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NBAA 2017

Bombardier Global 7000 makes debut on world stage

by James Wynbrandt

With the unveiling of FTV4 (flight-test vehicle 4) at last month's NBAA Convention, Bombardier introduced the Global 7000, claimed to be the world's largest purpose-built business jet. The clean-sheet, $72.8 million ultra-long-range jet features a four-zone cabin with galley and crew rest suite; 7,400-nm range; and what the company says is the smoothest ride in class thanks to the "optimized" aerodynamic characteristics of the wing.

Michel Ouellette, senior v-p of the Global 7000/8000 program, said that the jet "will meet all its performance targets" and will enter service in next year's second half. Eight customer aircraft are currently on the production line at Bombardier's Toronto facility.

Among the Global 7000's performance benchmarks: short-field and high/hot capability, opening London City, Aspen and other challenging airports to the Global; and a typical cruise speed of Mach 0.85 (Mmo is Mach 0.925 and high-speed cruise is Mach 0.90), shortening travel time between city pairs such as New York-Dubai,

Continues on page 44 ▶

DAVID McINTOSH

Making its public debut at the NBAA Convention in Las Vegas last month, the ultra-long-range Global 7000 dominated Bombardier's static aircraft display at Henderson Executive Airport.

Bizjet-A380 wake encounter spotlights vortex concerns

by Sean Broderick

A European Aviation Safety Agency (EASA) safety information bulletin (SIB) on avoiding en route wake turbulence suggests that concern about the issue was rising even before an encounter between an Airbus A380 and a Bombardier Challenger 604 in January this year left the business jet a total loss.

The June SIB "enhances the awareness of pilots and air traffic controllers of the risks associated with wake turbulence encounters in the en route phase of flight and provides recommendations and advisories with the purpose of mitigating the associated risks," the EASA explained in the document. The SIB does not reference the A380-Challenger accident. But the agency took the unusual step of following up the bulletin, issued just weeks after release of the German Federal Bureau of Aircraft Accident Investigation (BFU) preliminary report on the accident, with a press release. The release notes that wake-turbulence encounter likelihood "is very low, but cannot be excluded." It also calls out "heavy" and "super-heavy" aircraft, naming the A380 among others, as "more prone to generate stronger vortices."

The bulletin "was not directly a consequence of the A380 event," an EASA spokesman said, but rather "more general information on the wake vortex issues." The SIB is a "mitigating measure" as part of the regulator's sharpened focused on wake

Continues on page 44 ▶

LEGACY® 500
BY EMBRAER

The game-changing Legacy 500 — the first midsize jet with fly-by-wire controls — is the benchmark for the future in performance, passenger room and comfort. 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 delivers a smooth flight in a largest-in-class stand-up cabin with a flat floor, fully equipped galley, state-of-the-art inflight entertainment and elegant seating that converts into fully flat berths in a low cabin altitude. The main baggage compartment is the largest in class and complements generous inflight-accessible cabin stowage space. The clean-sheet-design Legacy 500 is also the fastest jet in its class, delivering a high-speed cruise of Mach 0.82 and excellent runway performance.

EMBRAER: A VERY UNIQUE COMBINATION OF PERFORMANCE AND RELIABILITY

“The Legacy 500 provides a unique combination of performance, comfort and reliability. These jets deliver a great value for customers we fly. I think very few manufacturers are able to combine all of the critical components of what makes a great aircraft, and Embraer certainly does that through innovations such as fly-by-wire technology.

Embraer’s team has been incredibly responsive to ensure that we get our airplanes up and flying for our customers. I would tell you Embraer’s craftsmanship and passion have come through in the products the company makes for us, and we, in turn, build on that passion when operating those planes and flying them for our mutual customers. We share Embraer’s passion for taking care of our flying customers.”

- Michael Silvestro, CEO, Flexjet

Watch Mike’s story and request more information at
EmbraerExecutiveJets.com/Mike

EMBRAER

CHALLENGE.
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Inside this issue

DIY flight department or management company?

More options are available to airplane owners these days, but if anything, that makes it tougher still to weigh the pros and cons of perennial issues such as control, costs and complexity. **Page 20.**

AIN Senior Editor Carey Wins NBAA Journalism Honors

AIN senior editor Bill Carey received the NBAA 2017 Gold Wing Award, which the association awards annually to recognize "accurate and insightful reporting on business aviation." Carey accepted the award at the Media Kickoff Breakfast for the NBAA Convention last month.

The award recognizes Carey's July 2016 article in **AIN**, "The Commercial Applications and Considerations of Flying Small Drones," which addressed efforts within the business aviation community to deploy small unmanned aircraft systems (sUAS) in a variety of roles. The article also highlighted NBAA's efforts to help established flight departments develop successful UAS operations.

NBAA chairman Paul Anderson presented the award, and said, "The article describes the many ways companies are incorporating drones into their work—from household names like Disney to small startup businesses—and highlights the spirit of innovation driving business aviation."

Author of the recent book, *Enter the Drones*, Carey is based in Washington, D.C., and covers air transport, defense and unmanned aerial systems for **AIN**. —M.P.

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As we go to press

ONE AVIATION ISSUES MORE LAYOFF NOTICES

Albuquerque, New Mexico-based One Aviation laid off an unspecified number of workers on October 19, a move the company attributed to the end of production of the Eclipse 550 as it looks toward building the larger Eclipse 700 derivative. One of those laid off reported difficulties in obtaining necessary parts to maintain and repair Eclipse 500/550s. Company CEO Alan Klapmeier said these delays have stemmed from supplied parts not meeting production standards. The layoffs followed reports that One Aviation partner Kestrel Aircraft was recently evicted from its Brunswick, Maine headquarters for failing to pay back rent and faces legal action for unrepaid economic development loans to build a Kestrel K350 turboprop production facility in Superior, Wisconsin. All Eclipse service centers remain open, Klapmeier told **AIN**.

DELIVERIES, BILLINGS FALL AT TEXTRON

Third-quarter revenue at Textron Aviation fell $44 million year-over-year, to $1.154 billion, as it delivered 41 Citations, unchanged from a year ago, and five fewer King Airs, at 24. The Textron division recorded a profit of $93 million in the third quarter, a $7 million decline from third-quarter 2016 attributable to "unfavorable performance and lower volume and mix, partially offset by a favorable impact from pricing." Textron chairman and CEO Scott Donnelly said the business jet market is "flattish." However, he said Textron Aviation is "holding firm" on new aircraft pricing and is "willing to trade volume for price." On the King Air side, Donnelly said the market for these turboprop twins is mostly outside the U.S. and has "felt the pain of the strong U.S. dollar." Backlog climbed by $142 million over the quarter, to $1.2 billion.

CONGRESS MULLS AGE 65 EXEMPTION

The House Transportation and Infrastructure (T&I) Committee is believed to have considered a possible amendment to the comprehensive FAA reauthorization bill that would extend the age 65 limit on airline pilots to certain Part 91K/135 operations, knowledgeable sources told **AIN** on condition of anonymity. As originally discussed, such a limit would apply to operations that have 100,000 flights or more annually, affecting primarily NetJets. The age 65 rule is believed to be among the topics discussed during a meeting held late this spring between the committee and NetJets executives. The committee has been assembling what one person termed a "whopper of a manager's amendment" containing numerous provisions as T&I chairman Bill Shuster (R-Pennsylvania) works to build support for the FAA bill, which also proposes the controversial air traffic control reorganization. A change to the age 65 rule would likely draw strong opposition from charter and fractional operators.

NBAA TO CONTINUE FIGHT FOR SMO

NBAA promised to continue its fight to save Santa Monica Airport (SMO) in California, but is warning operators to prepare for runway closures and construction in the wake of a district court decision to dissolve the temporary restraining order (TRO) on the city's plan to shorten the airport's runway to 3,500 feet from 5,000 feet. The runway-shortening project was expected to begin October 23, initially leading to an airport closure from 9 p.m. to 7 a.m. daily. NBAA director of airports and ground infrastructure said the association continues to fight to preserve access, pointing to its lawsuit before the U.S. Court of Appeals challenging the FAA/city settlement agreement that paves the way for the runway-shortening project.

BIZJET DELIVERIES SLOW AT EMBRAER

Embraer Executive Jets deliveries slid 20 percent in the third quarter, to 20 aircraft. Midsize models accounted for the decrease: it shipped seven Legacys in the quarter—two 450s, a 500 and four 650s. A year ago, Embraer delivered a total of 12 Legacys: six 450s, four 500s and two 650s. However, Embraer matched the number of Phenom deliveries from a year ago, handing over 13 in both third quarters. But the mix was slightly different, with more Phenom 100s shipped (four) in the most recent quarter versus just one in the year-ago period. Twelve of the 13 Phenom deliveries a year ago involved the larger 300, compared with nine in the most recent quarter. Through the first nine months, Embraer Executive Jets deliveries were 15 units shy of where they were at the same point last year.

DRONE AND AIRPLANE COLLIDE OVER CANADA

A drone struck a Beechcraft King Air 100—operated by charter operator Skyjet—on approach to Québec City Jean Lesage International Airport on October 12, marking the first such collision between a drone and a commercial aircraft in Canada, according to the Air Transportation Safety Board of Canada (ATSBC). The twin turboprop, which was carrying eight passengers on a flight from Rouyn-Noranda Airport in Quebec, sustained minor damage and landed safely. Transport Canada and the ATSBC are in contact with Skyjet, the airport, air navigation service provider Nav Canada and Québec City police, said Canadian Transport Minister Marc Garneau.

City gets green light for runway work at SMO

by Kerry Lynch

A U.S. District Court gave the general aviation community a reprieve last month when it issued a temporary restraining order (TRO) preventing the city of Santa Monica from moving forward with plans to shorten the runway at Santa Monica Airport to 3,500 feet from 5,000 feet. Then, a week later, the same court dealt the community another blow in the long-fought battle to save SMO, dissolving the TRO and denying a request for a preliminary injunction.

The move cleared the way for the city of Santa Monica to continue a long, hard-fought effort to methodically dismantle the historic airport, a step toward shuttering it altogether by the end of 2028. Airport director Stelios Makrides hailed the decision, saying the court's ruling "affirms that the legal complaints raised lack merit" and indicated that the runway-shortening work would be under way shortly.

The FAA paved the way for Santa Monica to shorten the runway by reaching a surprise "settlement agreement" with city officials in closed-door meetings earlier this year. That agreement, which marked a striking turnaround for an agency that had fought for years to preserve the airport, also allows the city to close the airport by the end of 2028.

The TRO was granted on October 8 to airport neighbor Kate Scott and pilot James Babinski. Both had undergone flight training at SMO. They argued that the city failed to comply with public hearing and certain environmental vetting requirements before forging ahead with the runway-shortening project.

Finding of 'Irreparable Harm'

The court initially determined that Scott and Babinski would "likely prevail at trial on the merits of their claim." The court also agreed that the plaintiffs met the test for "irreparable harm," necessitating a TRO based on concerns that the runway shortening would require aircraft to fly lower over neighborhoods, increasing noise. Also, the court noted the concern that flight at the lower altitude over densely populated areas "increases the risk to pilots." The court further faulted the city for failing to provide a timely objection to the TRO.

The Santa Monica Airport Association, AOPA and NBAA filed amicus briefs backing the case, stressing that the status quo will not impose additional harm to the city while the case over the future of SMO is fully heard in court. But if the city is permitted to move forward with plans, they told the court, the damage could be irreparable and have ramifications throughout the Los Angeles region.

But the city filed nearly 1,400 pages of documents to bolster its case and sought and received an expedited briefing period, providing little time for rebuttal. The city argued that the settlement agreement does not call for any action—and therefore doesn't require hearings—and that the airport plans have been fully vetted in compliance with the law. The city disputed the plaintiffs' safety case, saying a shorter runway means fewer airplanes, improving safety.

The court cited the assessment of the city's safety expert as it lifted the TRO on October 16, a week after issuing the order. The court also pointed to the FAA's safety determination. While it found earlier that the case would likely prevail, it subsequently determined that the runway-shortening project did not necessarily require public hearings. But rather, the court cited the law as saying the city "may" host public hearings. Further, the court determined that since land acquisition was not involved, the city did not need to conduct public hearings for a runway reconfiguration.

The court ruling does not end the legal challenges, but it did permit the city to shorten the runway. NBAA, along with five stakeholders at the airport, has a case before the U.S. Court of Appeals for the District of Columbia, charging that the FAA disregarded statutory requirements in signing the agreement. That case has the backing of AOPA and GAMA as "friends of the court." ❑

EMBRAER GIVES PHENOM 300 'ENHANCED' TREATMENT

NBAA 2017

Embraer introduced the Phenom 300E, an updated version of the Phenom 300, last month at the NBAA Convention. The E stands for "enhanced," according to Embraer, and refers to the jet's redesigned cabin and the addition of Lufthansa Technik's Nice HD CMS/IFE (high-definition cabin management/in-flight entertainment) system. Deliveries of the $9.45 million jet will begin in next year's first quarter.

The cabin has new seats, designed and engineered by Embraer and manufactured at sister company Embraer Aero Seating Technologies in Titusville, Florida. They incorporate extendable headrests with bolsters, extendable leg rests and retractable armrest, and the seatback has been broadened for greater support. The 300E also offers more leather and stitching options for seat customization and personalization.

The table, side ledge, sidewall and valence designs are new and the cabin is more spacious, thanks to a three-inches-wider aisle and one inch more headroom than in the 300.

An upper "technology panel" along the centerline of the cabin ceiling presents passengers with pertinent in-flight information, while allowing for convenient interaction with cabin management controls. In-flight entertainment with audio and video on demand is an option via two slender swing-down seven-inch displays. The ceiling panel has upgraded lighting with ambient mood selections, and patented flush air nozzles. Bluetooth connectivity allows passengers to view in-flight information on their personal devices.

DAVID McINTOSH

Michael Amalfitano, Embraer Executive Jets president and CEO

Much of the technology remains hidden, tucked into side ledges, for example, keeping the interior sleek and stylish, a design signature of Jay Beever, the company's v-p of interior design and architect of Embraer's so-called "future proof" cabins.

The Phenom 300E delivers a high-speed cruise of 453 knots, range of 1,971 nm with six occupants and a maximum cabin altitude of 6,600 feet. —*J.W.*

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NEWS BRIEFS Compiled by Chad Trautvetter

G500/600 Performance Exceeds Specs

Gulfstream Aerospace said the G500 and G600 will offer performance beyond earlier projections when the two jets enter service next year. The G600 will have a maximum range of 6,500 nm at Mach 0.85, 300 nm farther than originally promised. At high-speed cruise, Mach 0.90, the G600 will cover 5,100 nm, also 300 nm beyond initial projections. The G500 will be able to fly 5,200 nm at the Mach 0.85 long-range cruise speed, beating the original estimate of 5,000 nm. At high-speed cruise, also Mach 0.90, the G500 will fly 4,400 nm, 600 nm farther than originally expected.

Honda Appoints Chinese Dealer

Honda Aircraft has tapped Honsan General Aviation as the authorized sales representative in China and has applied for type certification validation for the HA-420 HondaJet with the CAAC. Honsan is based at Guangzhou Airport in Southern China, positioned to serve markets in Hong Kong and Macau, said Honda Aircraft CEO Michimasa Fujino. CAAC approval is expected to take 18 months. The HondaJet has already received approval in the U.S., Mexico, Europe, Canada and Brazil.

Max-Viz EVS Passes 2,500 Installations

The Astronics Max-Viz enhanced vision system (EVS) is now installed on 2,500 airplanes and helicopters. The system provides pilots with improved situational awareness and safety by enabling them to see more precisely during day or night in adverse weather conditions such as haze, smoke, smog and light fog, the company said. Of the 2,500 systems installed, 60 percent are on GA airplanes and 40 percent on helicopters.

VistaJet Sees Strong U.S. Growth

Since entering the U.S. market in 2014, VistaJet has experienced "unexpectedly strong growth." The membership charter firm was started in Europe 14 years ago with one Learjet 60; it now has an all-Bombardier fleet of 72 Challenger 350s and Global 5000s. The number of U.S. program members has grown threefold year-over-year, with new program hours climbing by 145 percent; flight departures were up 30 percent in the third quarter versus the same period last year; and third-quarter program hours were up 210 percent from a year ago. As a result of this growth, "We will be expanding our U.S. fleet by 50 percent in the next few months," said VistaJet U.S. president Ron Silverman.

Safran's Bizjet APU On Track

Testing on the Safran Power Units (SPU) SPU300[BA] auxiliary power unit for the Bombardier Global 7000 is progressing as expected toward certification by year-end, SPU said. It recently completed electromagnetic interference testing, "effectively concluding the certification test campaign" needed for FAA approval. Earlier tests proved tailcone compatibility, containment and altitude starting/operation and a 150-hour endurance test.

OneJet To Add CJ4s to Fleet

Pittsburgh, Pennsylvania-based OneJet, which provides scheduled business jet service in the Eastern U.S., will add two Cessna Citation CJ4s in next year's first quarter and plans to take up to 10 of the light jets per year for an expanding network. The Citations will come from the pre-owned direct inventory of Textron Aviation. Launched in 2016, OneJet now offers 180 flights per week to a dozen cities, among them Albany, New York; Cincinnati, Ohio; Hartford, Connecticut; and Nashville, Tennessee, on eight Hawker 400XPs operated by Contour Aviation. The company expects to offer 300 flights per week by year-end.

Turbine accident stats 2000-2016: bizav accounts for more than half

by Gordon Gilbert

Business turbine airplane operations accounted for more than half of all turbine airplane accidents in the U.S. between 2000 and 2016. Over that 17-year period, business jets and turboprop airplanes combined suffered 771 accidents, 236 of which caused fatalities, according to the NTSB. These numbers represent 56 percent of all turbine airplane accidents in the U.S. (including the airlines) and 96 percent of the fatal accidents between 2000 and 2016.

Turboprops accounted for 70 percent of all U.S. turbine business airplane accidents and 75 percent of the fatalities. The 48 fatal accidents involving business jets were eight times the six fatal accidents involving passenger-carrying jetliners. However, the 159 fatalities from those bizav jet accidents were 31 percent of the 507 deaths on scheduled passenger flights by much more capacious airliners. On the airline side, 260 crew and passengers perished in a single accident, and in another airline accident a flight attendant was killed during an emergency evacuation after the airliner landed.

This data is derived from an NTSB computer run, prepared for **AIN**, that provides a detailed summary of what the agency concluded was every turbine airplane mishap that occurred in the U.S. between 2000 and 2016 under Parts 91, 91K, 135 on-demand, 135 scheduled, 121 and 125 (a total of 1,407 accidents). The NTSB also provided a list of the accident rates of these operational segments for the years 2004 through 2015.

Person vs Parcel and other Non-pertinent

The purpose of this article is to focus on the private and on-demand segments in which personnel travel was the mission. As such, the Safety Board did its best to extract those aircraft and operations that didn't fit the accident criteria. Accidents involving experimental aircraft and ex-military trainers were removed. Aerial application, skydiving, public use, flight instruction and flight-testing were excluded because the NTSB deemed they "would not be relevant to your interest."

In the flight-testing category, the Safety Board did not include in the detailed accident summary data the fatal manufacturer-flown accidents during test flying of the Swearingen SJ-30 in April 2003 and the Gulfstream G650 in April 2011. Technically, however, they occurred under Part 91 and are therefore calculated into the flight hour and rate data.

In addition, **AIN** omitted from the detailed summary database 114 Part 91 and 135 on-demand mishaps and Part 121 fatal accidents involving airplanes hauling parcels or other cargo. All told, the number of relevant Part 91, 91K, 135 and 121 accidents in the 16-year period was 1,293.

Crew Type Implications

Historically, it has been a given that aircraft crewed by paid or professional pilots have fewer accidents than those flown by their owners or other non-paid crew. A fact it might be, but quantifying it is another matter. The NTSB divides general aviation accident statistics into five mission-based categories: corporate, positioning, air taxi, business and personal. Data shows that aircraft within the first three mission categories are almost always flown by paid pilots. The Safety Board's business flight category consists primarily of aircraft with unpaid pilots.

Ascertaining the crew status for all personal missions, however, presents a problem. Accident reports in which the missions are labeled personal don't always provide a distinction between paid and unpaid crews (although some reports have referred to the pilot as the airplane's owner). Because **AIN**'s investigation of accident reports in the personal category shows that the overwhelming majority were being flown by non-paid pilots, references to paid pilots in this article apply only to those flying corporate, positioning and air-taxi missions.

In the 17-year period studied, jets being flown by salaried crews under corporate Part 91 were involved in just seven fatal accidents, only one more than Part 121 jetliners during the same time frame. However, adding positioning and air-taxi flights to the mix results in 29 fatal accidents involving aircraft flown by paid pilots, or four times as many fatal crashes as Part 121 jets. The 19 fatal accidents attributable to business and personal Part 91 jets were three times as many as under Part 121.

The 12 fatal crashes of jet aircraft on positioning flights accounted for 34 percent of all Part 91 fatal accidents, and the 28 deaths from positioning missions represented 30 percent of all fatalities from Part 91 accidents. Bizjets operating under on-demand Part 135 suffered 10 fatal accidents.

