded to these altitudes in the entire ICAO NAT region on Dec. 7, 2017, and will apply to all flights in this region above FL290 on Jan. 30, 2020. ■

Compiled by Kerry Lynch

MARK SATURNO

BRIAN MOORE

GREG PAXSON

JEFF MAGNUS

SCOTT OLINGER

*Hartzell Engine Technologie*s named **Keith Bagley** president. He succeeds **Mike Disbrow**, who is retiring. Bagley previously spent nearly 14 years with Pratt & Whitney, most recently as general manager of the engine maker's Columbus Forge operation in Columbus, Georgia.

Masood Hassan, president of *Teledyne Controls*, is retiring in July after 35 years with the business. Masood joined Teledyne Controls in 1983 as a senior member of technical staff, later was promoted to vice president of aircraft systems, and ultimately became president. The company named **George Bobb III** to succeed Hassan. Bobb joined Teledyne Technologies in 2008, was subsequently named president of Teledyne Aerospace Electronics and also serves as president of Teledyne Scientific & Imaging.

Mark Saturno was promoted to president of *Esterline's* Simulation Visual Systems business unit and **Frank Timmermans** to president of Esterline's Advanced Displays business unit. Saturno, who joined Esterline through the acquisition of the aerospace and defense display businesses of Barco in February 2015, had served as vice president for worldwide sales, Simulation Visual Systems and before that had spent nine years with Cubic Defense Applications. Timmermans, who also joined Esterline through the Barco acquisition, had been vice president and general manager of both the Esterline Simulation Visual Systems business and the Esterline site in Kortrijk, Belgium.

Airbus has named **Richard Marelli**, president of its Helibras subsidiary, as Airbus's lead executive for Brazil. Marelli, who has worked for Airbus since 1981, has played a role in the development of the Dauphin and Super Puma in France, served as director of the NH90 assembly lines, and has been at Helibras since 2010.

Elliott Aviation is celebrating the 40th anniversary of chairman and CEO **Wynn Elliott** with the aviation services business. In addition, the company promoted **Sam Elliott** to vice president and general manager of the Des Moines, Iowa facility. Wynn Elliott joined the company, then known as Elliott Flying Service, in 1978 as a line service technician, held roles as vice president and general manager in Omaha, Nebraska, and became chairman and CEO in 1993. During his tenure, he renamed the company Elliott Aviation, steered major renovations and expansions that included interior refurbishment and design centers, added several new programs such as the Elliott Aviation Sound Management System for King Airs, and relaunched the Elliott Jets aircraft sales division. Sam Elliott joined the company in 2013 after holding management roles at Des Moines based Kum and Go and most recently was director of operations at Elliott's Des Moines facility.

Eurocontrol appointed **Eamonn Brennan** director general. Brennan, nominated by the Government of Ireland, has been chief executive and a board member of the Irish Aviation Authority. He succeeds **Frank Brenne**r, whose term ended on December 31. He had held the position since Jan. 1, 2013.

NBAA has named two new regional representatives as the association expands the program to seven regions. **Paige Kroner** was appointed to represent the Mid-Atlantic region, a newly added territory for the association. **Brittany Davies**, meanwhile, becomes the Northeast regional representative, taking over for **Dean Saucier,** who retired at the end of the year after 17 years with the association. Kroner joined NBAA in 2014 after serving as manager of industry and government affairs then as FBO deputy manager for Signature Flight Support. Davies most recently was president of Wind Shift Consulting, which focused on strategic marketing and development within the business aviation industry, and also was the first executive director of the Westchester Aviation Association in White Plains, N.Y., and vice chair of NBAA's Local and Regional Groups.

Rick Ochs was elected chairman of the ASTM F46 Committee, which covers academic knowledge standards for aviation maintenance personnel. Ochs, a former avionics department manager for Southern Air Transport, founded Columbus, Ohio-based *Spirit Aeronautics* in 2000 and currently is CEO of the company.

FlightSafety International announced several management appointments, including the promotion of **Brian Moore** to executive director, operations. Previously manager of the Wichita East Learning Center in Kansas, Moore has served with FlightSafety since 1990, beginning as an instructor for Beechcraft products and later serving as relationship manager for Hawker and Beechcraft and assistant manager of the center. **Scott Politte**, most recently assistant manager of the Wichita center, was named to succeed Moore as manager. Politte has served with FlightSafety since 2006, beginning as a product marketing manager in Toledo and then holding positions of increasing responsibility. **Chad Raney** is stepping into the role of assistant manager, succeeding Politte. Raney has 20 years of aviation experience, joining FlightSafety in 2008 as an instructor and most recently serving as director of programs. **Danny Robayo**, meanwhile, was promoted to regional operations manager, in addition to his role as manager of the Teterboro, New Jersey facility. Robayo has held a number of positions of increasing responsibility since joining the Teterboro center in 1991, including roles involving Falcon training, as well as director of training and assistant manager.

Scott Kruce has joined *Duncan Aviation*'s avionics install sales team in Lincoln, Nebraska. Kruce moves into sales after serving as an avionics install technician and crew lead during his past 10 years with Duncan.

Jet Support Services, Inc. (JSSI) named **Brendan Lodge** as aircraft acquisitions specialist. Lodge, who was the 2012 chairman of the Central European Private Aviation Association, has a background as an aircraft sales broker and financier, and was previously director of aircraft sales and acquisitions at JetBrokers.

Air 7 named **Greg Paxson** director of maintenance. Paxson has more than 20 years experience holding maintenance leadership roles with Part 135 operations.

Phillips 66 Aviation named **Matt Dill** director of supply, military, and exports, U.S. marketing, a role that also includes responsibility for the general aviation channel. Dill, most recently director, NGL business development, Midstream, joined the Phillips 66 commercial organization in 2003 as a risk analyst and since has held a range of trading and strategy positions.

Mooney International appointed **Jeff Magnus** sales manager. Magnus, who flew both fixed- and rotary-wing aircraft in the U.S. Marine Corps, subsequently launched his own aviation services company, Magnus Aviation, which became a Cessna sales team authorized representative. He has also served with Signature Flight Support.

Aviation Specialties Unlimited recently hired **Vikki Rosploch** to serve as events and media coordinator and retained **Twain Josephson** as an independent contractor. Rosploch brings a background in marketing, formerly working with both non-profits and high-tech companies. Josephson, who will manage sales, has experience in the agriculture market, is both a fixed-wing and helicopter pilot, and has an aerial applicator certificate.

Sharon Klose joined *West Star Aviation* as director of engine programs. Klose has more than 30 years of aviation experience with companies including KC Aviation and Honeywell, and most recently was senior sales/service engine manager at Duncan Aviation.

Katerina Barilov joined *Shearwater Aero Capital*. Barilov previously was an investment banker in the Industrials Group of Goldman Sachs, focused on the aerospace and defense sector.

Signature Plating appointed **Zane Leake** vice president of sales. Leake has nearly 30 years of aviation experience, most recently with AmSafe Aviation.

Executive AirShare promoted **Jill Plumb** to vice president of marketing and customer experience. Plumb has served with the company for 11 years, most recently as director of marketing and corporate communications.

Scott Olinger has joined upset prevention and recovery training specialist *APS* as a senior sales manager. Olinger, who has been an airport manager as well as a demonstration pilot for Bombardier, has background as a flight instructor for Part 61, 135, 141, and 142 flight schools. ■

FINAL FLIGHT

Thor Solberg Jr., who spent years battling to preserve the family-run and privately owned Solberg Airport in Readington, New Jersey, died on December 16. He was 74.

"Words can't express how incredibly sad we are to say goodbye to Thor Solberg Jr.," said a notification from the airport. "He devoted his life to Solberg Airport and will be dearly missed by all who knew him." Solberg spent his life at the airport that his father, aviation pioneer Thor Solberg Sr., founded in 1939. He also served as a captain with United Airlines, accumulating 11 jet type ratings.

A strong advocate for business and general aviation issues, he became actively involved with the National Air Transportation Association. Joining in 1992, Solberg served on several committees, including as chairman of the Flight Training Committee, and held a term as chairman of the association. This groundwork in advocacy came into play when he was forced to fight off an attempted eminent domain seizure of property by Readington Township. The municipality had attempted to "condemn" and take over 624 acres surrounding the 102 acres that make up the actual airport property. Solberg prevailed in the courts and, as recently as early this year, Solberg Aviation won a judgment surrounding recovery of legal fees. Solberg owned and operated the airport with his siblings, Lorraine Solberg and Suzy Solberg Nagle. ■

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SCHEDULERS & DISPATCHERS CONFERENCE... February 6-9, Long Beach Convention Center, Long Beach, CA. Info: www.nbaa.org/events/sdc/2018/.

SINGAPORE AIRSHOW... February 6-11, Changi Exhibition Centre, Singapore. Info: info@singaporeairshow.com; www.singaporeairshow.com/public/.

EBAA ANNUAL BIZAV SAFETY CONFERENCE... February 15-16, Hilton Cologne, Cologne, Germany. Info: safety@ebaa.org; https://ebaa.events.idloom.com/annual-safety-conference.

HELI-EXPO... February 26-March 1, Las Vegas Convention Center, Las Vegas, NV. Info: heliexpo@rotor.org; http://heliexpo.rotor.org/.

NBAA PDP COURSE: REGULATORY COMPLIANCE AND DOCUMENTATION... February 26, Loews Coronado Bay Resort, Coronado, CA. Info: taustin@nbaa.org; www.nbaa.org/events/pdp/regulatory-compliance-and-documentation/20180226/.

NBAA LEADERSHIP CONFERENCE... February 26-28, San Diego, CA. Info: info@nbaa.org; www.nbaa.org/events/leadership/2018/.

MARCH 2018

BUSINESS AIRCRAFT FINANCE, REGISTRATION & LEGAL CONFERENCE... March 18-20, Sanibel Harbour Marriott Resort & Spa, Fort Myers, FL. Info: sobrien@nbaa.org; www.nbaa.org/events/finance-registration-legal-conference/2018/.