Fatal crashes represented 20 percent of all 241 business jet accidents, but the 188 fatal crashes of turboprops accounted for 35 percent of all 530 propjet accidents. Turboprops being flown under corporate and business missions were involved in 15 fatal accidents each. Fatal accidents represented half of all the Part 91 corporate turboprop accidents but only a quarter of those in the Part 91 business

Continues on page 42 ▶

U.S. Turbine Business Airplane and Airline Accidents • 2000-2016

		Part 91 Business	Part 91 Pers	Part 91 Corp	Part 91 Pos/Ferry	Part 135 Air Taxi	Total All GA Ops	Part 135 Schd	Part 121 Schd/Nsched
JETS	Total	33	49	47	64	48	241	0	415
	Nonfatal	29	34	40	52	38	193	0	409
	Fatal	4	15	7	12	10	48	0	6
	Fatalities	11	32	33	28	55	159	0	507
TURBOPROPS	Total	61	212	36	76	145	530	33	74
	Nonfatal	46	117	21	55	103	342	27	70
	Fatal	15	95	15	21	42	188	6	4
	Fatalities	39	243	51	35	114	482	26	103

Part 91 Corp includes three Part 91K nonfatal jet accidents and three Part 91K turboprop accidents.
**Accidents involving cargo-only flights are not included. Source: NTSB*

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NEWS BRIEFS Compiled by Chad Trautvetter

Hemisphere Order Book Now Open

Textron Aviation opened the order book during the NBAA Convention last month for the $35 million Hemisphere, which will sit atop the product line as the company steps into the large-cabin market. The 4,500-nm, Mach 0.90 aircraft is attracting interest from across the board, from corporate operators and fleet owners to individual operators, said Textron Aviation senior v-p sales and marketing Rob Scholl.

Tamarack Adds Winglets for 560XLs

Tamarack Aerospace is expanding Cessna Citation offerings, adding the 560XL series to the list of Atlas active winglets applications, the company announced last month. It is undertaking a certification program to install the winglets on the Excel, XLS and XLS+, and has formed a partnership with Innova Aerospace to offer the winglets as part of the "myC560" Citation Ultra and Encore upgrade program. The company expects STC approval for the series will take two years. The 560XL series expands a portfolio for the winglets that already includes the Citation CJ, CJ1, CJ1+ and M2. In addition, approvals for the CJ3/CJ3+ are expected to follow late in the first quarter next year and for the CJ2/CJ2+ a few months after that. It is also working on winglets for the Citation Mustang.

Nextant Completes G90XT Test Program

Nextant Aerospace has completed certification trials for the King Air G90XT's new single-lever power control system, paving the way for expected FAA certification by the end of this month, with EASA validation to follow. The system allows each engine to be controlled with one lever, leaving pitch control to the Fadec. The remanufactured King Air adds Garmin G1000 avionics and a digital pressurization system. It also offers 20 knots more speed at altitude and a new cabin and environmental system.

Industry Starts Countdown to Corsia

The countdown has begun for aircraft operators and governments to prepare for the carbon offsetting and reduction scheme for international aviation (Corsia). Creation of the program was approved by governments meeting at the ICAO General Assembly in October last year. Corsia has been designed to offset the growth in carbon dioxide emissions from international aviation after 2020. The first six years of the program will be voluntary for nations to join and then it will be mandatory "for all but the smallest aviation markets." Operators affected by Corsia will need to offset their emissions from Jan. 1, 2021, but the program comes into effect before then, with compliance required as early as one year from now. Corsia has two parts: monitoring of emissions and offsetting. With few exceptions, all operators that fly international routes will need to start monitoring and reporting their fuel use to governments in 2019.

Garmin Unveils New Weather Radar

Garmin has introduced a weather radar that incorporates automated atmospheric threat assessment. The Doppler-based GWX 80 also features automatic 3D volumetric scanning, predictive wind-shear detection, hail and lightning prediction and advanced ground-clutter suppression. The GWX 80 has fully automated tilt management that prevents pilots from over scanning or under scanning. Predictive wind-shear detection is provided and is fully automated through takeoff and landing, giving pilots aural wind-shear notifications and visual identifications on a dedicated Garmin display. A high-definition color palette enables pilots to more easily interpret individual storm severity or multiple storm cells. Garmin expects to receive TSO approval by year-end.

Dassault will have to wait still longer for the Falcon 5X to join the 7X and 8X in service.

NBAA 2017

Dassault Falcon 5X facing another engine delay

by Matt Thurber

The Silvercrest engine for the Falcon 5X has encountered a new problem during testing that might further delay the aircraft program, engine maker Safran Aircraft Engines informed Dassault early last month.

Dassault test pilots have flown the 5X for 50 hours with preliminary "non-production" engines since the new Falcon first took to the sky on July 5. During testing, the aircraft reached 41,000 feet and Mach 0.85. "Pilot feedback on aircraft handling qualities has been extremely positive, with excellent system performance in all conditions of flight, and aerodynamic behavior has been exactly as predicted," Dassault chairman and CEO Eric Trappier said last month at the NBAA Convention.

Entry into service for the 5X had already been rescheduled to 2020 because of earlier problems with the Silvercrest engine, but the full effect of the new problem has yet to be determined. The program "will have to be postponed again," he said. "It will take a few more weeks for measuring all the consequences of this very unfortunate issue and define an appropriate solution. We're trying to fix the program with Safran and trying to keep all our options open. The problem is a serious one."

"Recent testing in our flying test-bed in San Antonio [Texas] does not completely meet our expectations," said Cédric Goubet, executive vice president of Safran's Commercial Engines Division. He explained that all technical fixes for the problems from two years ago that originally delayed the 5X program have been validated and incorporated into the design. The new problem has to do with the responsiveness of the high-pressure compressor at high altitudes, he explained. "The compressor is a bit too slow to accelerate and decelerate. We have a good understanding of the issue. There are several solutions that we have to discuss with the customer. Safran is absolutely committed to delivering the right engine, and we will get there."

Trappier went on to address questions about Dassault's newest business jet program, about which he revealed few details. "Our design engineers are actively working on a new model," he said, "and some of our partners are already getting involved in concept design." What makes the new program significant is that it will be fully [conceived] within the Dassault Systèmes 3D Experience digital design system, which incorporates all elements of a product, from design to manufacturing to product support.

"We are now entering a new era, one that emphasizes a fully collaborative development approach," he explained. "One that streamlines information exchange between corporate divisions and between outside partners, ensuring that all participants are perfectly integrated into the project." ❑

SAFRAN PLANNING FIX FOR SILVERCREST COMPRESSOR ISSUE

During recent testing of the Silvercrest engine, Safran Aircraft Engines discovered a new issue that might affect entry into service of the Silvercrest-powered Dassault Falcon 5X. Safran executives told **AIN** at the NBAA Convention last month that fixing the issue should not affect the timeline of the Silvercrest-powered Cessna Citation Hemisphere.

"We are confident we will fix this by the time the Hemisphere is at the same stage of development as the 5X," said Cédric Goubet, executive v-p of Safran's commercial engines division.

The issue was discovered during airborne testing of a Silvercrest mounted on Safran's Gulfstream II flying testbed (FTB) in San Antonio, Texas. The problem didn't manifest itself during takeoff or landing or normal operations, but only at high altitude during engine-responsiveness tests, according to Goubet. "The high-pressure [HP] compressor was a bit too slow to accelerate and decelerate," he explained.

MARIANO ROSALES

With some 800 test flights completed, Safran's Silvercrest engine now faces scrutiny following compressor problems discovered during high-altitude operations.

The compressor problem "has really been highlighted in the FTB," explained Michel Brioude, general manager of the Silvercrest program. More flight-testing is planned, as well as testing in a high-altitude test chamber. These tests will help Safran engineers refine the best solution, which could include improving the HP compressor airflow.

The HP compressor is a four-stage axial design with a single centrifugal impeller. The Silvercrest delivers 11,500 to 11,900 pounds of thrust and has a bypass ratio of 5.9:1.

"We have a good understanding of the issue," said Goubet. "There are various solutions, and we have to design the most efficient one."

He added that Safran can't yet supply a timeline for the fix. The most recent plan was to achieve certification of the Silvercrest in the spring of next year, in preparation for the 5X to enter service in 2020.

The testbed engines have logged 800 flights, and the engine on which the problem was discovered had run in the GII FTB for 90 hours (30 hours on the ground and 60 hours in the air). The compressor problem was discovered during a test that was pushing the engine to its operational limits. In normal operations, pilots wouldn't even notice the lack of HP compressor responsiveness, he said.

"This was disappointing to discover," Goubet told **AIN**, adding, "We are confident and committed to come up with a robust solution." —*M.T.*

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NEWS BRIEFS Compiled by Chad Trautvetter

Honeywell HTF7700L Gets FAA Nod

The Honeywell HTF7700L turbofan that powers the Cessna Citation Longitude received FAA approval early last month. This certification marks the sixth application of the HTF7000 series, variants of which are already in service on the Challenger 300 and 350, G280 and Legacy 450 and 500. The Longitude is expected to enter service early next year.

UBS Bizjet Index Jumps in September

The latest UBS Business Jet Market Index jumped 10 percent from the August survey as respondents noted healthier pre-owned business jet inventories and improved pricing, as well as higher customer interest. Now at 53, the index score returns to its post-U.S. election high and denotes an improving market. The overall index reflects an improved view of pre-owned aircraft pricing and inventory, up 24 percent and 22 percent, respectively, along with higher customer interest, which rose 11 percent. North American customer interest warmed by 11 percent and remains strongest at a score of 70, followed by an "improving" Europe (56), while Asia (51), Latin America (48) and the Middle East (47) "appear stable to slightly improving."

Wheels Up Eyes U.S. Growth

Wheels Up raised $117.5 million of equity last month, taking the company's equity close to $700 million, with an enterprise value of $1 billion. According to company founder and CEO Kenny Dichter, this latest round of financing will be used to fund continued growth of the company's aircraft fleet, which currently numbers 80 airplanes: 65 King Air 350is purchased new and 15 pre-owned Citation XLSs. The membership-based company has 45 King Airs on order with Textron. Wheels Up expects to add another 20 aircraft to the fleet next year.

Larry Flynn Joins Aviation Finance Firm

Capital Aviation Group (CAG), a new division of Cars (Capital Automotive Real Estate Services), has hired former Gulfstream Aerospace president Larry Flynn to the advisory board as it moves toward the first deal that replicates for FBOs and airports the successful model applied by Cars for automotive dealers and premises. Flynn told **AIN** that the financing would be for "airports, FBOs or anyone who has a need for financing of property on an airport. This could be anything from a fuel farm, to a hangar or FBO, to infrastructure, but not rolling stock or aircraft."

Daher Marks 200th 900-series TBM

Daher delivered the 200th 900-series TBM—a TBM 910—to U.S. distributor Cutter Aviation last month. The milestone delivery comes as Daher emphasizes growing commercial operations of the TBM 910 and TBM 930. "In the two years since we began promoting TBM-series aircraft for charter and for-hire applications, commercial operators' interest in single-engine turboprops has steadily risen," said Nicolas Chabbert, senior v-p of Daher's airplane business.

FAA Mulls Canceling Circling Procedures

In a proposed cost-cutting measure, the FAA is considering eliminating certain circling procedures, including circling-only instrument approaches and circling minimums charted on straight-in procedures. "As new technology facilitates the introduction of area navigation instrument approach procedures over the past decade, the number of procedures available in the National Airspace System has nearly doubled. The complexity and cost to the FAA of maintaining these procedures...is not sustainable," the agency said.

Flexjet fleet in rapid growth mode

by Matt Thurber

The October 4 delivery of Flexjet's largest airplane, a Gulfstream G650, marks the fractional-share operator's move into a new realm of service for customers who want to fly long-range trips. Flexjet celebrated the arrival of the new jet on October 6 during a ceremony at its Cuyahoga County Airport headquarters in Cleveland, Ohio. The company's second G650 joined the fleet a week later.

"We've been envisioning this for many years," said Flexjet CEO Michael Silvestro. The two G650s are part of a $2.5 billion, 50-airplane order that Flexjet made with Gulfstream three years ago. Flexjet also became the exclusive fractional-share provider for the G650, G650ER and G500.

So far Flexjet has taken delivery of seven G450s, and early next year expects to take delivery of its first G500, for which it is the North American launch customer. Four G500s will join Flexjet next year. Customers have been asking for longer-range trips, Silvestro explained, adding that Flexjet will use the new jets in the Global Access program for international travel and to supplement existing lift.

The G650s are part of Flexjet's Red Label fleet, which assigns dedicated flight crew to each jet. As there won't be enough G650s in the fleet in the short term, Flexjet plans to offer quarter shares to buyers who want to fly long trips. "We can't oversubscribe a fleet that isn't there yet," Silvestro said.

MATT THURBER

Flexjet CEO Mike Silvestro, left, and chairman Kenn Ricci celebrate the arrival of the company's Gulfstream G650.

The order covers six G650s, and the remaining four will be delivered in 2019.

The Flexjet G650s are equipped with a customized four-zone interior with two staterooms. The aft stateroom can double as a crew rest area if a trip is long enough to require an augmented crew. There is also a crew rest area near the forward galley. Flexjet is adding its own interior modification to the G650s, a cabinet with a 42-inch TV and a stowable ottoman opposite a divan in zone three that Flexjet certified itself.

Flexjet now operates 160 airplanes, and deliveries scheduled for the next few months will add another Phenom 300, five Legacy 450s and six Challenger 350s. The Red Label fleet offers the Legacy 450 and larger jets.

The Gulfstream order reflects a shift in Flexjet operations away from lighter aircraft. "We made a decision to put our capital focus on larger aircraft," said Flexjet chairman Kenn Ricci. "Uber-ization seems to be coming to the light end of the market. It doesn't seem that you're going to uberize large aircraft because uberization by definition seems to be targeted toward cost. NetJets gave us an opening. We thought three years ago, 'How could we compete against NetJets? They're bigger and they have more airplanes. That's our opportunity. We can be a boutique, be specialized and have this Red Label program. When Gulfstream gave us this exclusivity, that was pretty big for us, to be able to represent such an iconic brand."

At the ceremony, Ricci thanked Flexjet employees for helping build the company. "The G650 is evidence of what we can accomplish," he said, "99,000 pounds of evidence, but I think it also says something about where we're going, faster, farther and higher."

Ricci also praised the employees for their contributions during recent natural disasters. "I'm proud about this company," he said. "When I think of what this company did to retrieve people from Florida as the hurricanes were approaching, and then to get them back down there…then I saw this company come together for Puerto Rico. I saw us bring supplies there and saw people donate money to help the people of Puerto Rico." ❑

Congress Buys Six More Months as ATC Debate Roils

The seemingly unending cycle of short-term FAA authorization extensions continues under the latest stop-gap measure passed in late September. That measure extends the agency's programs through March 31, buying Congress six more months to hash out a long-term bill.

Whether Congress can reach agreement on a long-term bill before then remains in doubt, as neither the House nor Senate has been able to pass its respective FAA reauthorization bill, let alone come to agreement on the key sticking point: air traffic control reorganization.

The House proposal to create an independent, user-funded ATC organization continues to hold up its version of the FAA reauthorization bill, H.R.2997. But House Transportation & Infrastructure (T&I) Committee chairman Bill Shuster (R-Pennsylvania) has come close to bringing it to the floor on a few occasions. The House Rules Committee twice opened H.R.2997 to amendments, but has not yet set the parameters for consideration of the bill. Nor has the House leadership placed it on the calendar for a vote.

Even so, business aviation advocates note that Shuster is chipping away at naysayers in the House and is believed to be engaged in a full horse trade to get those votes. This strategy apparently includes promising a trucking amendment that matters to certain of the ATC reorganization opponents. One lobbyist noted that a "whopper of a manager's amendment" is believed to be in the works.

Shuster also is picking up key allies. NetJets wrote the T&I committee saying, "We welcome your innovative approach to modernizing and reforming the current system."

The proposal still has strong opposition in the Senate, so it would have a difficult climb in that chamber even if it gets through the House. However, the four-year Senate FAA reauthorization bill, S.1405, which has no such ATC provision, also is stuck, apparently over an attempt to change the 1,500-hour requirement for Part 121 pilots.

While the path forward looks murky, opponents of ATC reorganization are unable to rest easy in light of progress made in the House. The issue took center stage during last month's NBAA Convention. NBAA hosted a multi-pronged effort to encourage attendees to reach out to their lawmakers in opposition. Also, the heads of a half-dozen business and general aviation associations warned against what National Air Transportation Association president Martin Hiller termed the "airline-ization" of ATC.

NBAA president and CEO Ed Bolen called the proposal "potentially the biggest threat we have ever seen," and Experimental Aircraft Association chairman Jack Pelton said the outcome could be catastrophic. *—K.L.*

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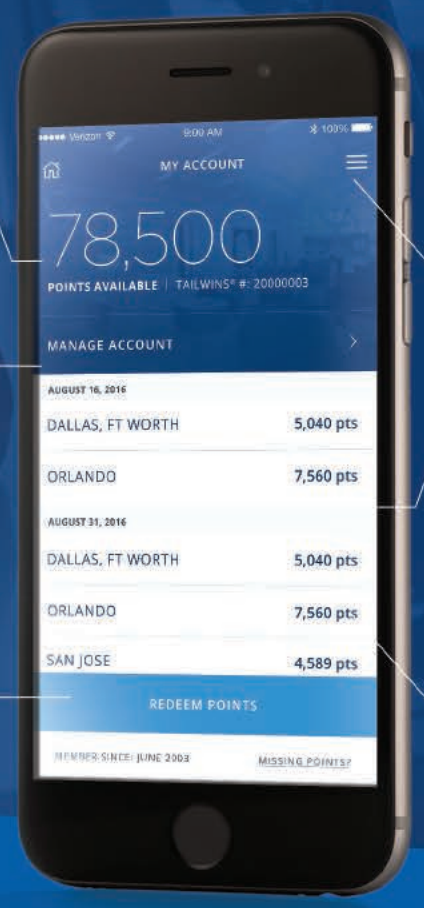

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NEWS BRIEFS Compiled by Chad Trautvetter

Satcom Direct Launches LTE Hub

Satcom Direct has launched a compact SD LTE Hub that provides connectivity for helicopters, turboprops and light and midsize business jets. The router, which has received FAA PMA approval, supports the latest cellular, Wi-Fi and satellite technology. It incorporates an 802.11ac Wi-Fi access point that supports data transfer rates of up to 867 Mbps in the cabin. On the ground, high-speed connectivity is delivered to the aircraft through LTE cellular data; in the air, the router connects with the aircraft's air-to-ground network or satcom system. The router is compatible with L-, Ku- and Ka-band satellite networks.

EASA NPA Would Ease Non-Etops Ops

The EASA has issued a notice of proposed amendment (NPA) that would permit larger European-certified multi-engine business jets with 19 passenger seats or less used in on-demand air charter service to operate with 120- to 180-minute one-engine inoperative (OEI) diversion times without obtaining approval for extended-range twin-engine operation performance standards (Etops). Without an exemption, an Etops approval is required for OEI diversion times that are more than 60 minutes. This NPA proposes to raise the current non-Etops operation mtow threshold to 133,000 pounds from 100,000 pounds. The NPA would also remove the specific type design approval for non-Etops operations between 120 and 180 minutes. Essentially, the rule would harmonize EASA requirements with those of the U.S., Canada and Australia. Comments on the NPA are due by Jan. 3, 2018.

Zetta Jet Bankruptcy Case, Ops Continue

Zetta Jet, which filed for U.S. Chapter 11 bankruptcy restructuring in September, has received several favorable court rulings that will enable the company to continue with bankruptcy proceedings and pay key debtors. The court also agreed to the company's request for a court-appointed trustee to manage the restructuring process. The U.S. court agreed to join the Zetta Jet Pte. and Zetta Jet USA bankruptcy cases and further granted the request for a trustee. Zetta Jet president and CEO Michael Maher said, "We believe that having an independent and impartial trustee...is the best course to ensure smooth operation…throughout the proceedings." The court also granted Zetta Jet's petition to pay certain critical vendors to enable the company to continue operations.

Bill Aims To 'Clearly' ID Aircraft Owners

Proposed legislation aimed at clearly identifying the owner of an aircraft is now winding its way through a U.S. House subcommittee. The Aircraft Ownership Transparency Act of 2017 (H.R.3544) requires that the "beneficial" owner of an aircraft is clearly identified before that aircraft can be FAA registered. The legislation defines a "beneficial" owner as a person who, directly or indirectly, exercises control over the aircraft through "ownership interests, voting rights, agreements or otherwise; or has an interest in or receives substantial economic benefits from the assets of the covered entity." In the case of an aircraft owned or controlled by more than one entity, the legislation requires identification of the relationship between entities. Additionally, in the case of a trust or association, the legislation calls for a "chain of control" to show the identities of the owner, trustee and beneficiary.

Bizav fatal accidents rise

by Gordon Gilbert

Fatal accidents worldwide involving business jets and turboprops were up 42.8 percent year-over-year in the first nine months while fatalities climbed by 43.5 percent, according to data compiled by **AIN**. There were 20 fatal accidents involving business jets and turboprops combined in the first three quarters of this year compared with 14 fatal crashes in the same period last year.

Business jets logged five fatal accidents in the first three quarters, up from two fatal accidents in the same time last year. The number of fatal turboprop accidents rose by three, to 15.

There were no fatal U.S.-registered business jet accidents in the third quarter of this year, but there were two accidents involving U.S.-registered business jets in the first half, compared with one accident in the year-ago span. All were being flown under Part 91.

On March 24, a Citation 500 being flown IFR under Part 91 by a private pilot 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 "steering problems."

On May 15, a Learjet 35 crashed during the turn for a circling approach into Teterboro. The two pilots were killed on the Part 91 positioning flight from Philadelphia. The aircraft was "less than a mile" from Runway 6 on the ILS approach when it crashed during the right turn for the circling approach to land on Runway 1. Both accidents are under investigation.

Fatal accidents involving non-U.S.-registered business jets also surged, with three crashes, compared with just one accident in the same period last year. On May 17, a Mexican-registered, privately operated Learjet 25 crashed seconds after takeoff, killing the two pilots. On July 4, all nine people aboard a Venezuelan-registered Gulfstream III perished when the aircraft crashed into the sea. Five people lost their lives in another crash into the sea by a Venezuelan-registered jet, a Learjet 25D.

Fatal accidents involving U.S.-registered turboprops doubled from four in the first nine months of last year to eight in the same period this year. This year, two of the fatal accidents occurred under Part 135 compared with one Part 135 fatal crash last year. Part 91 accounted for the remainder.

Fatal crashes involving non-U.S.-registered business turboprops declined year-over-year by one, to seven. ❑

U.S.-registered Business Jet and Turboprop Accidents/Incidents Worldwide

(First Nine Months 2017 vs. First Nine Months 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	**7**	**7**	**5**	**6**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**
Nonfatal accidents	5	6	3	5	1	0	1	1	0	0	0	0
Fatal accidents	2	1	2	1	0	0	0	0	0	0	0	0
Fatalities	3	2	3	2	0	0	0	0	0	0	0	0
Incidents	32	17	25	11	1	4	6	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	**25**	**25**	**16**	**19**	**0**	**0**	**8**	**5**	**1**	**1**	**0**	**0**
Nonfatal accidents	17	21	10	17	0	0	6	4	1	0	0	0
Fatal accidents	8	4	6	2	0	0	2	1	0	1	0	0
Fatalities	17	15	13	9	0	0	4	4	0	2	0	0
Incidents	43	29	36	25	0	0	7	4	0	0	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	**8**	**2**	**4**	**2**	**2**	**0**	**2**	**0**	**0**	**0**
Nonfatal accidents	5	1	2	1	2	0	1	0	0	0
Fatal accidents	3	1	2	1	0	0	1	0	0	0
Fatalities	16	2	7	2	0	0	9	0	0	0
Incidents	8	14	7	9	0	2	0	3	1	0

Business turboprops	Total		Private		Charter		Other*		Unknown	
	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016
Total accidents	**23**	**18**	**15**	**7**	**5**	**8**	**3**	**3**	**0**	**0**
Nonfatal accidents	16	10	10	4	4	4	2	2	0	0
Fatal accidents	7	8	5	3	1	4	1	1	0	0
Fatalities	30	27	19	11	5	10	6	6	0	0
Incidents	6	7	2	3	1	1	3	3	0	0

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

***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. ■

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Business aviation and addiction

by Pete Combs

Corey Slone was having a tough day when he stepped onto the flight deck of an airliner at Miami International Airport one hot day in 2002. He had slept through his wake-up calls at the hotel. He was still drunk from the night before.

Slone caught a hotel shuttle to the airport and made it through security to the aircraft moments before it was scheduled to depart. "I got on the aircraft and stowed my bag," he said. "I started asking myself, 'OK. What do I need to do to get this thing going?'"

That's when the bottom fell out. "Within about a minute, an ops person and the captain show up and say, 'Hey, maybe you should get all of your stuff and get off the airplane.'"

Slone had been found out. He was ordered to take a DoT Reasonable Suspicion test. The result: his blood alcohol content was .156 percent—almost four times the maximum legal amount as defined by the FAA. It was 10 hours since he had stopped drinking the night before.

Alone back at the hotel, Slone was overwhelmed by humiliation and fear, realizing that his drinking was about to cost him his aviation career. The incident cost Slone his FAA medical certificate, his ratings and, therefore, his flight status. But because he worked for a major airline, he was able to take a pilot's single path back to the flight deck. He was accepted by the Human Intervention Motivation Study—HIMS.

Support for Airline Crew

HIMS began in 1974 as a study of substance abuse among flight crewmembers spearheaded by the Air Line Pilots Association (ALPA) and funded by the National Institute for Alcohol Abuse and Alcoholism (NIAAA). It was a test program, aimed at helping recovering pilots find a path back to flight status. From that point, the FAA began treating addiction as a medical condition rather than a moral failing.

"Before 1974, if you were diagnosed with alcoholism, the FAA terminated your medical certificate, rendering you ineligible to fly," explained Slone, now the National HIMS chairman and chairman of the HIMS Advisory Board.

Under HIMS, pilots battling addiction are supported by a team of both flight and medical professionals. "Aviation medical examiners [AMEs] are part of the team," said Dr. Michael Berry, the FAA's Federal Air Surgeon. "That person acts as a sort of conductor…to make sure that all the various pieces fit together." Berry oversees the Special Issuance of a Medical Certificate program under FAR 67.401, the document that serves as the backbone.

In addition to AMEs, each team has a mental-health professional who specializes in addiction. There is a peer pilot—someone from within the addicted pilot's own organization, preferably someone who has battled addiction and successfully returned to flight. There is also a management pilot from within the recovering pilot's company, who frequently assesses the addict's progress both in recovery and in returning to the cockpit. There are often other team members, such as Employee Assistant Program (EAP) representatives and a neuropsychologist to assess the physical effects of addiction in each case.

Like most of the 6,000 pilots who have successfully participated in the HIMS program since 1974, Slone entered a drug and alcohol rehabilitation facility, a residential program where he began his long, often difficult road to recovery. He entered a 12-step program. Most important, Slone said, he admitted that he had a drinking problem. "It's very humbling to climb back into a small airplane again and have to regain your certificates," he said. Almost two years from the day he was pulled from the flight deck at Miami International, Slone was back in uniform.

Over the past 43 years, Berry said, airlines have become strong partners in the process of returning a recovering addict to the flight deck. Each carrier has its own individual process, often involving ALPA or other pilot unions.

Bizav Pilots on Their Own

Berry, Slone and others describe airline participation in the HIMS program as "robust." However, they say the situation for pilots involved in business aviation is much different.

"There are no organized efforts within business aviation to implement a program broadly," said Dr. Quay Snyder, program manager for the FAA/ALPA HIMS organization and long-time member of the NBAA Safety Committee. In the realm of business aviation, "Most companies continue to treat this as a behavior and terminate someone with this medical problem."

Berry concurred, saying the HIMS program is often identified within general aviation as "that program for airline pilots." Because flight departments in business aviation are much smaller than the airlines, business organizations often cannot support a pilot battling addiction through the nine to 24 months generally needed for a pilot to complete rehab and meet the requirements for returning to flying.

"The perception…is that alcoholics or drug abusers are morally corrupt people, and owners or flight department managers simply don't want people like that in the company," said Berry.

But businesses understand things when stated in business terms, said Snyder. "From a financial perspective… the data today makes it entirely appropriate to look at something in the neighborhood of a 25 or 30:1 return on investment," he added, pointing to the financial justification for retaining a pilot through the recovery process and eventual return to flight.

Snyder advocates the incorporation of a HIMS program into the safety management systems (SMS) of business aviation operations worldwide, likening it to SMS requirements for crew rest. ❑

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Lessons on emergency planning from Hurricanes Harvey & Irma

It's hard to watch the devastation from the recent hurricanes without—of course—feeling compassion for all the people affected by them in Texas, Florida and the Caribbean. The loss of lives and destruction of property is heartrending, and rebuilding will take months, if not longer. As a long-time emergency planner and one-time director of emergency planning at the University of Saint Louis, I look at the government's and private industry's emergency efforts and think of the plans I've helped put in place or consulted on. How would they have fared under these massive, rapidly changing events? And what lessons can we draw from what went well and what didn't?

I have learned a few lessons from the days immediately after the disasters have struck and recovery is in its early stages. I'm sure there will be more lessons to be learned when response plans are analyzed and after-action reports are written. It will be important for all of us to review those reports and update our own personal and business emergency plans by drawing on the insights gleaned from these disasters.

The first thing that was emphasized, for me, once again is the importance of not only having an emergency or disaster plan but also of updating it regularly and testing it periodically. The days before disaster strikes is obviously not the time to pull the plan off the shelf and dust it off.

From what I've heard from talking informally with aviation businesses affected by Harvey and Irma, those with plans in place that were regularly reviewed, updated and tested seem to have fared better in managing the crisis during the storms, and they seem to be on a clearer path to recovery. Of course, time will tell.

Operators with an Argus Platinum rating are required to have a well developed Safety Management System (SMS) and a tested Emergency Response Plan to obtain and maintain that rating. Part 121 operators have to comply with the FAA's recent SMS regulations, which require "an emergency response plan that provides for the safe transition from normal to emergency operations." The emergency response plan must include, at minimum: delegation of emergency authority throughout the certificate holder's organization; assignment of employee responsibilities during the emergency; coordination of the certificate holder's emergency response plans with the emergency response plans of other organizations it must interface with during the provision of its services.

These requirements are a good starting point for preparing emergency response plans.

Disaster Planning Beyond the Regs

The other point that was again brought home to me is the importance of the person who's put in charge. Both Harvey and Irma show the importance of having people in those jobs who can pivot quickly and smoothly when emergency situations change. With Irma, for example, storm preparations were well under way on the expectation that the hurricane would hit Florida's east coast. Only a couple of days before landfall, the storm's eye shifted and the impact was falling primarily on the west coast. People who can handle a quickly changing, dynamic situation will be the ones you want to be in charge to execute the plan when disaster happens.

Finally, it's important to keep up with new technology that could help your business prepare for a disaster, cope during the disaster and assist in the aftermath. One new technology that got its first full disaster demonstration in Harvey—and was later used in Irma—is drones.

FAA Administrator Michael Huerta commented recently that "you only have to look at the recent flooding in Texas after Hurricane Harvey to see what a transformative role drones are playing. After the floodwaters had inundated homes, businesses, roadways and industries, agencies sought FAA authorization to fly drones in airspace covered by TFRs. We recognized that we needed to move fast, faster than we have ever moved before. So we basically made the decision that anyone with a legitimate reason to fly an unmanned aircraft would be able to do so. In most cases, we were able to approve individual operations within minutes of receiving a request."

John Goglia is a former member of the NTSB and currently a safety consultant. He welcomes your e-mails at gogliaj@yahoo.com.

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

Turboprop single ops could boom in Europe

by Ian Sheppard

Reflecting on the March 1 EASA rule allowing operators to provide commercial single-engine turboprop (SET) operations in instrument meteorological conditions (IMC), those attending the SETOps2017 conference at the Royal Aeronautical Society in London on September 29 pondered whether single-engine turboprops will stimulate a new era of growth for business aviation in Europe or if it's just hype. While activity has risen sharply from a low base so far this year, it remains to be seen whether widespread SET operations will evolve in Europe. However, one thing the conference attendees did agree on is that new business models offered by the likes of Wheels Up and Surf Air will help to stimulate the market.

Opening this year's event, conference chair James Dillon-Godfray, business development director at London Oxford Airport, said, "We had to wait 20 years for the EASA to sanction the use of single-engine turboprops in IMC. We're way behind the curve here in Europe." He noted that some operators, such as Hendell Aviation, had already started commercial SET operations before the rule, using exemptions. He also noted that turboprop singles will be able to operate to "three times [as many] airports" as current turboprop twins, "potentially adding 1,000 new routes [across Europe]."

More Flights, More Airports

Small airfields, especially those that offer GPS/LPV 200 approaches "equivalent to Cat I," represent "one of the keys," Dillon-Godfray said. Among the provisions in the new SET rule are a requirement for pilots to have 100 hours of pilot-in-command experience in IMC for single-pilot operations, extensive engine trend monitoring and strict flight-planning requirements, such as having "safe landing sites within 15 minutes' gliding time all along a route."

Currently, he noted, three types have been approved for SET-IMC: the TBM 900 series, Cessna Caravan and Pilatus PC-12, but it's likely that the Quest Kodiak and in-development Cessna Denali will be added in the not-too-distant future.

Richard Koe of WingX noted that while SET activity is "growing quickly," so far only 7 percent is commercial/AOC, and the rest is private. The turboprop-single fleet in Europe currently numbers 330 aircraft. Overall, the number of commercial SET flights has climbed by 72 percent from a year ago, he added.

Adam Twidell, founder and CEO of online broker PrivateFly, is predicting that "customers will be predominantly new to business aviation," but warned about non-AOC aircraft doing illegal charter flights, undercutting legitimate commercial operations.

A "trailblazers" session featured speakers from Hendell Aviation, Voldirect and Jet Fly, which are already conducting commercial SET operations in Europe. Frederic Caussarieu, president of French operator Voldirect, said, "People realize that turboprops can be fast, efficient—with lower carbon dioxide emissions—so they are the future. Customers also realize we can use shorter airstrips, which get them closer to their destination. [SETs also offer] more value for money." ❑

Management Company

The decision to keep a flight department in house or outsource it to another company can be a matter of corporate culture.

More options are available, and owners count control, costs and complexity among the issues

by James Wynbrandt

Today the perennial either/or question of the best way to manage and operate business aircraft is colored by the growing complexity of operations, demands for more accountability and transparency, and new support options available to owners regardless of their management structure. Yet whether to use a management company or operate through a company flight department remains often as much a cultural decision as a logical one. Conklin & de Decker has no data on any operational cost differential between the two, and David Wyndham, president and co-owner of the consultancy, said he's seen no evidence of a shift in either direction. For every case of a company electing to put its flight department under a management company, another opts to manage its own. But the shifts are occurring. Here are some of the factors driving the activity, and their effects on those seeking to find or offer the best management arrangement.

Priester Aviation has seen "a spike in interest from flight departments looking at other methods of managing their aircraft resources," said Charlie Hughes, senior vice president management sales at the company. Often the growing complexity of today's operations and regulatory environment "paves the way" for exploring the management option, Hughes said.

Charlie Hughes, senior vice president management sales at Priester Aviation

"A flight department with only a couple of airplanes, three or four pilots and a couple of mechanics…may simply not have the resources, time and personnel to keep up."

Hughes and other operations professionals are quick to clarify that it's not flight departments themselves, but rather the executives they answer to who typically reach out to management companies. "It's not unusual for the flight department to report to the vice president of HR, and the vice president of HR doesn't know beans from apple butter" about aviation, Hughes said. "They feel some wisdom in having a team of aviators making sure they're abiding by best practices."

At Solairus Aviation, chairman and CEO Dan Drohan reports an increase in flight departments among its new management clients. "Somebody [at these companies] is saying, 'It makes sense for these people and these assets to be managed and handled and housed in an entity that is separate from our core business,'" said Drohan. Such owners see third-party management "as a way to bundle it all together, and get a statement at the end of the month that says, 'Here's what it cost you to own your airplane.'"

Solairus Aviation chairman and CEO Dan Drohan

Meanwhile, perhaps in response to growing operational complexity, Don Haloburdo, vice president and general manager of flight services at Jet Aviation, sees "more first-time buyers opting to have the aircraft managed rather than go through all the steps it takes to set up their own flight department." Yet Conklin & de Decker's Wyndham, while acknowledging a good management company is "potentially a godsend" to new owners, believes "a well run Part 91 flight department" is fully capable of operating independently, and internationally, particularly with resources such as NBAA and an expanding array of support services. "If it's a single ship and a single global business, [flight-planning services] Universal and Jeppesen are more than willing to step in and support them," Wyndham noted.

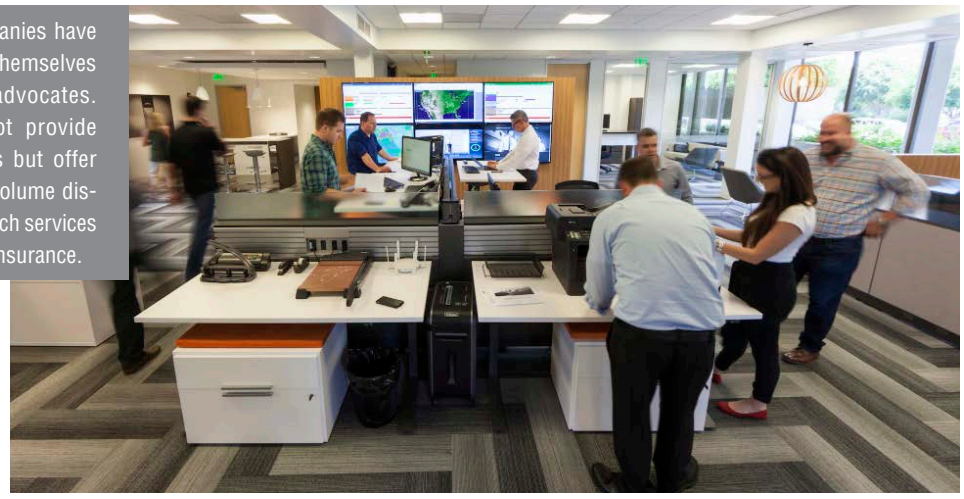
Don Haloburdo, vice president and general manager of flight services at Jet Aviation

Companies that want to keep flight departments independent can still turn to management companies for external review. "They don't want to use a management company, but they want to make sure they're doing everything right," said Jason Middleton, CEO and co-founder of Silver Air, which "audits" flight departments when requested. "We look at everything from a non-biased perspective and give them recommendations," Middleton said. The first audit step is reviewing the P&L statement. "We take a forensic look from a cost perspective: how many hours they flew, what they spend on maintenance, fuel, the hangar, and tell them if there are any anomalies," said Middleton.

Jason Middleton, CEO and co-founder of Silver Air

But "a lot of lead pilots fear" management company intrusion into operations, said Dave Weil, founder and CEO of Flight Department Solutions (FDS), which offers a la carte support services to flight departments. Pilots should consider the potential benefits, he advises. For example, outside experts can become the department's advocates in operational matters. "If a management company,

or Flight Department?



Some companies have positioned themselves as client advocates. They do not provide full services but offer customers volume discounts on such services as fuel and insurance.

Dave Weil, founder and CEO of Flight Department Solutions

rather than the pilots, is trying to talk to the owners about [the inadvisability of] pilots flying 20 hours a day," it can have more impact, Weil suggested.

For companies or owners that haven't previously thought about it, weighing a switch to management makes sense if a company or owner is "transitioning from one type of [aircraft] or flight profile to another" said Haloburdo, such as "from a Citation to a Global 5000," or from domestic to international travel, which "changes the infrastructure required" for operations. The retirement of a chief pilot or flight department manager is another potential moment of change.

The Flight Department Transition

When a change is made, management companies say they try to make it as smooth as possible, recognizing concerns within the flight department about the switch. As Hughes noted, "If somebody came to me and said, 'Somebody is looking to take over Priester Aviation,'" he'd feel similarly anxious, adding, "Our job is to make it a pleasant, positive transition. Our objective is not to replace people, but to provide assistance and help do things better. We want to work within the existing teamwork; we're not looking for other ways to do things."

Often when Solairus takes on such a client, "Folks at the flight department level are a little reticent because they feel like they're being shut down, or the management company is going to do something drastic." That concern has sometimes been justified, said Drohan. "I think historically some management companies have handled this really poorly," instituting "sweeping changes" imposed with "an iron fist." Nonetheless, Drohan believes "the boogeyman notion of management companies" within flight departments is dissipating, as recognition grows of the support that a major firm can provide.

"It's a partnership," said Haloburdo. "Everybody needs to have the mindset that as a collective team we're here to support the people riding in the back of the airplane. We don't want to take over their jobs."

Indeed, management companies say few jobs or employees are lost in such transitions. Flight crews typically become employees of the management company (assuming they meet all qualifications and standards, as operators say is overwhelmingly the case). An exception: Drohan cited the flight department of a public company that was moved to another state, with Solairus taking over management; all department personnel were offered positions. "Some chose to take it and others didn't," he said.

Flying Solo—the Flight Department Preference

Many factors can lead companies and individual owners to favor the in-house flight department. To begin with, some owners are inherently "not good candidates for management," said Weil, because "they either want a high degree of control, or they question every little cent management spends, or they want their operations so customized that a management company can't meet their needs," Weil said. "I've had experience with all three."

Stephen Hofer, president and founder of aviation law firm Aerlex, believes "a desire to exercise complete and exclusive control over their own aircraft may be the greatest motivator" behind many moves to flight departments. The preference for autonomy may be well founded. "We see the traditional flight department as hard to beat in larger companies with multiple aircraft that have privacy and security concerns," said Wyndham, "where you want to be able to talk about proprietary matters among your own employees." Even large management companies, he noted, often outsource flight planning and handling functions.

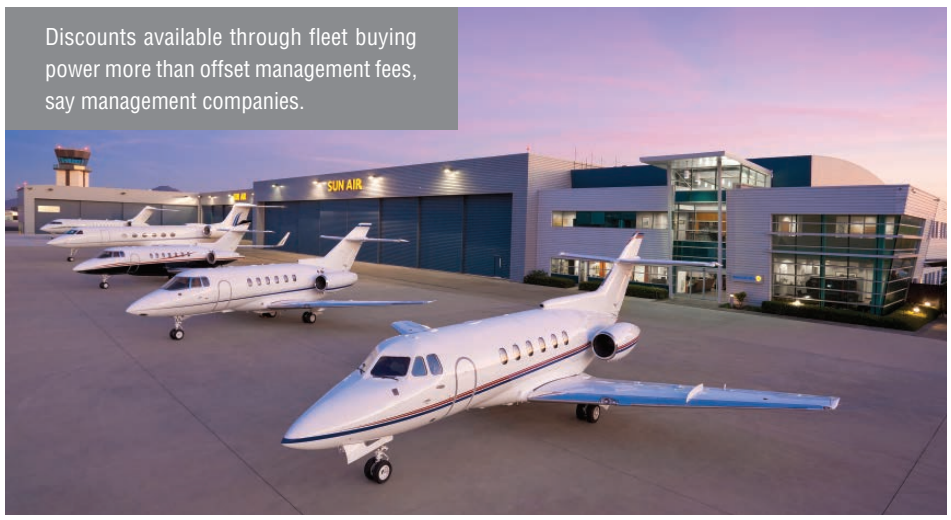
A quest for greater team spirit within an organization leads some owners to exit management arrangements. Weil cited a company with a three-aircraft managed flight operation that approached FDS about establishing its own flight department for three reasons: "They want pilots and staff to have more sense of ownership with the company, rather than mixed loyalty," Weil said. The company is also on the management company's charter certificate and wants to stop chartering out the aircraft; and finally, "They also think from a cost standpoint they can do at least as well as if not better" than their management company.