OPERATING LEASE SEMINAR 2018... March 20-22, Hilton Garden Inn Hotel Dallas, TX. Info: info@everestevents.co.uk; https://everestevents.co.uk/event/operating-lease-seminar-2018/.

WOMEN IN AVIATION CONFERENCE... March 22-24, Peppermill Reno, Reno, NV. Info: www.wai.org/conference.

SINGAPORE AVIATION SEMINAR... March 26-28, Singapore Aviation Academy, Singapore. Info: https://flightsafety.org/event/4th-annual-singapore-aviation-seminar-sass/.

AEA INTERNATIONAL CONVENTION & TRADE SHOW... March 26-29, MGM Grand Las Vegas, Las Vegas, NV. Info: www.aea.net/convention/2018/.

NBAA INTERNATIONAL OPERATORS CONFERENCE... March 26-29, Las Vegas, NV. Info: info@nbaa.org; www.nbaa.org/events/ioc/2018/.

NBAA PDP COURSE: WHEN LEADERS TALK: MASTERING COMMUNICATIONS... March 30, JW Marriott Las Vegas Resort & Spa, Las Vegas, NV. Info: taustin@nbaa.org; www.nbaa.org/events/pdp/mastering-communications/20180330/.

APRIL 2018

SUN 'N' FUN... April 10-15, Lakeland Linder Regional Airport, Lakeland, FL. Info: www.flysnf.org.

ASIAN BUSINESS AVIATION CONFERENCE & EXHIBITION... April 17-19, Shanghai Hawker Pacific Business Aviation Service Centre, Shanghai, China. Info: info@abace.aero; https://abace.aero/2018/.

AIRCRAFT RECORDS & TOTAL ASSET MANAGEMENT SEMINAR... April 18, Gibson Hotel Dublin, Dublin, Ireland. Info: www.everestevents.co.uk/event/aircraft-records-total-asset-management-seminar-2018/.

EURASIA AIRSHOW...April 25-29, Antalya International Airport, Antalya, Turkey. Info: http://eurasiaairshow.com.

MAY 2018

NBAA MAINTENANCE CONFERENCE... May 1-3, Albuquerque Convention Center, Albuquerque, NM. Info: info@nbaa.org; www.nbaa.org/events/maintenance-conference/2018/.

NBAA BUSINESS AVIATION TAXES SEMINAR... May 10-11, Dallas, TX. Info: info@nbaa.org; www.nbaa.org/events/taxes-seminar/2018/.

63RD ANNUAL BUSINESS AVIATION SAFETY SUMMIT... May 10-11, Radisson Blu Aqua Hotel, Chicago, IL. Info: solorzano@flightsafety.org; https://flightsafety.org/event/bass-2018/.

EUROPEAN BUSINESS AVIATION CONVENTION & EXHIBITION... May 29-31, Palexpo Convention Center, Geneva, Switzerland. Info: info@ebace.aero; https://ebace.aero/2018/.

JUNE 2018

MAINTENANCE RESERVES SEMINAR 2018... June 5-6, Jury's Inn, Prague, Czech Republic. Info: info@everestevents.co.uk; https://everestevents.co.uk/event/maintenance-reserves-seminar-2018/.

PILATUS OWNERS AND PILOTS ASSOCIATION ANNUAL CONVENTION... June 7-9, The Roosevelt Hotel, New Orleans, LA. Info: http://pilatusowners.org/popa-annual-convention-off-season/.

NBAA REGIONAL FORUM... June 21, Westchester County Airport (HPN), White Plains, NY. Info: info@nbaa.org; www.nbaa.org/events/forums/2018hpn/.

JULY 2018

FARNBOROUGH INTERNATIONAL AIRSHOW... July 16-22, Show Centre, ETPS Rd, Farnborough, England. Info: +44 (0) 1252 532800, enquiries@farnborough.com; www.farnboroughairshow.com/trade/.

EAA AIRVENTURE... July 23-29, Wittman Regional Airport, Oshkosh, WI. Info: www.eaa.org.

AUGUST 2018

LABACE... August 14- 16, São Paulo, Brazil. Info: www.abag.org.br/labace2017.

SEPTEMBER 2018

NBAA REGIONAL FORUM... September 6, San Jose International Airport (SJC), San Jose, CA. Info: info@nbaa.org; www.nbaa.org/events/forums/2018sjc/.

REGIONAL AIRLINE ASSOCIATION ANNUAL CONVENTION... September 26,-28 San Long Beach, CA. Info: www.raa.org.

OCTOBER 2018

NBAA BUSINESS AVIATION CONVENTION & EXHIBITION... October 16-18, Orange County Convention Center, Orlando, FL. Info: (202) 783-9000; www.nbaa.org.

SAFETY STANDDOWN... October 30-November 1, Hyatt Regency Hotel, Wichita, KS. Info: www.safetystanddown.com/.

DECEMBER 2018

MEBAA... December 10-12, Dubai World Trade Center, Dubai, United Arab Emirates. Info: www.mebaa.aero/.

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