Management companies have long contended that the discounts they can offer through their fleet buying power on fuel, insurance, training costs, hangarage and other expenses more than offset the management fees they charge, but clearly not all their potential customers are convinced. While the costs of starting a flight department "are not insubstantial," said Hofer, "companies that do it occasionally tell me, 'We think the cost savings we can realize in the long run with an internal flight department will more than compensate for the substantial up-front expenditure we will incur.'"

Professionals also cite poor communication or mismanaged expectations and a passion for privacy among other factors that lead owners to go independent.

Lack of accounting transparency, long a major complaint among management customers, is less of an issue today than it has been in the past. "Owners have gotten more sophisticated and ask a lot more questions than they used to," said Hofer. He traces the trend to the fractional industry. "All the providers sold products by saying, 'Here's what it really costs.'"

Whatever the motivation for going, or remaining independent, all flight departments "need to be sharpening their focus and capabilities with safety management systems," said Don Hitch, vice president of flight operations at Wonderful Citrus in Delano, California, which operates half a dozen jets and turboprops. Seven years ago the company hired Hitch, a pilot with extensive experience in both management companies and flight departments, to bring a "high-level profile of safety" to the organization, which many on both sides of the management company/flight department question say is a critical component of all well managed operations.



Discounts available through fleet buying power more than offset management fees, say management companies.

Charter Revenue and the Management Model Decision

Part 135 issues don't appear to play much of a role in current switching activity (the company Weil cited above notwithstanding). Most flight departments transferring to management oversight don't seek charter revenue, whether or not they choose to operate Part 135. And while management companies may be the easiest route to getting

Continues on next page ▶

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on a charter certificate and generating some offsetting revenue, even one-aircraft flight departments have gotten their own Part 135 certificates—for single-pilot operations no less—and handled their own charter.

Meanwhile, owners seeking charter revenue from their departments through a management arrangement can have their own crews fly Part 135 missions, or the management company can crew those flights. "It does happen that the management company would provide the crew for charter," said Middleton at Silver Jet. "It's not the norm, but if the owners don't want to beat the crew up, and reserve them for their own flight operations," it can be arranged. Middleton added that for owners who want crews to be their direct employees rather than the management company's, "We will absolutely do that. And if it's on a charter certificate, we'll do a third-party contract among us, the pilots and the owner."

Given their appetite for adding lift to meet charter demand, John Cosenza, senior advisor at FDS, said, "You can work the right deal with most charter management companies." But he added, "It's a mind game when an owner comes to me and says, 'I'm flying only 80 hours per year and I think I should put it on charter.'" Asks Cosenza rhetorically, "Do you really need an aircraft if you're not flying 150, 170 hours a year?" Chartering or fractional ownership would make sense at that usage level, he noted, given that fixed costs account for 75 to 80 percent of ownership expenses. "But people do it," Cosenza said. "There's some kind of strange psyche that goes into owning the aircraft."

The Hybrid Approach to Operations

Today flight departments don't have to make the stark choice between continuing to go it alone or turning over their operation to a management company. They can outsource tasks and responsibilities as needed, creating what some refer to as a hybrid operation. A growing number of firms like FDS and consultants offer menus of services that can help a flight department get off the ground, and/or keep it operating at peak efficiency.

"You can buy expertise as needed," said Hofer. This applies to owners of managed aircraft, as well. "The use of specialists to assist in supporting aircraft owners, whether in a flight department or part of a management program, is where the industry has gone in recent years," Hofer said. "I think that reflects the greater sophistication of the owner who really wants to, or has to, justify the cost of ownership, and who is really determined to shave those costs."

Aerlex clients are among them. "When it gets to the point where regulatory issues become too challenging"—Hofer cites LOAs or a single RVSM authorization—"there are people in firms like mine that will help you [solve them]."

That's in addition to "all kinds of expert auditors" available, Hofer said, citing a consultant who worked in the fractional industry for years "and now audits fractional bills for clients," and a former DOM for many Part 135 operators who provides maintenance oversight services for owners of managed aircraft.

FDS, meanwhile, goes "as far as setting up flight departments," said Cosenza. "We do every aspect of it, from hiring the chief pilot to maintenance director and putting ops manuals in place, and we have had an occasion where we've set up a hybrid organization. They might have a chief pilot or director of aviation running the operational side, and we'd handle the back office: HR functions, payroll, accounting taxes, financial reporting and so on."

In the late 1980s Cosenza established and then ran Citibank's in-house flight department for many years after transferring the fleet of jets and helicopters from Jet Aviation's management.

Management companies themselves might offer hybrid services. Middleton cites a company that prefers to keep all operations "very confidential," but contracted with Silver Air to manage its maintenance. "That's all we do," he said. "We tell them what's coming up" on the maintenance schedule and perform the needed work.

Since management companies might audit flight departments, Weil at FDS recommends that owners of managed aircraft have an outside expert review their accounts periodically to ensure "they're getting what their contract says they should be getting, or find savings that they're missing," he said.

The Advocacy Management Model

An "owner's advocate" management model aims at a form of hybridcy of its own, possibly appealing to flight departments and managed aircraft owners alike as an alternative to the "full service" offerings of major providers. These self-described advocate management companies, such as Solairus, Silver Jet and Sun Air Jets (all three California companies), might outsource virtually all services, eliminating what they see as a potential source of conflict of interest.

Silver Air in Santa Barbara has 10 aircraft, from light to large-cabin jets, under management. It grew out of a small flight department where Middleton was hired as a pilot when the owner put the aircraft under management to generate charter revenue. He developed the management model after seeing how, he believed, the management company took advantage of the owner. "Basically, it came down to advocacy: someone on my side of the table for everything, and not having any conflicts," Middleton said. These conflicts, advocates say, are inherent in the services many management companies offer, because of service fees added to the invoices. By outsourcing and getting bids for all services—hangaring, maintenance and the like with no mark-up, and getting all their income from management fees alone—these management companies claim they can truly advocate on behalf of owners while still providing volume discounts on fuel, insurance, training and other services.

Drohan said clients at Solairus, which has 130 aircraft under management, "really like the fact that we are an aviation asset management company and our entire infrastructure is built around that objective. We're not trying to be a real estate company or a fuel company."

Sun Air Jets, like Silver Air, is the outgrowth of an unhappy management experience. In the late 1990s owner Edward Atsinger III was new to aviation but had two jets and a helicopter under management. Displeased with the service, Atsinger brought aboard Brian Counsil, president and COO, to oversee the operation, and Camarillo's Sun Air Jets was born. Said Counsil, an accountant and tax lawyer, "He knew how he wanted to be treated as a consumer of aircraft services, and we tried to approach management that way when we started." The financial and analytical information Sun Air provides clients "is a product we designed for ourselves as our own first client, modeled on what we knew we wanted as customers," he said. "I'm in business to run an aircraft like a business. Everything we do is as a fiduciary on behalf of clients, and create a true win-win symbiotic relationship."

But advocacy management might be as much a philosophy as a set of operating policies, practicable in both small flight departments and large management companies. Whereas other advocate-style managers eschew offering any in-house services, Sun Air Jets has its own hangars and an office in Van Nuys and an in-house maintenance department. Does that not present a conflict of interest in comparison to other advocates?

"Generally, if an operator doesn't own any of it, [the company] is not much more than a relationship, a computer and a telephone, which has its place," Counsil said. "Sun Air Jets has a deep equity interest in what it does, and we have constructed and own facilities. When we do major inspections, we can control the process. We're not a retail shop that makes money on discrepancies. It's a service we provide in aid of the airplane." Counsil could be speaking of a savvy customer served by any operational model when he concludes, "Our aircraft owners take comfort in knowing who's flying the airplane and who's doing the maintenance. If we took advantage of clients, they wouldn't be here any more." ❑

The management option is appealing to companies that want to eliminate their flight departments.

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PC-24 on track for year-end delivery

by Ian Sheppard

DAVID McINTOSH

As part of the effort to prepare the PC-24 for service, Pilatus has ramped up 24/7 customer service and developed a full-motion flight simulator in cooperation with FlightSafety International.

Pilatus is closing in on certification and first delivery of the PC-24 "Super Versatile" jet, hoping for both by year-end. At the NBAA Convention last month, Pilatus CEO Marcus Bucher said, "We are at the very end of the development program." The three development aircraft (P01, P02 and P03) have so far logged 2,000 hours on 1,250 flights. Bucher said that EASA pilots would fly the aircraft for the final time last month before the agency completes the paperwork. Prompt certification would allow the Swiss manufacturer to deliver the first customer aircraft to U.S. fractional operator PlaneSense next month.

"Most development testing has been completed," said Bucher. The first two prototype aircraft, P01 and P02, have completed flight-testing. At Pilatus's base in Stans, Switzerland, P01 is taking part in post-certification activities, aimed at helping customers to define their options. P03, meanwhile, is participating in a 150-hour function and reliability campaign that must be completed before the EASA can grant the aircraft a type certificate.

Bucher said series production is ramping up. The first aircraft for PlaneSense had its wing and fuselage mated in July and has since had various systems fitted ready for "intense testing and flight-testing."

Pilatus launched the $8.9 million PC-24 in 2013, revealing at EBACE that May that it had taken orders for 84 copies but elected to close the order book while it developed the aircraft. The type quickly proved popular, particularly with operators of the PC-12 (and PC-12NG), partly because it has been designed to fly from almost any airfield in the utility-capable tradition of the PC-12. The aircraft will be able to operate from airfields with a balanced field length of as little as 2,690 feet.

As to when the order book will be reopened to accept orders beyond the 84 aircraft already signed for, Bucher said, "We want to be sure we can deliver to customer expectations first, and you'll definitely hear from us next year about exactly when the order book will reopen."

Pilatus has developed what it calls an advanced cockpit environment with Honeywell, and the aircraft is powered by two Williams FJ44-4A rear-mounted turbofans. The PC-24 will be the first FJ44 application to take advantage of Williams's quiet power mode, which allows the engine to provide "quiet, efficient ground power," eliminating the need for a traditional APU. Additionally, the cabin and cockpit can be independently heated or cooled while the engines are shut down. ❑

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AIRBUS

New models will be ready when market rebounds

by Mark Huber

The glut of recently used aluminum appears to be clearing out, and that's good news for sales of new jets, in the sense that things aren't going to get demonstrably worse. According to Rollie Vincent of JetNet iQ, "If you look at used airplanes that are five years old or newer there's virtually nothing left on the market. That cleanup has largely happened in the last 12 to 18 months, especially to the extent that it has taken away from new aircraft sales. The buyers are companies that normally would have bought new but could not pass up the value of a pre-owned." The available used business jet inventory for sale at the end of the summer was 7 percent lower year-over-year and represented 10.3 percent of the installed base, the lowest since before the financial crisis, according to data from UBS Global Research.

Nick Popovich of Sage-Popovich concurs. "This market is going to tighten pretty soon."

While optimistic, Alex Overstrom, head of PNC Aviation Finance, said that OEMs are still "in a tough spot, as used aircraft price declines have made new aircraft less competitive with pre-owned. That said, we are still financing a decent number of new aircraft, particularly with large corporate clients, who are often leasing. I expect that the used aircraft market will remain robust while new aircraft will be challenged over the next 12 to 24 months. As used aircraft inventory declines and prices rise, and OEMs bring production to lower levels, the market should begin to get back closer to equilibrium."

As deliveries decline, OEMs typically tend to focus on maximizing revenue per aircraft, either by skewing their attention to large-cabin offerings or by adding value to existing models and raising the price. Both trends continue to dominate the new business jets coming to market and under development this year, and both are arguably healthy in the sense that they drive innovation.

However, given the current new business jet delivery numbers (661 last year, according to the General Aviation Manufacturers Association), one cannot expect the innovation to be uniform across product lines. As Vincent sanguinely points out, several OEMs have room for "pruning in the garden," by discontinuing slow-selling models or consolidating product lines. While almost any new aircraft can sell when sufficiently discounted, for production to be rational in this market for the OEMs' shareholders and customers, the aircraft must cross into new frontiers of operational efficiency over its entire life cycle. Several of the following aircraft are poised to do just that with new engines, new airframe alloys, more capable avionics and cabins that maximize interior space, comfort and convenience. New jet buyers are demanding more and OEMs that fail to deliver do so at their peril. While the new jet market's descent has slowed and it is poised to recover, it will do so by redefining value and catering to customers less tolerant of tardy or incremental product improvement.

The Supersonics

Aerion AS2

Aerion is now hoping to formally launch development next year, with the goal of certification in 2025. In 2014 Aerion revamped the proposed supersonic bizjet as a trijet with more range and a larger cabin. The new AS2—Aerion supersonic second design—retains its predecessor design's supersonic natural laminar-flow wing, but will now have a range of at least 5,000 nm and a cabin cross-section nearly the size of a Gulfstream G550's. The 30-foot-long cabin, which is 17 feet shorter than the G550's, will feature a two-lounge layout, galley and both forward and aft lavatories, plus a baggage compartment accessible in flight.

Mtow grows to 121,000 pounds and the fuselage is lengthened to 170 feet. Balanced field length is 7,500 feet at mtow, but that is reduced to 6,000 feet at weights of less than 100,000 pounds. Flying at the lighter weight reduces range by 20 percent. Maximum speed is Mach 1.6; however, the aircraft is designed to cruise efficiently at Mach 0.95 to comply with existing supersonic overflight bans. Earlier this year Aerion announced that it had selected GE to provide the AS2's engines and that they would be derived from an existing commercial core that could deliver thrust in the 15,000- to 17,000-pound range.

In 2014 Aerion announced an agreement to collaborate with Airbus on technologies associated with the future of high-performance flight, and exchange knowledge and capabilities in design, manufacturing and certification. Over the longer term, Aerion said, the deal will provide proprietary technology and assistance to Airbus Group in the development of high-performance aircraft technology. Aerion said that Airbus has been instrumental in helping with the design of an articulating landing gear, the fuel system, the computerized fly-by-wire flight control architecture, and the carbon-fiber wing, fuselage and empennage structures. In 2015, the program got another boost when fractional operator Flexjet signed a letter of intent for 20 AS2s with plans to offer them to Global Lease customers.

HyperMach SonicStar

This revised design proposes a top speed of Mach 4.4, a maximum range of 6,500 nm and seating for up to 32 passengers. The company says it has completed several rounds of financing and is continuing to develop "65,000-pound-thrust H-Magjet 4400 hybrid turbofan ramjet engines" with sister company SonicBlue.


Aerion AS2

First flight for the $180 million aircraft is estimated in 2022 and certification in 2025. Testing of a half-scale model could start next year.

Spike Aerospace S-512

Spike Aerospace is planning a series of test flights of the first SX-1.2 demonstrator this fall. The SX-1.2 is a scaled, proof-of-concept aircraft that will help validate the aerodynamics of the S-512 supersonic jet. The company intends for the SX-1.2 to be followed by a series of successively larger and faster aircraft, leading ultimately to a supersonic demonstrator. Spike said in September that it is already building the third generation of demonstrators, with the first two complete and ready for first flights.

CEO Vik Kachoria said Spike is on schedule to begin high-speed testing by the middle of next year and build the crewed high-speed demonstrators in 2019. That will lead to final designs, production and testing of the S-512.

Spike has developed partnerships with Siemens, Quartus, Aernnova, Greenpoint and BRPH and intends to have the S-512 flying by early 2021, with customer deliveries beginning in 2023.

The S-512 will seat up to 22 passengers, with a range of 6,200 nm and a cruise speed of Mach 1.6. Spike is looking for a low- to medium-bypass-ratio engine producing 20,000 pounds of thrust at sea level. The company continues to search for more funding for the $1 billion program and estimates a market for 600 aircraft between 2020 and 2030. Spike's goal is to bring an aircraft to market by 2022.

Boom Supersonic

Boom Supersonic had raised $41 million through early this year to fund a one-third-scale XB-1 Baby Boom demonstrator that could fly as early as next year. The XB-1 features three non-afterburning General Electric J85-21s with variable-geometry intake and exhaust, Honeywell avionics, Tencate carbon-fiber prepreg and Stratasys 3D-printed components. The scaled aircraft will be used to evaluate the design for the larger aircraft's delta wing and carbon-fiber fuselage.

While Boom's ultimate goal is to manufacture a three-engine, $200 million, Mach 2.2 supersonic jetliner with about the same seating capacity as a first-generation regional jet that could be configured as a business jet, the company is currently focused primarily on securing airline orders. Boom has purchase commitments for 76 aircraft from five airlines for the full-scale version, which it aims to have in service by 2024.

Boom announced last year that Richard Branson's Spaceship Company will provide engineering, manufacturing and flight-test support to Boom and holds an option on Boom's first 10 aircraft. Two cabin configurations have been unveiled to date—for 45 and 55 passengers. The company maintains that the seat-mile costs will be comparable to those for airline business class.

Airliners

Airbus ACJ Neo

Airbus will make the re-engined Neo (new engine option) A319 and A320 available for the Airbus Corporate Jet (ACJ) program next year. For power, Neo customers have a choice of either the CFM LeapX or the Pratt & Whitney Pure Power PW1100G. Deliveries of the ACJ320neo are slated to begin in next year's fourth quarter, with ACJ319neo deliveries beginning in early 2019.

The new aircraft are 16 percent more fuel-efficient than their predecessors thanks to the new engines and the addition of wingtip "sharklets." More centerline fuel tanks take the range from 6,000 nm to 6,750 on the 319 (eight passengers) and from 4,300 nm (eight passengers) to 6,000 nm (25 passengers) on the 320. Both aircraft also get lower cabin altitudes and redesigned luggage holds that provide more capacity.

Earlier this year, Airbus Corporate Jets unveiled the Infinito cabin design for the ACJ319neo developed with Italian hypercar maker Atelier Pagani Automobili. The design incorporates composite materials such as CarboTitanium and features a curved pathway through the cabin, shell-shaped valances and walls between zones that can switch from opaque to transparent. The interior has soft leather carpets and a wooden floor contrasting with carbon fiber in furniture and wall frames.

Airbus ACJ350 XWB

Airbus began delivering the A350 XWB to the airlines in 2014 and formally announced its intent to offer a private variant of the aircraft last year. The aircraft is known as the ACJ350 XWB and without an interior will sell for $250 million. In typical executive configuration with 25 passengers, it will have an unrefueled range of 10,800 nm—20 hours in the air—allowing direct connection between most major city pairs. Top speed is Mach 0.89.

The cabin of the Dash 900 measures 170 feet long, 18 feet wide and eight feet tall, yielding 2,910 sq ft of floor space. Airbus is introducing Easyfit, a streamlined process for outfitting the cabin interior that uses the cabin wall attachment points. While the 350's cabin is wider than that of the 787 (the other large composite airliner), the windows on the Boeing

Continues on next page

2017

Boom Supersonic


Spike Aerospace S-512

Continued from preceding page

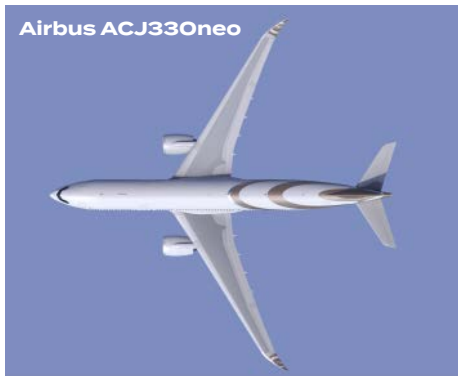

Airbus ACJ350 XWB

New Jets 2017


Bombardier Global 7000

are noticeably larger and feature electrochromic dimming, while the Airbus relies on old-technology electro-mechanical shades. The larger windows on the 787 create the illusion of more interior space. Conversely, the smaller windows on the A350 make the cabin marginally quieter.

Mtow is close to 600,000 pounds, and an aircraft this big can't land just anywhere: it needs 6,100 feet to stop. Takeoff distance at maximum weight is 8,770 feet. The claimed fuel-efficiency advantage over the 787 appears to come from Airbus's wider use of composites–53 percent versus 50 percent on the 787. The Airbus also employs a new winglet design called a "sharklet," which reduces drag and boosts top speed to Mach 0.89 from Mach 0.85. The two aircraft rely on the same engine technology.


Airbus ACJ330neo

BBJ Max series

Airbus ACJ330neo

The new private variant of the Airbus A330neo will be able to fly 25 passengers 9,400 nm, enabling non-stop flights from Europe to Australia. The A330neo will be powered by the new-generation Rolls-Royce Trent 7000 and incorporate a longer wing and wingtip sharklets similar to those on the A350 XWB. The improvements deliver a 12 percent fuel-burn reduction compared to a standard A330, as well as payload and range improvements. Other ACJ330neo features: an onboard airport navigation system, runway overrun prevention system and LED exterior lights. The first A330neo will be delivered to the airlines next year and the first ACJ330neo slot will be available in 2019.

BBJ Max

The BBJ Max is the private version of Boeing's new 737 Max series. The 737 Max 8, the first of potentially five Max variants, gained FAA certification in March. Boeing plans to follow the Max 8 with the larger Max 9 next year and the higher-capacity Max 200 and smaller Max 7 in 2019.

Boeing Business Jets (BBJ) announced in 2013 that it would build executive versions of the 737 Max known as the BBJ Max, also fitted with CFM Leap 1-B engines. Deliveries of the BBJ Max are expected to begin in 2021, to date in three variants, the Max 7, Max 8 and Max 9. They are based on the current BBJ1, BBJ2 and BBJ3, respectively, and have the same cabin sizes as their predecessors but significantly more range and, in the case of the BBJ Max 7, more range and luggage space.

The BBJ Max 7 will be 6 feet, 4 inches longer than the BBJ1 with a range of 7,000 nm (four passengers), a significant improvement over the BBJ1. It will require only seven auxiliary belly tanks as opposed to nine on the BBJ1, opening more cargo space. The BBJ Max 8 will have a range of 6,325 nm, a 14.6-percent improvement over the BBJ2. The BBJ Max 9 will offer a 6,255-nm range, 16.2 percent more than the BBJ3. The new aircraft will be 14 percent more fuel efficient than current-production single-aisle BBJs, thanks to new-design winglets and the new engines, which are mounted farther forward and higher on the wing and connected by new and more aerodynamic pylons. The Max also gets a more aerodynamic vertical stabilizer. To provide adequate ground clearance for the larger engines, the landing gear will be lengthened so the airplane will stand a little taller on the tarmac.

The Max will employ limited fly-by-wire controls, mainly to the wing spoilers. Other planned technology includes the addition of four big 15.1-inch Rockwell Collins flight displays in the cockpit, the same ones that are on the 787 Dreamliner. Maintenance on the Max will be easier than on the BBJs, as fault data, once collected by instruments in the forward equipment bay, will now be available for technicians and pilots on the cockpit display screens. The Max will also hold more maintenance data on an enhanced onboard network system and network file server, doubling the amount of maintenance information available during flight and transmitting it live to ground stations so that issues can be resolved quickly in flight or shortly after the airplane lands. This will further enhance the aircraft's already high dispatch reliability—Boeing quotes a 99.7-percent dispatch rate for the current-generation 737.

Large cabin, long-range

Bombardier Global 7000 & 8000

Bombardier continues development of a pair of new aircraft with more range and fuel efficiency than the current Global 6000 flagship. Both aircraft use the Global 6000 fuselage but stretch it—the 7000 by 11 feet, 3 inches and the 8000 by two feet, three inches—and add bigger cabin windows extending higher up the sidewall. Financial problems related to the development of the C Series airliners and problems related to the development of the Global 7000's thinner production wing have pushed the development schedule to the right. The aircraft were originally scheduled to enter service in 2016 and 2017, respectively.

Bombardier plans to decide later on the Global 8000 program schedule.

The fourth Global 7000 flight-test aircraft (FTV4) joined the test program in late September and a fifth will be added to the program before anticipated certification and entry into service next year. FTV4 is being used for interior validation testing in parallel with the Global 7000 interior test rig, which simulates real-world flexing and bending of the fuselage with interiors installed. The fuselage on the Global 7000 is being constructed with aluminum-lithium (Al-Li) alloy similar to the material used on the C Series airliner. The material can reduce weight by as much as 10 percent compared with composites and has the potential to improve fuel efficiency by up to 20 percent, according to the company.

The aircraft has a new thin high-speed wing, fuel-efficient GE Passport engines (16,500 pounds of thrust each), fly-by-wire flight controls and Rockwell Collins Pro Line Fusion avionics. The engines were certified last year. Bombardier said that at Mach 0.85 the range for the 7000 bumps up to 7,400 nm and 7,900 nm for the 8000. Range numbers assume 10 passengers and four crew on the 8000. Maximum ramp weights for both aircraft top 105,000 pounds.

Among the features of the new jets: a hyper-quiet cabin divided into three or four zones; a galley 20 percent larger than that on the Global 6000, with double convection/microwave and convection/steam; a mid-cabin/self-serve galley; redesigned and larger crew rest areas; panoramic passenger windows that give the cabin an airy feel; improved heating and cooling; redesigned seats; a center lounge/media room with 42- to 50-inch flat-screen monitors; adjustable color LEDs in the ceiling; a conference/dining table that seats six; a private state room; an optional stand-up steam shower; a more robust environmental-control system; and a capacious

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Gulfstream G500

Dassault Falcon 5X

New Jets 2017

195-cu-ft baggage hold. The price for the 7000 is expected to be in the region of $73 million.

Gulfstream G500 and G600

Gulfstream continues to report progress on two new large jet programs, the G500 and G600. Through August 20 the five G500s had flown 3,460 hours during 905 flights; the G500 recently completed certification testing for flyover noise, cabin systems, brakes and lighting, while company testing of the fuel system is finished. The aircraft made a 10-hour, 6-minute flight in April and set a city-pair record from Savannah to Paris in May, covering the 3,788 nm in 7:40 at an average speed of Mach 0.90. The G500 has been flown to Mach 0.995 and 53,000 feet. Gulfstream expects to complete certification flying in this quarter.

Meanwhile, the four G600 test aircraft have logged 780 hours during 175 flights, the longest lasting 13 hours and 5 minutes in May. A fifth test aircraft, with a full production interior, will be added to the program later this quarter. Development testing has been completed in initial envelope expansion and flying qualities, brakes, low speed or stall, load calibration, parameter identification and climb performance. Certification testing for loads and flutter has been completed. The aircraft has reached Mach 0.995 and 54,000 feet. Gulfstream says the G600 is on schedule for certification and deliveries next year.

In October 2014, Gulfstream formally launched the two large-cabin jets designed to replace the G450 and G550. The top speed for both aircraft is Mach 0.925. The G500 has a range of 5,000 nm at Mach 0.85 and 3,800 nm at Mach 0.90. The G600 has a range of 6,200 nm at Mach 0.85 and 4,800 nm at Mach 0.90. Gulfstream has set initial prices at $44.65 million for the G500 and $55.65 million for the G600.

Power for the aircraft will come from Pratt & Whitney Canada's new PW800. The 16,000-pound-thrust-class PW814GA and PW815GA have the same core technology used in the company's geared turbofan airliner engines. The cabin cross-section of each aircraft measures 91 inches wide and 74 inches tall—seven inches wider and two inches taller than cabins in the G450 and G550—and they can be configured for up to 19 passengers. The G500 has three living areas and the G600 has up to four as well as an optional crew rest area. Both aircraft offer forward and aft lavatories, and a full-size galley that can be located either forward or aft.

The cockpits feature fly-by-wire controls and active-control sidesticks and the new touchscreen Symmetry flight deck, which is driven by Honeywell Primus Epic avionics. The avionics include Gulfstream's enhanced vision, Honeywell's synthetic vision with 3-D taxi and a head-up display system. The full three-axis digital fly-by-wire system offers benefits that include flight-envelope protection, stability augmentation, increased redundancy and reduced maintenance.

The streamlined and highly styled cockpit, which is finished in black leather with metallic accents, is the most striking feature of the interiors. Most of the switchology found in earlier designs has been eliminated. Inputs are made through five Honeywell touchscreens with large, easy-to-view icons. Gulfstream's familiar cursor-control devices (CCD) are integrated into the center console at the head of the hand grips. The console extends aft of the pilot seats, but it is lower slung, making step-over entry and exit easier. The CCDs give each pilot control of three of the four main display screens and allow data to be shifted between them in the event of a failure.

Dassault Falcon 5X

The Falcon 5X twinjet flew for the first time on July 5 from Dassault's Bordeaux-Mérignac final assembly facility, using a "preliminary version" of the long-delayed Safran Silvercrest engines. The flight-test campaign lasted a few weeks and was designed to streamline the development process. A full-fledged flight-test campaign with "certifiable engines meeting Dassault's specifications" was scheduled to begin next year, enabling the 5X to enter service in 2020. However, a new problem with the Silvercrest's high-pressure compressor, discovered during flights on Safran's GII testbed in San Antonio, Texas, will likely add further delay to the 5X program (*see stories on page 10*).

The $45 million 5X was announced in 2013 and offers an 8.86-foot fuselage diameter that is slightly wider than that of the 8X; it yields six-and-a-half feet of headroom and a cabin volume of 1,766 cu ft. Cabin configurations provide seating for up to 12 passengers.

Dassault claims that the aircraft will be 50 percent more fuel efficient and cost 30 percent less to operate than competing models from other manufacturers. It will have fly-by-wire controls with sidesticks, and the new Silvercrest engines will each provide 11,450 pounds of thrust. The avionics will be based on the Honeywell EASy system, which provides dual head-up displays with synthetic and enhanced vision information. The large cockpit will incorporate a 32 percent larger windshield than the one on the 7X as well as pilot seats that recline 130 degrees, allowing one crewmember to rest while the other flies.

The 5X will have an mtow of 69,600 pounds and a range of 5,200 nm, which equates to 11 hours, 30 minutes in the air. It will be able to take off from 5,000-foot runways and return to earth at a modest 105-knot approach speed. It will do this without sacrificing high-speed cruise performance. The 5X will have a top speed of Mach 0.90. The all-new wing incorporates a fresh winglet design; leading-edge slats that enable lower approach speeds to shorter runways; and flaperons.

The 5X offers a brighter interior with windows 30 percent larger than those on the 7X. The entryway can be filled with natural light, courtesy of an electronically dimmable Zenith skylight from Vision Systems above the galley aisle. The smart glass in the skylight can adjust tint in virtually any degree to modulate the amount of incoming light and solar heating. The 5X's pressurization system yields a cabin altitude that is only 3,900 feet at 41,000 feet; and it's just 6,000 feet at the service ceiling of 51,000 feet. The cabin has the Falcon HD inflight-entertainment system and is available with various layouts, and the seats can be fully reclined to produce


Cessna Citation Hemisphere

sleeping areas for up to six passengers. The pressurized 155-cu-ft main baggage area is accessible through the aft lavatory, providing dressing space in flight. The single executive seats have been redesigned with a slick-looking shell back and mechanical functions such as slide, swivel and recline controlled by an electric switch in place of the traditional, and maintenance-prone, cabling system. Full-electric-function single seats are an option.

Large Cabin

Cessna Citation Hemisphere

Relatively little is known about this aircraft, announced in 2015, other than its size, range and $35 million price. Much of the aircraft is still being defined, although it appears that Cessna will be creating a niche between the traditional super-midsize and large-cabin, long-range models. To date the company has said that the Hemisphere will have a range of 4,500 nm, a top cruise speed of around Mach 0.90, a flat-floor, multi-zone cabin with a 102-inch diameter, "class-leading operating costs and performance," and will fly in 2019. Textron Aviation's engineering head, Brad Thress, said earlier this year that progress on the program continues with the completion of advanced wind tunnel tests to decide the structural size of the aircraft. Cessna displayed a cabin mockup of the large-cabin jet last month at the NBAA convention and opened the order book for the airplane.

Super-midsize

Cessna Citation Longitude

Certification is expected late this year or early next for Cessna's $26 million entry into the super-midsize derby. Five aircraft are currently in flight-test and the

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Embraer Phenom 300E


Pilatus PC-24

New Jets 2017

first batch of production aircraft is being assembled. The 3,400-nm-range Longitude offers a 12-passenger, 77-inch-wide, six-foot-tall, flat-floor cabin; a pair of Fadec-equipped Honeywell HTF7700L turbofans (7,550 pounds of thrust each); and Garmin G5000 touchscreen avionics with autothrottles and radar, optional head-up display and extended maintenance intervals.

It has a cabin altitude of 5,950 feet, standard double-club seating with eight single executive seats of a new and wider design, a walk-in 112-cu-ft baggage compartment that is accessible in flight, a full-fuel payload of 1,600 pounds, a maximum cruise speed of 476 knots, and is designed to use 5,000-foot runways (at mtow). Other creature comforts: a vacuum-assisted externally serviced lavatory, a full galley with sink and potable water and 20 percent more legroom than in competing airplanes, according to Cessna.

Cessna is eschewing expensive systems such as full fly-by-wire flight controls. The Longitude will have limited fly-by-wire for the rudder, spoilers and brakes ("brake-by-wire"). The aircraft will be equipped with the LinxUs system to provide real-time maintenance monitoring in flight. It also has more user-friendly maintenance access ports than past models.

The OEM has focused on creating a comfortable cabin. Natural light throughout comes from 14 large windows. LED lighting is controlled via a wireless cabin-management system that Cessna has implemented on other models, among them the Citation X+. The system delivers a menu of information/entertainment choices, such as SiriusXM and moving maps. Iridium satcom is standard, and that allows Wi-Fi at speeds that are poised to increase significantly with the launch of next-generation satellites between now and the end of next year. Passengers can operate the system via onboard touchscreens, controllers or smart devices (with a downloaded app). Most of the slide/swivel/reclining seats will be full berthing. While the standard configuration features a double club-four arrangement of eight single seats plus a side-facing single kibitzer in the front of the aircraft that's suitable for a flight attendant, the aircraft can also be ordered with an aft three-place side-facing divan or a forward two-place side-facing kibitzer. Each single seat has two USB charging ports and sidewall stowage for personal items.

Light Mediums

Pilatus PC-24

Through the summer the three PC-24 "Super Versatile Jet" test aircraft had accumulated 1,800 flight-test hours and Pilatus is on track to certify the new twinjet in the fourth quarter of this year.

The first PC-24 test aircraft rolled out of the hangar on Aug. 1, 2014, and flew in May 2015. The first two years of production quickly sold out. Pilatus temporarily stopped accepting new orders at 84.

The aircraft combines light-jet operating economics with super-midsize capabilities and comfort and is aimed at more conventional offerings from Cessna and Embraer. Like the PC-12 single-engine turboprop, the PC-24 retains an aft cargo door. With a takeoff distance of 2,690 feet (2,526 feet for landing) at the 17,650-pound mtow, the PC-24 can operate from unpaved and unimproved fields. Pilatus aims to have the 10-passenger, $8.9 million all-metal aircraft approved for single-pilot operations.

Power comes from a pair of Williams International FJ44-4As each rated at 3,435 pounds of thrust. Engine features: automatic thrust reserve, passive thrust-vectoring nozzles, quiet power mode in place of an APU to provide ground power, integral pre-cooler to condition bleed air and reduce drag losses, and an anti-ice and noise-suppressing inlet. They have a 5,000-hour TBO and a hot-section time of 2,500 hours. The engines help propel the PC-24 to FL450 in less than 30 minutes and achieve a high-speed cruise of 425 ktas at FL300. Range with four passengers is 1,950 nm and at mtow the maximum payload is 2,500 pounds.

The customized avionics suite, dubbed Pace—Pilatus advanced cockpit environment—is built on the Honeywell Primus Apex system and features all the latest advances.

The voluminous passenger cabin provides more space than either the Cessna XLS+ or the Embraer Phenom 300 and has a flat floor, which means less headroom in the aisle. The aircraft will come with seven interior options for executive, commuter, combi and quick-change layouts as well as options for an externally serviced lavatory, either forward or aft, and galleys. The PC-24's dominant feature is the rear cargo door, which measures 4.1 feet wide and 4.25 feet tall.

In June last year Pilatus Business Aircraft broke ground on a dedicated 120,000-sq-ft facility for PC-12 and PC-24 completions at its base in Broomfield, Colorado, that will be operational by the middle of next year. Plans call for the first eight PC-24s to be completed at the Pilatus plant in Switzerland; the ninth aircraft is scheduled to arrive in Broomfield for completion at the beginning of next year.

Light Twins

Embraer Phenom 300E

Embraer is unveiling an updated edition of the best-selling Phenom 300 that features a redesigned cabin with a shell that yields more interior space; wider and deeper seats with retractable outboard arms that expand aisle width by three inches; a slimmer valance for improved headroom; and a centerline tech panel. The side-ledge passenger service unit has also been redesigned, and receding the ceiling upwash edge emphasizes the sense of space. The 300E is available with various upholstery stitching patterns, and the snap-on seat coverings themselves can be replaced easily without removing the seats from the aircraft. Seats for the 300E will be built at Embraer's new company-owned 50,000-sq-ft seating plant, which opened last year in Titusville, Florida. Price for the refreshed model starts at $9.49 million.

SyberJet SJ30i and SJ30x

MSC Aerospace is planning two new versions of the SJ30 light twinjet. The SJ30i will feature an upgraded Sybervision avionics suite with the Honeywell Primus Apex 2.0 system with 12-inch displays and a new interior. The avionics and interior are lighter than their progenitors and take an estimated 200 pounds out of the airplane. A follow-on aircraft, the SJ30x, will have uprated Williams International FJ44-3AP-25s with dual Fadec controls and is expected to provide performance benefits such as higher cruise speed at altitude, faster climbs, more payload, and better high and hot performance. It will also have single-point refueling. Price for both aircraft is expected to be in the $8 million (2014 $) range.

The SJ30 program began in the 1980s and the SJ30-2 finally received FAA certification in 2005. Since then, the company has had several different corporate owners and produced only eight examples of the Mach 0.83, 2,500 nm, seven-seat jet. The aircraft holds three world records for speed and distance. It is designed with a 30-degree swept wing for high-speed and


Cessna Citation Longitude


SyberJet SJ30i

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New Jets 2017

efficient cruising and with leading-edge slats and trailing-edge flaps that are optimized for low-speed approaches. The SJ30 has a service ceiling of 49,000 feet, maintains a sea-level cabin to 41,000 feet and is approved for single-pilot operations.

Last year SyberJet announced that it was ramping up the wire harness shop in Cedar City, Utah, to manufacture wiring harnesses for the SyberVision flight-test aircraft, high-intensity radiated field (HIRF) laboratory testing, and subsequent production aircraft. SyberJet's engineering team has completed all of this wiring harness design in the San Antonio location to support the SyberVision program.

Entry-Level Twins

Embraer Phenom 100EV

Deliveries of Embraer's Phenom 100EV began this year. The updated $4.495 million Phenom 100 variant features new avionics, slightly swifter 405-knot top cruise speed, substantially faster climb times, 43 pounds more full-fuel payload and better high/hot performance. Takeoff distances shrink by nearly 1,000 feet thanks to high/hot thrust gains of up to 15 percent.

The 100EV features Prodigy Touch avionics built on the Garmin G3000 system and Pratt & Whitney Canada PW617F1-Es that each deliver 1,730 pounds of thrust, 35 pounds more than the PW617Es on the 100E. The 100EV achieved its performance gains through a combination of more engine thrust and reduced airframe weight.

One Aviation/Eclipse EA700

In September, One Aviation flew the first Eclipse EA700 testbed, an experimental EA500 fitted with an aerodynamically conforming version of the 700's planned larger wing designed for greater fuel capacity and stronger performance. One Aviation plans to fly three prototypes, each testing different components for the EA700.

In July last year One announced a new variant of the Eclipse 550 with four feet more wingspan, a 14-inch fuselage stretch and improved performance and range, as well as a higher gross weight. The $3.6 million Eclipse 700 twinjet will also have an integrated Garmin G3000 suite and switch to Williams FJ33-5A-12 turbofans (derated to 1,200 pounds of thrust each). The engines will provide a range of 1,470 nm at max cruise speed. The more powerful engines will shorten takeoff runs, quicken climb times and boost the aircraft's service ceiling to FL430. The EA700's Garmin G3000 avionics suite will provide synthetic vision, GFC 700 autopilot, Garmin ESP protection system and Lnav and Vnav, and will comply with ADS-B and RVSM requirements.

One has selected Acme Aerospace for the lithium-ion battery system and PPG Alteos for electronically dimmable interactive cabin windows using Nuance V2 shading by Vision Systems. The changes make the Eclipse "a true six-passenger airplane," noted One chairman Alan Klapmeier. He said the company holds orders for 30 aircraft, mostly from current Eclipse owners. Klapmeier thinks the market for the Eclipse 700 is significantly larger than that for the EA500/550. He estimated that work on the Eclipse 700 could be finished within 18 to 24 months, contingent on raising capital. One Aviation is looking for $100 million to restructure the company and "less than $50 million" to finish the 700 in particular.

Singles

Cirrus Vision SF50

Cirrus received FAA certification for the $1.96 million single-engine SF50 Vision Jet in October last year and announced this summer that it is ramping up production to one aircraft per week. Pat Waddick, president of innovation and operations, said the slow delivery rate was deliberate and necessary to mature production processes. Waddick said Cirrus intends to bump production to two jets per week by early next year.

Cirrus has orders for 600 Vision Jets. In this year's first quarter it opened a 70,000-sq-ft paint and finishing center at the production facility in Duluth, Minnesota. The transfer of customer acceptance to the Vision Center in Knoxville, Tennessee, freed more space in Duluth. Waddick said that the company plans to bring a second shift to the jet line and more off-shift work to handle swifter jet production rates. By the end of the year customers for all Cirrus aircraft will take delivery at the Vision Center in Knoxville, and factory training for all Cirrus aircraft will be conducted there. Todd Simmons, president of customer experience, said the training building is under construction and will be finished by year-end. It will house a level-D full-motion simulator for the Vision Jet. In the next four to five months, all jet training will move there. Simmons said the Knoxville campus is also home to a factory service center, and Cirrus is supporting the SF50 with premium products and services such as Jet Stream, a prepaid maintenance program that covers the engine, airframe and avionics.

Power for the SF50 comes from a Williams International FJ33-5A turbofan producing 1,800 pounds of thrust. Maximum cruise speed is 300 knots and maximum range is 1,250 nm, albeit at 240 knots. At 300 knots it falls to 1,100 nm. The SF50 takes off in as little as 2,036 feet; lands in 1,721 feet; and stalls (full flaps) at 67 knots. It climbs at 2,000 fpm and the service ceiling is 28,000 feet.

The Cirrus Perspective cockpit is built on the Garmin G3000, with three touchscreen controllers powering the two large main display screens. The system incorporates built-in flight-envelope protection to prevent loss of control. Enhanced vision system and enhanced real-time weather radar are optional. The SF50 has modular seating for up to five adults and two optional jump seats suitable for small children. The useful load—passengers, gear and fuel—is 2,248 pounds.

Stratos 714

Stratos Aircraft reported in September that the lone flight-test Model 714 had logged 80 hours on 44 flights since first flying late last year. The company has started construction of a second prototype and has completed the erection of a 13,000-sq-ft composites facility in Redmond, Oregon. The company plans next for pressurized flights, receiving clearance to operate at FL280, and verifying the 714's projected 400-knot cruise. Through summer the aircraft had reached 18,000 feet and 250 knots indicated, or 330 ktas. The lone flight-test aircraft has been fitted with a complete interior that was designed and installed by Stratos, save for seat structures provided by Millennium Aircraft. Ninety percent of the aircraft was fabricated by Stratos, including the trailing link landing gear, which was fit-prototyped using additive manufacturing (aka 3D printing).

The 714 is currently flying with Garmin 3X avionics, but the company said the final decision on a suite is still years off. The cockpit has cabled sidestick controls. The current test aircraft is fitted with an older-generation Pratt & Whitney Canada JT15D-5, but plans now call for the PW535E to power production aircraft; this is the engine that powers the Phenom 300. The need for a 3,000-pound-thrust-class engine to meet the aircraft's mission parameters of Mach 0.7, 1,500 nm range and four 200-pound passengers drove the current configuration.

CEO Michael Lemaire said the company continues to focus on raising the bulk of the estimated $200 million required to finish certification and that, while interest in the aircraft has grown substantially since it flew, the company is three to four years away from taking deposits. Stratos has not ruled out offering the 714 as a kit before it offers a certified aircraft. The price is not set yet but should be in the same territory as the TBM 930, said John Hadlich, Stratos's prototype project manager, adding that the company has sufficient funding in hand to build a second aircraft and continue the development effort.

Flaris LAR 01

Poland-based aviation newcomer Flaris unveiled this $1.5 million five-seat, single-engine light jet at the 2013 Paris Air Show. Certification has slipped multiple times as the company grapples with engineering challenges exemplified by a powerplant change from the originally envisioned 1,460-pound-thrust Pratt & Whitney Canada PW610F to the Williams International FJ33-5A (1,900 pounds of thrust). The LAR 01 is fitted with dual Garmin G600 avionics. Other features: rear-hinged main cabin doors, detachable wings and stabilizers, a fuselage fuel tank, electric deicing and an in-the-nose whole-aircraft ballistic parachute. Target performance: max cruise speed of 380 knots, stall speed of 62 knots, 1,400 nm of range, a 45,000-foot ceiling and the ability to take off from short grass strips.

The company said a second airplane is nearly complete and construction is under way on two more fuselages. Last year Flaris announced it had completed ground runs with the Williams engine and hoped to fly an aircraft soon. Ground tests were continuing on gearbox-driven accessories. Initial test flights will be conducted with the fuselage unpressurized, although the company claims good progress with the ventilation and pressurization unit. Work is also continuing on the multistage whole-aircraft parachute system. ❑

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With S211, APS covers high-altitude jet upsets

by Matt Thurber

After spending time ingraining a disciplined and strategic application of upset prevention and recovery training (UPRT) techniques in an Aviation Performance Solutions (APS) Extra 300L single-engine piston aerobatic airplane, pilots might want to consider sticking around for a jet enhancement program to learn how to handle upsets at high altitudes.

APS currently offers high-altitude jet UPRT in its Siai Marchetti S211 single-engine jet trainers, one of which was on the static display at last month's NBAA Convention. I was recently invited to sample the half-day S211 UPRT session at APS's headquarters in Mesa, Arizona. APS also has facilities in Arlington, Texas, and Breda International Airport in the Netherlands, and the in-aircraft high-altitude UPRT is available in Texas and at customer request.

APS trainees can add the S211 high-altitude UPRT enhancement program to the end of their full Extra 300L-based UPRT or as part of a recurrent training event at APS, according to Paul "BJ" Ransbury, APS president and CEO. The enhancement takes half a day, either on the last half of the third day, or the morning of the fourth day. For recurrent students, the S211 high-altitude course can be added as a second-day training event. "We need to make sure the fundamentals are in place before we take them to high altitude," he said. "There's just so much going on there."

APS also offers low-altitude programs integrating the S211 with the Extra 300L program, with many customers taking the entire three-day course in the S211 exclusively. However, for human factors reasons and repetition to proficiency, Ransbury recommends that initial UPRT is best accomplished by using both training airplanes, with at least two flights in the Extra 300L.

The high-altitude training course begins with a ground session on high-altitude jet operations, then for pilots who haven't flown the S211 yet in the program, a differences briefing and a preflight discussion are provided to cover the training plan and profiles to be flown.

High-altitude Jet Ops

Karl "Schlimmer" Schlimm is APS's director of flight operations; he flew F-16s and OV-10s in the Air Force and also owned a charter operation. During the ground session on high-altitude jet operations, Schlimm covered the basics of transonic flight, highlighting the difficulties that pilots can experience when flying swept-wing business jets, especially jets that can fly at speeds where shock waves can develop on various areas of the airplane.

Shock waves, which occur at the critical Mach speed when the airflow at that area reaches Mach 1, can cause a number of effects that pilots need to be aware of. One of these is wave drag, which is a result of shock waves initially forming on areas of maximum camber such as wings, engine inlets and even areas on the fuselage.

More concerning is that flying at Mach numbers beyond maximum operating Mach (Mmo) can potentially develop further into Mach tuck because of a few factors, although modern transport-category airplanes integrate design features and technology to mitigate this hazard. At extreme speeds beyond Mmo, shock-induced airflow separation can cause a loss of downwash force on the tail, he explained, "potentially decreasing pitch control at a time when you need it most."

On the other end of the speed spectrum in slow flight operations near the aerodynamic stall, for example, in a T-tail jet the pilot may have the control authority in some circumstances to pull the airplane into a dangerously high angle of attack because, he added, "in a T-tail airplane the downwash of the main wing flows below the plane of the tail, because the stabilizer or elevator are not washed out like they would be in a conventional-tail airplane. If you do that right at a point where the turbulent stall-induced airflow separation comes to the inboard area of the main wing, the resulting low-energy turbulent airflow over the tail can cause the elevator to lose sufficient authority to reduce angle of attack to recover from the stall, thus causing a rare and dangerous deep stall."

During a sustained, aggressive stall in a swept-wing jet, the stall can progress from the wingtips to the root. This moves the center of pressure forward, which can induce a large pitch-up moment. "If you get the center of pressure too forward toward the center of gravity," he said, "you can lose the natural pitch-forward moment certification feature, and you get an airplane that gets pretty squirrelly in pitch. In the worst case it can be uncontrollable, and that's one of the reasons why some swept-wing airplanes have stick shakers and pushers." Some jets, Learjets in particular, have ventral fins on the aft fuselage, to provide a measure of pitch stability at high angles of attack. Flying too close to the aft center of gravity limit can exacerbate this situation.

While modern jets are designed to reduce the risk of Mach tuck, if it did happen, the tools available to get out of this situation are to add drag to slow somehow, reduce speed by lowering thrust and possibly adding speed brakes—or even by lowering the landing gear in extreme situations if approved by the manufacturer—and by using elevator trim to assist in alleviating control pressures to help the crew to bring the nose up.

Stall Prevention and Recovery

A key area of focus in the high-altitude training program is stall prevention and recovery at high altitudes, which are defined for UPRT purposes as stall occurring above 25,000 feet.

Because swept-wing jets can ultimately stall at the wingtips first in a sustained stall, the ailerons can lose effectiveness. This is one of the reasons most jets have roll spoilers: because they are placed farther from the tip and thus remain effective at high angles of attack. At high altitudes, however, available engine thrust is far lower, and power will not be as effective in generating acceleration. As at low altitude, angle of attack management in stall prevention and recovery is king. As a result of these factors, high-altitude stalls require the pilot to reduce angle of attack and be patient in allowing the airplane to accelerate away from the stall, typically requiring a descent of several thousand feet, and out of the slow flight regime. General guidance in high-altitude stall recovery is to accelerate to the appropriate cruise or climb before stabilizing the aircraft in altitude.

The APS All-Attitude Upset Recovery Strategy baseline process—push, roll, power, stabilize—can't be completed until the wing is fully unstalled, the lift vector carefully re-oriented, the energy state managed, and the aircraft stabilized in pitch, thrust, speed and altitude, while ensuring the aircraft is configured and trimmed appropriately. This can take a surprising amount of time, much longer than pilots experience in a similar situation but at low altitude.

"Pilots of large transport-category airplanes should not be surprised that it takes a long time to recover fully from a high-altitude stall and to a properly stabilized flight condition," said Schlimm. "You can get slow in a jet, start sinking and you get into trouble if you're not careful, and the pitch attitude looks normal outside. At high altitude, you can arrest that sink rate only by initiating a positive reduction in angle of attack, and accelerating with excess thrust when you have it, understanding that excess thrust reduces substantially with increasing altitude." If the pilot isn't patient, he added, "You can push out of the stall and pull right back into it."

Schlimm explained how easy it is to get into a buffet-limited condition at altitude, by turning too steeply, loading up the wing and losing airspeed with potentially no excess thrust available to regain the lost speed, especially if the situation is allowed to deteriorate below L/Dmax airspeed. This is one of the reasons why low bank angles are recommended at high altitudes. It is possible to get into this condition when flying into a warmer airmass, and it could be exacerbated further by turbulence, thus generating drag in a limited-thrust condition resulting in the speed decaying unnoticed while on autopilot, or as simple as the pilot accepting too slow an airspeed assigned by ATC at or near maximum altitude.

"In a swept-wing airplane near maximum altitude, when your speed is approaching an approach-to-stall condition," he said, "the rate of airspeed decrease will tend to increase and you may have only a few seconds to make a decision and descend because you didn't notice it before, and now it's time-critical."

"If you're caught in that speed-unstable region below L/Dmax speed [the slow flight region] with no excess thrust, you have to descend, and pilots should expect to lose 3,000, 4,000, 5,000 feet or more at high altitude, especially in a swept-wing airplane. It's important to take action as the pilot flying while getting assistance from the pilot monitoring such as requesting or announcing an immediate descent. If ATC does not respond, declare an emergency and squawk 7700. The airplane is coming down one way or another. It's up to the crew to take actions to ensure that the descent is in control."

Then Schlimm said he would seek an altitude that the jet can maintain where there is enough power for optimum cruise with

sufficient excess thrust remaining. "You don't want to have to level off and then have to descend again either because you didn't accelerate sufficiently or descend to a sustainable altitude."

There is much more to the high-altitude jet operations ground training, but the primary focus is to help the student understand the differences when flying at high altitude and why the training focuses so much on not just handling the upset properly but recognizing when the airplane is in a stable recovery.

S211 at High Altitude

The S211 is a relatively easy to fly, swept-wing, single-engine jet trainer, powered by a 2,500-pound-thrust Pratt & Whitney Canada JT15D-4C. Maximum speed is 400 knots (Mach 0.80) and clean stall speed 90 knots. To make the S211 more closely match the airplanes business jet pilots fly, APS installed a Garmin G3X display (both seats) driven by a GTN 650 navigator (front seat only but displays GTN routing in the back). APS recently added a second S211.

The high-altitude training has three objectives, Ransbury explained during our pre-flight briefing: to enhance awareness and reinforce upset prevention, knowledge and skills; understand, experience and practically apply key high-altitude learning concepts and control inputs; and successfully and consistently recover from a diversity of high-altitude stall and upset conditions.

"Upset prevention and recovery training programs often focus almost exclusively on recovery," he said, "and in reality it should be focused on prevention. We're going to be seeing a lot of both today."

The flight illustrated, sometimes in dramatic fashion, how a swept-wing jet can get a pilot into trouble at high altitudes, and differences in performance and handling at low versus high altitude.

"There is reduced maneuvering margin between the high- and low-speed buffet," Ransbury explained. "You're surprisingly close to the stall and don't realize it for a number of reasons. Yes, it's a smaller operating region, but also as we get into higher Mach conditions the stall angle of attack actually decreases. We're seeing the stall onset at a lower angle of attack than we normally would."

Couple that with the reduction in thrust at altitude, down to 20 to 25 percent of maximum thrust at the S211's 40,000-foot maximum altitude, and the challenge facing pilots gets more complicated.

If a pilot inadvertently allows the airplane to slow below the speed for max L/D (maximum lift over drag ratio) at high altitude in a thrust-limited condition (that is, the pilot can't accelerate out of it), then the only choice is to reduce angle of attack, accelerate to an appropriate Mach and stabilize the aircraft at a sustainable altitude to complete the recovery. But again, it will take a while to recover and the airplane will likely have to descend, because there might not be enough excess thrust to accelerate beyond L/Dmax while staying level.

"It's likely going to take more altitude loss to recover than expected," he said. In the S211, this can be 2,000 feet, more if the temperature is high or at altitudes close to maximum. To recover in this situation the pilot must reduce angle of attack until reaching climb or cruise Mach. "We want to get into a speed-stable region of the operating envelope," he said.

"Another factor at high altitude is reduced aerodynamic damping. We illustrate this by practicing calibration exercises at lower altitudes, feeling the amount of thrust available, how the controls feel, noting the duration of the full recovery process, then doing the same at high altitude and comparing. The lower aerodynamic damping means that at high altitude it's easier to overcontrol because there is a bigger response to control movement. "We need to remember [these factors] when recovering," Ransbury said, "and we need to be patient with whatever technique or strategy we're applying."

Ransbury went over the APS All-Attitude Upset Recovery Strategy baseline technique—push, roll, power, stabilize—and emphasized the steps I would take to recover from an upset.

Before needing to recover, however, it is first important to recognize the upset situation or that the aircraft is headed into an upset if nothing is done to fix the problem. "For example, inadvertent slow flight is an upset," he said. "That's where we want to fix it." If the crew doesn't fix it then, he added, it will get worse. "It's going to go from inadvertent slow flight, to approach to stall, to stall, to incipient spin, to spin. Unchecked, it's a stall-spin escalation."

Business jets aren't designed to recover from developed spins. "The further you get down the line in the escalation the more robust your skills need to be," he said. "But from an aerodynamic standpoint, the longer a pilot of a multi-engine jet allows a stall to exist, especially when combined with uncorrected yaw, the less likely you're going to survive the encounter. The earlier we can take effective action, the better."

Once the upset is under way, if the airplane is stalled it is imperative to reduce angle of attack. If the autopilot is on, it must be switched off in most airplanes before taking any further steps.

After unloading the wing (reducing angle of attack) so it can more effectively generate lift and be positively controllable in roll, the pilot reorients the lift vector. The lift vector is generally perpendicular to the upper surface of the wing, so this means getting that lift vector to point straight up by rolling the wings back to level. Pilots should not use rudder during the stall recovery, especially in swept-wing airplanes. If rudder must be used, pilots must be extremely cautious and measured in its application.

Managing energy is next, and this means adjusting power to suit the circumstances. Speed brakes might also be helpful. If recovering from an upright stall, full power will help accelerate to improve controllability and will ultimately help reduce the altitude loss. A mistaken split-S recovery from a roll upset that turns the airplane upside down would result in a dangerous steep dive, in which case power would need to be pulled back to idle.

The upset recovery isn't over until the airplane is stabilized. Close to the ground, this likely means returning to a climb. At high altitude this could be leveling off or even descending if power isn't sufficient. "We're setting pitch and power for the airplane to perform in whatever condition is appropriate for this scenario," Ransbury explained. "When you say you're stabilized, think about that as a separate phase of recovery. You want to go to a pitch attitude and power setting to accomplish a performance." He suggested checking that pitch is as desired, power is set, speed is stable, then checking the configuration of landing gear, flaps, speed brakes and trim before declaring "recovery complete." He emphasized, "You don't want to take your mind out of recovery mode until you know the airplane is doing what we want it to do."

"Our mental state at high altitude should be that there is nothing that we have to rush. It doesn't mean we can't be expeditious in our decision-making because we need to be ahead of the airplane, but we can't rush control inputs and expect there to be a rapid response on what we're trying to accomplish. The good news is, at altitude ground impact is not the imminent threat."

This training helps pilots learn to focus on the recovery and not be distracted by an ATC call or other seemingly urgent issues such as going over inappropriate checklist items. "Crew Resource Management processes are up to the flight department. In an airplane upset, the standard procedure for operators is often for the pilot flying to stay the pilot flying while the pilot monitoring helps manage the flight deck and ATC, although some operators will automatically have the pilot monitoring take over. It varies," he said.

"In any case, I'd rather the pilot flying take two minutes in the final stabilization step to get it right. There's no upside to rushing through the stabilization process and missing a critical item that could propel the aircraft into another upset condition seconds, or even minutes, down the road."

Mission Accomplished

After briefing the mission profile, I put on my parachute and climbed into the S211's rear seat. I had flown with Ransbury in the S211 last December, so I was somewhat familiar with the cockpit layout, but we went over the switches and controls again, as well as the bail-out procedure. A most important piece of information is not to confuse the canopy handle with the throttle.

After taking off from Phoenix Mesa-Gateway Airport's Runway 12R, Ransbury handed me the controls for the climb-out, and I maintained 190 kias as we climbed toward the Globe military operations area east of the airport.

After I tried the calibration exercises at 16,000 feet to get used to the handling and throttle response, Ransbury had me slow the S211 to 100 knots and deploy the speedbrakes, then accelerate out of the slow down. Then I brought it into a stall and applied the push-roll-power-stabilize strategy, noticing that the angle-of-attack gauge showed two yellow chevrons, almost to the red, and we heard the stall warning horn beeping almost continuously. In the stall, the nose banked left about 30 degrees before I started the recovery.

"Would you agree it's pretty responsive in the recovery?" Ransbury asked. I did.

He took the controls and simulated a wake turbulence encounter with autopilot on by imparting a rolling moment with the rudder. "You may not get an upset," he said, "but I want you to apply the strategy." Later I would see that this upset is far different at high altitude.

The nose banked slightly to the right then to the left. I switched off the autopilot and applied the strategy. It was a fairly benign upset, and the autopilot could have handled it. "The point is we had a certain amount of rolling moment and we saw that the airplane was pretty responsive and dampening was pretty controlled," he said.

We then practiced recovering from a nose-high upset using roll to lower the nose. With the nose pitched up 46 degrees, he demonstrated the push to unload the wing, adding power, then banking to lower the nose to the horizon. It is important to watch the angle-of-attack gauge, he said, to avoid pulling the nose up too hard during the recovery to avoid

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APS course covers jet upset training

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a secondary stall. I then flew the same maneuver.

Next was intentionally exceeding the climb profile, and this simulated a situation where the pilot got distracted and didn't notice the excessive climb. We were at 24,000 feet by then, and Ransbury pointed out how the controls felt more sluggish and the rudder was less effective. I continued climbing and slowing down, and the angle of attack started showing one yellow chevron as we started to feel a slight stall buffet. I leveled off and noted that the S211 was barely accelerating even though we had full power set. "Maintaining control in this situation is more important than talking to ATC, at least initially," he explained.

A runaway trim exercise was next, using the strategy of banking to lower the nose because we were simulating not having pitch control available to drop the nose. I still had to push forward to unload the wing, but the only way to get the nose to the horizon was with roll.

Above 25,000 feet we flew some unusual attitudes and noted the reduced aerodynamic damping and how much longer it takes to get back to the Mach 0.35 climb profile. Stall angle of attack was now much lower, too, and we were high enough that it would be necessary to let the S211 descend to accelerate back to the Mach 0.35 climb speed.

We continued to climb to 33,000 feet for the meat of the program, the high-altitude UPRT maneuvers.

First was the thrust-limited slowdown and trying to use power to maintain altitude after getting too slow, an excellent upset awareness and prevention exercise. This took much longer at the higher altitude.

Next was simulating an aggressive deviation for weather with a 30-degree bank to the right at cruise thrust. I tried to thrust out of the resulting slowdown, and the power was barely enough to recover without losing altitude, and the recovery took a long time.

Going right into a stall, we felt the buffet much sooner with the angle of attack indicator nowhere near the red chevron, and no tone from the stall warning. The S211 lost 1,500 feet during this maneuver.

Ransbury did the exact same footwork with the rudder pedals for the wake turbulence encounter with the autopilot on. This time, the result was stunning. The nose banked slightly to the right, then abruptly swung around the horizon to about 160 degrees to the left and down 24 degrees, so when I started the recovery, we were basically upside down and pointing well below the horizon.

First I pushed on the stick, despite the temptation to pull back to avoid the ground, then I rolled, but I mistakenly had turned the autopilot off then back on because I was pushing the wrong button on the stick. Switching the autopilot off, I rolled upright and resumed the climb profile during the recovery. This time we lost 3,500 feet. "It gets your attention, doesn't

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it?" Ransbury asked. "The same little inputs turned us upside down. Not only does the input put you in a bad situation, but it's easy to overcontrol to try to get out of it. It's much more dramatic here at altitude."

We did another wake turbulence encounter, this time to the right, and the nose rolled 150 degrees and dropped 18 degrees, and this time allowed the S211 to descend after the recovery. At high altitude, he pointed out, thrust available is so low that it might make sense just to leave the throttles alone, even in a nose-down upset as it might add more controllability and help with the recovery; however, due consideration must be given to your margin of safety from Mmo at any point during the recovery. "Consider that the decision on power might be different at altitude."

It took much longer to recover from the next maneuver, a nose-high upset with roll to bring the nose back down. "Did you feel the airplane was very sluggish?" he asked.

When faced with rolling nearly upside down and with the nose down, the classic incorrect upset recovery is the urgent reaction to pull the yoke or stick back and end up in a high-speed, high-g split-S maneuver—instead of rolling back upright—where the nose is pulled back up through the horizon. During this recovery, I flew the procedure correctly by pushing on the stick (while upside down), rolling back upright, reducing power, adding speedbrakes then returning to a climb attitude.

Ransbury flipped us upside down again and this time, as instructed, I didn't recover but flew the incorrect reaction by pulling back on the stick and completing the split-S. We lost nearly 10,000 feet, and I could feel the airframe nibbling at the stall buffet as I carefully pulled the nose back up; the g level peaked at 3.7. Ransbury debriefed me that we were simulating a 2.5-g airplane, but he clarified that in a crisis where exceeding Mmo was imminent or ground impact likely, cautiously applying control inputs to generate an over-g condition may be the best alternative.

Clearly the split-S isn't the correct way to handle this upset, and it would be easy in a business jet to pull way too many gs trying to pull the nose up while avoiding the stall instead of simply rolling upright to recover.

ATC called and warned us that the MOA was about to become hot, so Ransbury took the controls and did another split-S to facilitate our rapid descent into APS's low-altitude training area a dozen miles from Phoenix-Mesa Gateway Airport. We performed a number of configured low-altitude stalls, uncoordinated stalls and airplane upsets with the selectable control feel engaged, giving the S211 the handling qualities of a large transport-category aircraft. The aircraft responded promptly, with high stability and plenty of excess thrust. These final exercises once again reminded me of the stark difference in performance and handling qualities of jet airplanes at high altitude.

The S211 is an excellent tool for teaching business jet pilots how to handle upsets in an airplane that more closely replicates the flying characteristics of the airplanes they fly, while allowing pilots to make mistakes and pull heavy g loads as part of the learning process. ❑

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category, despite the fact that the corporate flights were under the command of paid pilots.

By far the highest number of fatalities in turboprop accidents occurred under personal flying, unlike their jet counterparts. Those 243 deaths represented 53 percent of those killed in all turboprop crashes. There were three times more turboprop air-taxi accidents than air-taxi jet crashes, although Part 135 propjets flew many thousands of hours less each year than air-taxi jets, according to FAA activity figures. Air-taxi operations by turboprops netted 42 fatal accidents compared with six for scheduled charter turboprops.

Accidents by Airframe

Most models of business jet and turboprop experienced an accident of varying degrees of severity that required an investigation, according to the NTSB data. Purpose-built business jet models escaping fatalities in U.S. operations over the 16-year time frame were the Beechjet 400, Dassault Falcon, Eclipse 500 and Mitsubishi MU-300. The Piaggio Avanti was the only general aviation turboprop having more than two accidents that suffered no fatal crashes.

Citations and Learjets accounted for the most accidents among business jets: 136 versus 105 for all the other models combined. Of the 85 Citation accidents, 17 (21 percent) resulted in 51 fatalities. Twelve of the fatal Citation crashes were tagged as "personal or business" flights under Part 91; two were listed as flown by a salaried crew; and an air-taxi flight and a positioning flight accounted for two accidents. In another fatal crash under Part 91 in which a bird strike brought down a Citation 500, the NTSB didn't report on the crew status.

Of the 51 Learjet crashes, 14 (28 percent) were fatal for 32 people. Seven, or half the fatal Learjet crashes, occurred while positioning the aircraft; six happened under Part 135 and only one under corporate Part 91. There were no Learjet fatal crashes listed specifically as flown by non-salaried crews, although this model had several nonfatal accidents under the command of unpaid pilots and being flown on personal or business missions.

Not surprisingly, considering the size of the fleet, King Airs accounted for more turboprop accidents than any other type, with a total of 120, or 22 percent of all propjet mishaps. The 39 fatal King Air accidents resulted in 133 deaths that broke down thus: corporate flights by paid pilots (30); business flights by unpaid pilots (17); personal flights (55); positioning flights (17); air taxi flights (13); and one in an unknown operation.

Cessna 208 Caravans conducting private, corporate and unscheduled air-taxi operations had a total of 61 accidents, 16 of them fatal for 32 people. The fatalities (shown in parentheses) broke down as positioning flights (one); air-taxi flights (15); personal (14); and business flights by unpaid pilots (two). There were no fatalities in the three corporate Caravan accidents being flown by a paid crew. Eighty-six Caravans carrying parcels or other cargo were involved in accidents.

The Piper PA-46-500 M/Meridian single had the third highest number of accidents and the seventh most fatalities among the turboprops: 37 total crashes and 26 people killed. All but one fatal crash occurred under the command of non-paid pilots. Piston-powered Piper PA-46s converted to turboprop power were involved in 21 total accidents and 23 fatalities. All accidents were being flown by non-paid pilots. No conversions were performed by Piper.

The Piper Cheyenne and Mitsubishi MU-2 tied for the second most fatalities in turboprop accidents, with 66 people dying.

Part 91K fractional operations were involved in only six accidents in the 16-year period. The mishaps, resulting in minor or no injuries, befell three jets and two turboprops: Piaggio Avanti (twice), PC-12, Hawker 800XP, Challenger 300 and Citation 560XL.

Relating the Rates

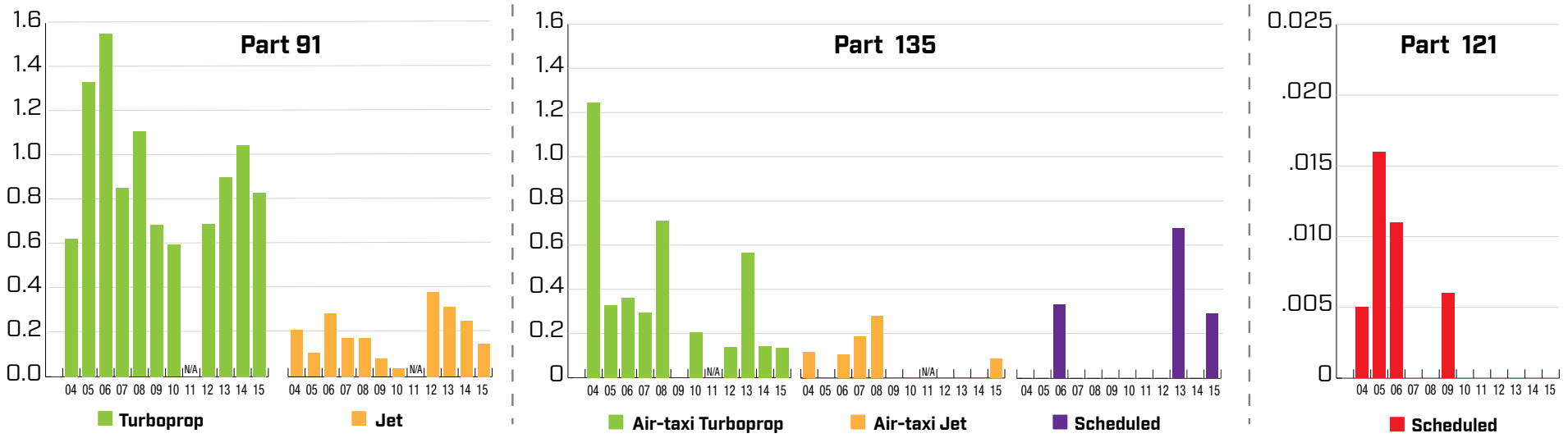
The NTSB also provided **AIN** with rate data—accidents per 100,000 flight hours—from 2004 through 2015, the latest year for which full data was available. Before 2004 the FAA's activity data did not separate Part 91 and small Part 135 aircraft operations. Rate data effectively indicates how frequently accidents occur in relation to how many hours per year a particular operational segment flies.

As mentioned earlier, rate and flight-hour data for general aviation is based on more accidents than in the detailed accident summary because activity figures provided by the FAA, and that the NTSB uses to calculate the rates of general aviation accidents under Part 91, include "everything not in Parts 121 and 135," the Board said. For example, "There are also experimental and ag airplanes powered by

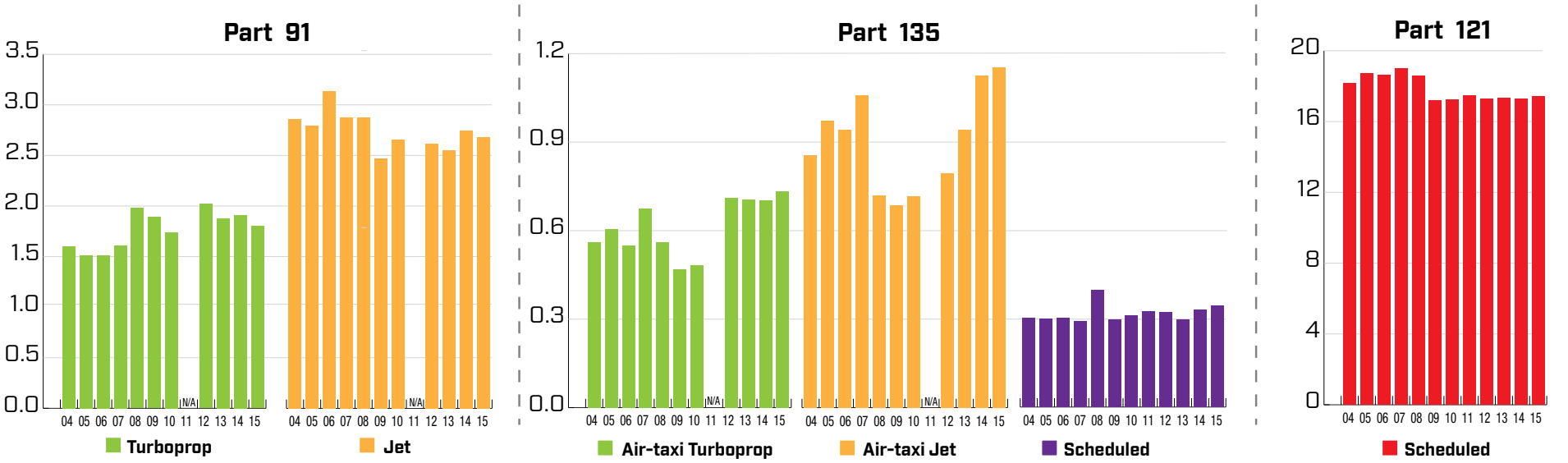
Continues on page 48 ▶

N/A = Not Available.
No bars shown indicates no accidents that year for that segment.

FATAL ACCIDENT RATE 2004-2015
(Per 100,000 flight hours)



ANNUAL FLIGHT HOURS 2004-2015
(in millions)



Source: FAA and NTSB

Organizers expect record turnout

by Peter Shaw-Smith

The Dubai Airshow, held on the 12th to 16th of this month in the UAE, expects to attract record exhibitor and visitor numbers, as the event takes place for the third occasion at the Exhibition Hall at Al Maktoum International Airport (DWC). The organizers are forecasting visitors at the trade-only event to rise by 9 percent on 2015 to 72,000, joined by 1,200 exhibitors, 1,350 media representatives and 160 aircraft on display.

"We are Number 3. Paris is the biggest, then Farnborough and then us. Singapore is younger than us [and claims to be bigger], but if you measure it on the number of exhibitors, square meters and visitors, it would be us as Number 3," Michele van Akelijen, managing director of Tarsus F&E Middle East, told **AIN** at the MEBAA Morocco business aviation show in Marrakech in September.

She asserted that orders are not necessarily a yardstick to measure the success of a show: "We have had shows with high orders and shows with low orders. [We are] more focused on creating the relationships to get those orders and…[promoting] networking in front of the right people. Dubai Airshow is the perfect platform to do that. You don't get that opportunity on a regular basis—where everybody is in the same place at the same time," she said.

Van Akelijen emphasized that show attendees need to be aware of the show's extensive conference program. "We have five going on this year. The programs are exciting. We are building…new conference rooms on the third floor of the exhibition hall, one for 300 people and two for 150 people. The conferences take place on November 13, 14 and 15."

The Space Pavilion Conference takes place on November 13 and 14. Dr. Ahmad Al Falasi, UAE Minister of State for Higher Education and chairman of the UAE Space Agency, will address a morning session on November 13 on domestic space programs such as the UAE mission to Mars, while Badr Al-Olama, head of aerospace at Mubadala Development, will speak later about that company's work in the field of aviation.

Two one-day conferences take place at the show on November 13. One of them is the Gulf Aviation Training Event (Gate); the other is the Cargo Zone Conference, which will debate the impact of cyber security on cargo operations, among other topics.

Boeing's market outlook for 2016-2035 predicts the Middle East will need 58,000 new pilots and 66,000 new skilled technicians to staff the region's airlines, according to F&E Group.

DAVID McINTOSH

The airshow's reach extends beyond the Arabian Gulf states and the aerospace heartlands of Europe and North America, with a growing exhibitor and visitor presence from across Asia and Africa.

Two two-day conferences take place on November 14-15: Airport Solutions Dubai and the Unmanned Aircraft Solutions Summit. Airport construction is becoming a major market focus, and F&E Group is consolidating equipment suppliers under one roof at three global annual conferences.

"We now have an Airport Solutions series of shows worldwide: one at Dubai Airshow, one in Mexico and one in Indonesia. It's about the passenger experience, air traffic management and ground-handling equipment. It's about anything and everything that goes into airport construction and refurbishment," she said.

The first Airport Solutions Global Series conference in Mexico took place earlier this year, while the Indonesian event was until this year part of the Indonesia Infrastructure Week, a spokesperson for F&E Group said. Tarsus is also understood to be considering Turkey as a venue for the event.

"Research we have done shows that Mexico and Indonesia are the areas where the most airport development is happening outside the Middle East. Mexico takes place in May. Indonesia is happening this month [November]," van Akelijen said.

Ian Bell, vice president and general manager for the Middle East and Asia-Pacific at CAE, will address the UAS Summit on "UAS aircrew training: evolving the process and leveraging technology to meet future needs." ❑

AIN will publish three of our award-winning daily **Dubai Airshow News** editions at the show on November 12, 13 and 14. We will also have comprehensive real-time reporting of all the top news at AINonline.com and in our daily e-newsletters.

Forecast pitfalls: Prognosticators adapt to evolving times

by Kerry Lynch and Curt Epstein

A tumultuous business jet market over the past decade—from the rapidly climbing deliveries of the roaring 2000s to the recent low mark in 2017—has made forecasting tricky business. Unit delivery predictions made a decade ago have been overly optimistic, understandably. But in a market full of contradictions, the dollar predictions have been much more on target.

"It has never been easy to be the forecaster in the room, and less so now," said Rolland Vincent, president of Rolland Vincent Associates and JetNet iQ creator/director. "Forecasting is an inexact science, despite all our high-powered analytical tools, deep data and what we think we know about customer behavior. Fundamentally, most of our forecasting tools are calibrated on past behavior; whenever possible, we look for patterns, correlations and divergences in prior data, sprinkle in some sensible interpretation and do our best to project these relationships into the future."

But when the market doesn't follow past practices, it makes that job all the more difficult.

Market Bullishness

In 2006 the business jet market was in a heyday, with shipments soaring, fractional operators filling order books, new charter models making their way into the market and emerging markets beginning to take root.

NetJets, the largest of the fractional operators, was experiencing close to 25-percent jumps in flight hours and revenues. Charter operators also found business booming. According to Bombardier, which rolled out its first annual 10-year forecast a year later, the corporate operator still ruled the market, accounting for an estimated 78 percent of the orders in 2006.

In that year, business jet makers handed over 887 aircraft, 137 aircraft more than a year earlier and double the number delivered a decade earlier. Orders were on the increase and backlogs approached 2,500 units, foretelling a continued steep climb in deliveries and reasons for long-term bullishness.

In the mid-1990s the business jet market was a $3 to $5 billion business. By 2006 that number had swelled almost fivefold, and Wall Street, which had long followed the

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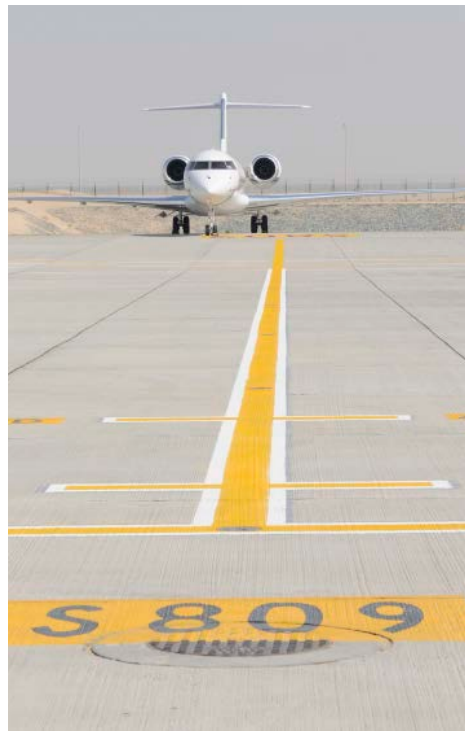

MARK WAGNER

Bizjet-A380 wake vortex

▶ *Continued from page 1*

encounters, the spokesman added. "There isn't any other new EASA communication on this topic at this stage."

Late last year the EASA quietly added wake-vortex encounters to its Safety Risk Portfolio (SRP), a list of mode-specific risks that data show merit specific risk-mitigation focus. Air transport operators were involved in 1,100 wake-vortex encounters between 2012 and 2016, according to EASA data. None was classified as an accident or serious incident.

The January 7 encounter happened as the Emirates Airline A380 and the German-registered Challenger were flying in opposite directions on the same route, L894, over the Arabian Sea. The A380, en route to Sydney from Dubai, was cruising at FL350 on a southerly heading. The Challenger, bound for Al Bateen, United Arab Emirates, from Malé, Maldive Islands, was on the opposite heading flying at FL340.

Approximately 45 seconds after the Challenger passed beneath and just to the right of the A380, it flew through the widebody's wake, and the smaller jet rolled "heavily" to the left, the BFU report said. The pilots struggled to regain control, losing 9,000 feet of altitude in 45 seconds. During the altitude loss, the Challenger completed "several rotations," the pilots told the BFU. The pilots recovered control of the aircraft at FL240 and diverted to Muscat, Oman. Two passengers were severely injured, while two others and the cabin attendant suffered minor injuries.

The BFU probe continues, but the preliminary report suggests that an area of focus is aircraft separation standards. The 1,000-foot vertical separation met reduced vertical separation minimums (RVSM) standards within the Mumbai flight information region where the occurrence took place, the BFU said. Strategic lateral offset procedures (SLOP), in which pilots are permitted to fly to the side of an air route's centerline to expand separation—and safety margins—were not permitted on L894, the BFU said.

Separation standards for the A380 were developed on the basis of working group recommendations made in 2006, the year before the aircraft entered service. While the group established new standards for arrival and departure sequencing, it concluded that existing en route horizontal and vertical spacing requirements were sufficient for the A380. "Based on current separation criteria, [wake vortex encounter] risk is considered to be acceptable at this time," a "safety case" produced for the working group said. "However, it is recommended that this issue be investigated further."

Wake-turbulence Risk Studies

The EASA's SIB references several publications that underscore wake-turbulence risk. One, a 2014 study published in Aircraft Journal titled "Improved Understanding of En Route Wake-Vortex Encounters," pointed to several factors that may boost en route risks. Two—the amount and mix of traffic—are related. The Aircraft Journal study cited a "stabilized" annual-movement increase of 3 percent forecast through the end of the decade. "With more movements, the risk of encountering a wake vortex increases quadratically," the study explained. Add an increasing mix of traffic and the risk grows. "Especially when the number of heavy aircraft increases along with the introduction of medium, light and very light aircraft, an increased risk is to be expected with respect to wake vortex encounters during the en route phase of flight," the study said.

Another factor is climate change. Multiple studies referenced in the Aircraft Journal piece indicate that the tropical regions are expanding toward the North and South poles. One ramification is a raising of the tropopause, the boundary between the troposphere and the stratosphere. The altitude of the tropopause varies with myriad factors, among them weather systems, but generally it ranges from 30,000 feet at the poles to 56,000 feet at the Equator. Research shows that wake-vortex encounters are more common just below the tropopause, in the troposphere. "The generally lower stability in the troposphere provides favorable conditions for the evolution of the wake vortex," the Aircraft Journal study said.

As the tropics expand, the tropopause in European airspace rises, exposing more cruise altitudes to tropospheric conditions. "This could result in more en route wake vortex encounters in the future and may contribute to increased severity of wake vortex encounters," the study said.

The EASA's SIB lists three factors contributing to the elevated risk of en route wake turbulence: crossing traffic climbing or descending in proximity to another aircraft; heavy aircraft generating stronger vortices; and the rising tropopause. The bulletin also underscores the added risk during RVSM operations. "Considering the high operating airspeeds in cruise and the standard 1,000-foot vertical separation in RVSM airspace, wake can be encountered up to 25 nm behind the generating airplane," the SIB said. "The most significant encounters are reported within a distance of 15 nm."

The January Challenger upset happened in airspace with no radar coverage. The BFU's reconstruction of the occurrence using Tcas and other onboard data show the Challenger was 15 nm past the A380 when it hit the widebody's wake.

While the EASA is on the record as taking a closer look at the risk of wake turbulence, it has not changed any procedures. The FAA's general guidance, Advisory Circular 90-23G, was last updated in February 2014. In 2009, the U.S. agency's Air Traffic Organization (ATO) issued a notice to controllers spelling out "interim" procedures, including separation standards, for A380 flights. The notice, effective for one year, was updated annually, and in May 2012 the term "interim" was removed from the title. In 2013, the massive Antonov An-225 cargo transport was included for the first time.

The most recent notice expired in June 2016, and the FAA has yet to issue a new notice. "Nothing has changed," an FAA spokesman said.

The A380 fleet, which numbered about 165 in the middle of last year, was up to 215 at the end of August. Airbus listed 102 more in its backlog. ❑

Global 7000 debut

▶ *Continued from page 1*

London-Singapore and Los Angeles-Shanghai, Ouellette said.

The flight-test program will employ five FTVs, each named for its specific mission in the validation and certification program. Four are currently flying.

FTV1 has notched 140 flights in a workhorse role and achieved a level speed of Mach 0.995 early in the program. FTV2 concentrates on powerplant, hydraulics and aircraft systems tests. FTV3, tasked with avionics and electrical systems, reached 51,000 feet on first flight and also conducted an 8,000-nm mission in which it spent three minutes north of 89 degrees latitude—essentially the North Pole. FTV4 is outfitted with a certification interior and is being used as the testbed for all cabin systems and furnishings. It first flew on September 28. FTV5, outfitted with a full production interior and slated to fly shortly, will become the Global 7000 demonstrator.

In total, the four FTVs have accumulated 900 hours of flight time, Bombardier said. The company is not releasing milestone figures on the total number of flight hours certification is expected to require.

Bombardier unveiled the Global 7000/8000 program at the 2010 NBAA Convention. The Global 8000—a shorter variant with longer range—has been scheduled to launch a year after the 7000's EIS, but at a pre-show briefing David Coleal, president of Bombardier Business Aircraft, said the company "will make a decision [on the schedule for the Global 8000] in the future." ❑

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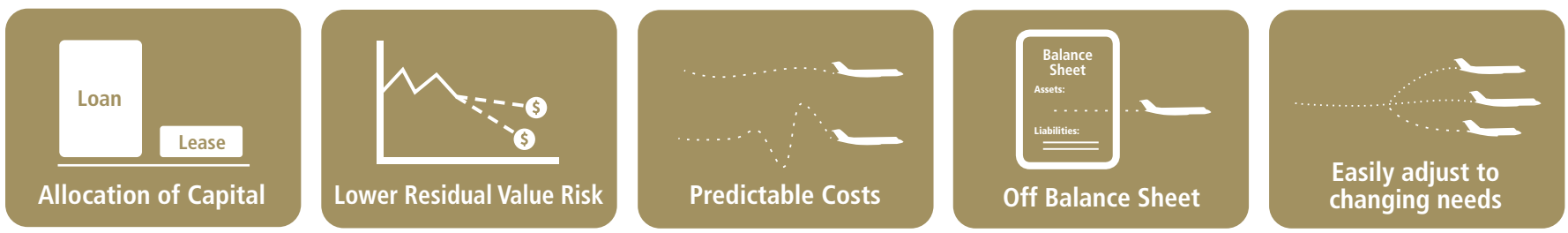

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Boston Globe *report blasts FAA oversight*

by Gordon Gilbert

General aviation is the latest topic to come under the harsh beam of the awarding-winning Spotlight investigative series from the *Boston Globe*. Titled "Secrets in the Sky" and published in late September, the report takes the FAA to task for its alleged failure to monitor and keep current its general aviation aircraft and pilot registration records. As a consequence, the article concludes that a "web of secrecy surrounds thousands of airplanes, making it nearly impossible to identify an airplane's real owners and hold them accountable."

The article claims that "lax oversight by the FAA over decades has made it easy for drug dealers, corrupt politicians and even people with links to terrorism to register private airplanes and conceal their identities." The authors describe in detail several specific examples, complete with the N-numbers of the aircraft involved: corporate jets.

Aircraft title and trust companies also came under the *Globe*'s scrutiny. The article describes these companies as a way for the real owners to register their aircraft in the U.S. without being noticed. The *Globe* reported it found that 3,500 aircraft are registered to 2,000 companies located at a single Wilmington address that is "home to a business incorporator."

The article lambastes the FAA for not requiring photos on airman certificates. As the FAA pointed out in the report, "Pilots are also required to carry a government-issued ID such as a driver's license to prove their identity."

While the *Globe* article reported that its investigation of the FAA's airman certification registration data netted five names that had "possible" ties to terrorism, it did not report that those five were just .00083 percent of the 600,000 names in the database.

A Strong Safety Record

Ed Bolen, president and CEO of NBAA, told **AIN**, "The business aviation community's top priority is the law-abiding, safe and secure use of aircraft. To that end, our industry continues building on a host of common-sense measures already in place to ensure these aircraft, the pilots and passengers they carry and the airports they use are safe and secure. Unfortunately, none of these measures were outlined in the *Globe* series, nor did the reporting put this important information in a larger context about the true nature of business aircraft use in America today."

The FAA told **AIN** it has a "team of special agents who work with domestic and international law enforcement partners to investigate cases involving fraudulent aircraft registrations" and has "worked with individual governments to systematically de-register aircraft with fraudulent registrations and to identify operators who are using aircraft for criminal purposes." The agency conceded it does not have the resources to determine the accuracy of certified information submitted for aircraft registration.

"However, the Registry does require proof of ownership that has to match the name of the owner seeking to register the aircraft, and the form contains language that indicates making false statements is a crime… The agency is developing a plan to significantly upgrade and modernize the aircraft registration process." ❑

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Safety 2000-2016

▶ *Continued from page 42*

turboprops that were intentionally excluded from the detailed summary data."

Readers will notice that there is no rate or flight-hour data for the general aviation segments in 2011. "We have two sources for activity data," the NTSB explained. "They are the FAA general aviation and Part 135 non-scheduled activity reports, and DOT Form 41 data (which is processed by the FAA to calculate Part 121 and scheduled Part 135 activity)." In 2011 there was a new survey contractor and, according to sources, the FAA had some concerns about its methodology, so numbers were not published for that year.

U.S. Business Jet Accidents by Airplane Model
Parts 91, 91K and 135 • Years 2000-2016

Manufacturer	Model	Total	Nonfatal	Fatal	Fatalities
Beechjet	400	7	7	0	0
Boeing	727/737	3	3	0	0
Bombardier	Challenger/Global	18	16	2	4
	Learjet	51	37	14	32
BAe	Hawker 125/800	9	6	3	17
Cessna	Citation	85	68	17	51
Dassault	Falcon	16	16	0	0
Grumman/Gulfstream	II/III/IV/V/150/200	17	14	3	28
Eclipse	500	5	5	0	0
Embraer	Phenom	7	6	1	3
IAI	Westwind	5	3	2	5
Mitsubishi	MU-300	3	3	0	0
Raytheon	Premier I	9	6	3	9
Rockwell	Sabreliner	6	3	3	10
Total		**241**	**193**	**48**	**159**

Source: NTSB. Accidents involving cargo-only flights not included.

U.S. Business Turboprop Accidents by Airplane Model
Parts 91, 91K and 135 • Years 2000-2016

Manufacturer	Model	Total	Nonfatal	Fatal	Fatalities
Beech	King Air	120	81	39	133
	A36*	8	2	6	13
	99/1900	21	16	5	9
Casa	212	2	1	1	6
Cessna	208	61	45	16	32
	210*	7	4	3	8
	206/207*	4	3	1	1
	402/421*	3	0	3	7
	Conquest	25	13	12	25
Convair	580	1	1	0	0
de Havilland Canada	DHC-2/3*	15	9	6	29
	DHC-6	7	5	2	2
Embraer	110/120	6	4	2	2
Fairchild	Turbo Porter	2	1	1	1
Grumman	Grumman G21*	1	0	1	4
Gulfstream	Rockwell Commander	25	15	10	25
Helio	Courier	1	1	0	0
Maule	Turbine	2	2	0	0
Mitsubishi	MU-2	34	16	18	33
Piaggio	Avanti	9	9	0	0
Pilatus	PC-12	22	14	8	28
Piper	Cheyenne	29	17	12	33
	PA-46-500 M/Meridian	37	25	12	26
	PA-46-310/350*	21	12	9	23
Quest	Kodiak	4	3	1	1
Short Brothers	SD3-30	12	9	3	8
Socata (Daher)	TBM 700/800	26	15	11	25
Swearingen	SA-227	25	19	6	8
Total		**530**	**342**	**188**	**482**

**Piston-powered airplanes converted to turbine power. Source: NTSB*

Annual hours rose between 2004 and 2015 for all general aviation turbine segments except for Part 91 jet flying, according to the FAA's data. There appears to be no absolute correlation between changes in annual total flight hours and the improvement or decline in accident rates. For example, when hours spiked in 2008 for Part 91 business jets the fatal rate remained the same as in 2007, a year of fewer hours. But in 2009, when flight hours bottomed, the Part 91 fatal jet rate declined too.

All GA segments except Part 91 turboprops had lower accident rates in 2015 than they did in 2004. Note that Part 121 operations ended the study period with a higher total accident rate despite annual activity plummeting by nearly 750,000 flight hours from 2004 to 2015.

Over the 12-year period for which the rate breakdown was available, Part 121 jetliners averaged 0.034 fatal accidents per 100,000 hours. Part 91 business jets averaged 0.197 for fatal accidents. The fatal rate for Part 135 air-taxi jets not only bettered that for the Part 91 jets, averaging 0.155, but also notched no fatal accidents in six of the years between 2004 and 2015. The fatal rate for turboprops under Part 135 averaged 0.414 and the segment had no fatal crashes in 2009. For turboprops flying Part 91, the fatal rate averaged 0.930. Rates were unavailable to compare Part 91 airplanes flown by paid crews with those flown by unpaid crews.

Nevertheless, these rates show that although airliners continue to remain civil aviation's safest segment, the Part 135 on-demand air taxi segment has the next lowest rate, followed by Part 91 jet operations, Part 135 on-demand turboprop flights and then the Part 91 turboprop category last.

The safety picture changes, however, when looking at numbers of accidents: while passenger airliners still have fewer fatal accidents than business airplanes, they do not have fewer fatalities than Part 91 aircraft flown by paid pilots. From 2000 through 2016, Part 91 corporate jets had seven fatal accidents that killed 33 people compared to six airline accidents in that period that were fatal to 507 passengers and crew. The bottom line: the bizav safety picture depends on how you see the numbers. ❑

The Infamous Seven

Over the 17-year period from 2000 to 2016, the NTSB investigated seven fatal accidents involving business jets on corporate flights being flown by salaried pilots under Part 91. In all, 33 people were killed. Passengers were being carried in all but one of the aircraft involved.

Rockwell Sabreliner, May 10, 2000, Kaunakakai, Hawaii. Fatalities: 6.
The airplane hit a mountain shortly after the pilots terminated an instrument approach and continued visually at night. The crew and four passengers were killed. "Inadequate crew coordination led to the captain's decision to discontinue the instrument approach procedure and initiate a maneuvering descent solely by visual references at night in an area of mountainous terrain," the NTSB concluded.

Learjet 24B, Dec. 23, 2003, Helendale, California. Fatalities: 2.
During flight at cruising altitude, the aircraft departed controlled flight and crashed. The captain and the first officer were killed, and the airplane was destroyed. Visual conditions prevailed for the flight, which operated on an IFR flight plan. The Safety Board could not determine why the crew lost control of the aircraft.

Cessna Citation 560, Feb. 16, 2005, Pueblo, Colorado. Fatalities: 8.
The two pilots and six passengers lost their lives when their aircraft, on an ILS approach in icing conditions, stalled and crashed. The NTSB blamed the flight crew for not effectively monitoring and maintaining airspeed, and not complying with procedures for deice boot activation on the approach, which caused an aerodynamic stall.

Cessna Citation 560, Jan. 24, 2006, Carlsbad, California, Fatalities: 4.
During the approach in a tailwind, the aircraft was flying 30 knots faster than the correct airspeed, resulting in touchdown 1,500 feet farther along the runway than normal, and much faster than normal. The captain then delayed the initiation of a go-around. Although the aircraft lifted off the runway, the delay resulted in the aircraft hitting a localizer antenna platform before striking terrain. Both pilots and two passengers were killed.

Beechcraft Premier, Feb. 20, 2013, Thomson, Georgia. Fatalities: 5.
En route the copilot had to remind the pilot about a speed restriction and also to adjust his altimeter. During the approach, an "anti-skid fail" message came on but even after the copilot commented on this, the pilot did not respond and ignored the warning. A few seconds after touchdown the pilot initiated a go-around but failed to retract the lift dump. The light jet lifted off near the departure end of the runway and the left wing struck a utility pole and the aircraft crashed, killing all five aboard. The NTSB said that contributing to the accident "was the pilot's lack of systems knowledge and his fatigue caused by acute sleep loss."

Canadair Challenger 600, Jan. 1, 2014, Aspen, Colorado. Fatalities: 1.
The final portion of the approach was not stabilized, the NTSB said. The airplane stayed nose down during the final descent and initial contact with the runway, after which it went airborne before hitting the runway again and coming to rest inverted. The copilot was killed. Contributing to the accident was the flight crew's decision to land with a tailwind above the airplane's operating limitations and failure to conduct a go-around when the approach became unstabilized.

Gulfstream IV, May 31, 2014, Bedford, Massachusetts. Fatalities: 7.
All seven people aboard were killed when the jet overran the end of the runway during a rejected takeoff after the pilots couldn't get the aircraft to rotate. The NTSB determined that the crew did not perform a flight control check before takeoff; were not aware that the gust lock system was engaged; and delayed starting the rejected takeoff procedure once they realized that the controls were locked. Contributing to the accident was the flight crew's "habitual noncompliance with checklists." *—G.G.*

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PROPELLING THE NEXT CONNECTION

Despite serious damage at the island's airports, the FBOs were able to provide a base of operations for relief efforts in the wake of the hurricane.

San Juan FBOs shine in Hurricane Maria relief effort

by Curt Epstein

Category 5 Hurricane Irma affected much of the Caribbean in the first half of September, but Puerto Rico escaped the worst of the 150 mph-plus winds. While neighbors in St. Maarten, St. Thomas, Barbuda and Anguilla suffered massive destruction, the U.S. territory became a hub of relief and humanitarian efforts, exporting supplies to those less fortunate. But a week later the entire island found itself in the same situation, if not worse, from Hurricane Maria, which made a direct impact on September 20.

A Category 4 storm at the time of impact, it wiped out the island's aging power grid, leaving 3.4 million inhabitants in the dark, and without electricity to power water pumps, most were left without running water. Also hit hard was the Commonwealth's telecommunication system, with virtually every cellphone transmission tower smashed.

As daylight broke over the island, San Juan's airports began to shake themselves off. Jet Aviation, one of two service providers at Luis Muñoz Marín International Airport, found that while a hangar was destroyed, the glass-sheathed terminal, designed to resist major storms, was unharmed. Like the rest of the island, the airport was without power, but the FBO's generators were fired up and the facility, along with the adjoining U.S. Customs station, was up and running within 16 hours of the storm's passing.

Dallas Mavericks owner Mark Cuban's 757 delivered nearly one million pounds of supplies to the Jet Aviation facility at Luis Muñoz Marín International Airport. Puerto Rico-born basketball player J.J. Barea (center) was among the volunteers.

"We went from an electrical economy to a diesel economy overnight," said Frances Ryan, Jet Aviation San Juan's marketing and communications director. The facility immediately became a linchpin in the relief and humanitarian operations to the island, handling 1,000 humanitarian flights through the middle of October, and relying on water from underground cisterns installed when the facility was built. Airport Aviation Services, the other FBO there, reopened soon after the storm as well.

Tommy Hill, president of Million Air San Juan, which shares the general aviation handling duties at Fernando Luis Ribas Dominicci Airport (commonly known as Isla Grande) with Signature Flight Support, returned from Miami, where he had evacuated a customer's Gulfstream G200, the morning after the storm. He then received the aircraft owner's blessing to begin a series of round trips, ferrying in needed supplies and carrying out people in need. The Million Air terminal and adjoining hangar are built of concrete and suffered no damage. Even a customer's Learjet 45, grounded by a bird ingestion before the storm and forced to shelter in place, was unharmed. A smaller conventional hangar suffered damage to one wall. Across the field, Signature's facility lost a hangar and had the glass on the concrete terminal blown out front and back, yet it too was soon back in operation.

In the early aftermath of the storm, flocks of business aircraft began to arrive, bringing in loads of crucial supplies. Dallas Mavericks owner Mark Cuban dispatched his 757 six times, delivering nearly one million pounds of food, water, generators and other goods to the Jet Aviation FBO, assisted by Puerto Rico-born basketball player J.J. Barea. Likewise, Houston-based Waste Management dispatched its Falcon 900EX with 3,000 pounds of medical supplies donated by hospitals, as well as generators, saws, clothing and diapers.

As it did in the wake of Hurricanes Harvey and Irma, business aviation stepped in immediately in the aftermath of Hurricane Maria.

"The devastation in Puerto Rico is heartbreaking and hard to comprehend," company president and CEO Jim Fish told **AIN**. "While we no longer have operations there, offering a helping hand in transporting supplies down there as quickly as possible was just the right thing to do." Hill noted one particular Citation X that made multiple trips to the airport, unloaded supplies for "whoever needed them," according to the crew, and left without any fanfare.

Million Air CEO Roger Woolsey, who spent more than a week on the island, dubbed these hundreds of aircraft the Corporate Air Force, adding that they arrived loaded with supplies and left with evacuees. He estimates the tempo of operations suggests they moved as many as 12,000 people. Once people learned that private aviation was willing to evacuate the sick, the elderly and children, the lines at FBOs began to grow. At the height of operations, Woolsey remarked, "We're not running an FBO right now, we're running a bus stop." A hangar at the FBO was converted into a seating area, and guards were hired to prevent people from interfering with the frenetic operations. "Because there was no electricity, the doors and the hangar doors were open and people were just walking onto the ramp unsecured," Woolsey said. "It was not a normal situation."

Both Jet Aviation and Million Air praised fuel provider World Fuel Services, which was able to keep pace with the extraordinary demand from the FBOs, which in some cases surpassed 50,000 gallons a day. Hill noted the only bottlenecks occurred when his location's fuel trucks all found themselves in line at the tank farm.

Keeping the generators going proved crucial. Early on, the unit at Million Air, which was damaged by the storm, failed, and it was two days before a replacement part could be procured from the U.S. Then, the lack of a steady flow of diesel fuel led the facility to run it on jet-A for two days. While it made more smoke, the newly repaired generator kept chugging away. Communications proved tricky as well, as Woolsey discovered. He flew several relief missions in a variety of aircraft ranging from a King Air 350i to a Learjet 60XR, carrying food, volunteer staffers and even a $26,000 military grade satellite receiver/transmitter unit that he had to fly to Ohio to pick up, along with two technicians to set it up at the facility. He and 17 volunteers from the company's mainland bases slept in the facility and subsisted on little more than Pop-Tarts and peanut butter sandwiches.

As for the local employees, many were required to move in with family members whose homes fared marginally better during the hurricane. Woolsey recalled trying to send one line service worker home with the guarantee of being paid, after learning the man had lost his entire house. The man surveyed the chaotic scene on the ramp, which was receiving up to 45 relief aircraft an hour, looked at Woolsey and replied, "Boss, I've worked at this airport for 25 years and I've never in my life seen this. You need me, Puerto Rico needs me. Surely this will calm down at some point; I'll go take care of my family when that happens." ❑

Forecast pitfalls

▶ *Continued from page 44*

aerospace industry, became acutely aware of the business jet market and followed these forecasts, noted Jens Hennig, vice president of operations for the General Aviation Manufacturers Association (GAMA).

One such closely followed forecast was the one compiled by Honeywell Aerospace, which bases its predictions on surveys of 1,500 business jet operators worldwide. In 2006, Honeywell's forecast predicted the business jet market would top 1,000 aircraft for the first time in 2007, making it a banner year. The aerospace giant also had a long-term bullish forecast, predicting the delivery of 12,000 aircraft through 2016 valued at $195 billion.

Embraer, which has kept a rolling forecast, was equally rosy about deliveries, predicting a market for 11,115 new business jets over the next decade (Embraer forecast over a 10-year period from 2007-2016, while Honeywell's covered 11 years, from 2006-2016). Embraer was a little bit more modest about new business jet market value, predicting new jets sold would total $169 billion through 2016.

Rolls-Royce, meanwhile, forecast out to 24,000 business jets over the next 20 years with large and mid-cabins accounting for half that total.

When 2007 rolled around, Honeywell's prediction for that year proved to be on target. According to GAMA data, business jet deliveries topped 1,000 for the first time in 2007, jumping almost 30 percent to 1,137. And through nearly the first three quarters of that year, new aircraft orders soared, up 100 percent with a 2:1 book-to-bill ratio.

With business still rocketing upward in 2007, forecasters remained bullish. When Bombardier publicly revealed its forecast for the first time in 2007, the manufacturer saw a market for 9,950 business jets through 2016 that would be valued at $228 billion.

Honeywell, meanwhile, scaled up its 11-year outlook, painting a long-term picture for 14,000 deliveries valued at $233 billion through 2017. In the short term, Honeywell predicted 2008 business jet deliveries would reach another new high, topping 1,300.

Honeywell's short-term estimates were correct again, with 2008 business jet deliveries growing 15 percent, to 1,317.

But that became the last year business jet deliveries would top that level.

Market Turns

By late 2008, powerhouse financial institutions such as Lehman Brothers and Bear Stearns had collapsed, fueled by sub-prime mortgages. On September 29 of that year, the stock market marked its single largest point drop to date.

While deliveries remained strong in 2008 as manufacturers worked through backlogs, this was the beginning of what would become a precipitous drop. It became worse when the heads of some big automakers made an infamous trip to Congress seeking aid. The trip to Washington, aboard corporate aircraft, became national headlines and put a bullseye on every corporation that owned an aircraft. Corporations closed flight departments, sold aircraft or hid them in hangars. The industry had become a favorite target of Washington in 2009 and 2010. Fractional operators began laying off and dumping orders.

The dynamics of the 2008-2009 time frame were changing so rapidly that they gave forecasters pause. Honeywell and other manufacturers scaled back their forecasts. By 2009, Honeywell saw manufacturers cutting output to 750 to 800 a year. Rob Wilson, then president of Honeywell's business and general aviation business, noted that credit had dried up faster than anyone predicted. As a result backlogs evaporated.

> "Forecasting is an inexact science, despite all our high-powered analytical tools, deep data and what we think we know about customer behavior."
> —analyst Rolland Vincent

The Teal Group's Richard Aboulafia noted in 2010 that the business jet market was hit harder than other areas of aerospace and predicted deliveries would continue to drop through 2012, before conducting a slow climb-out. Aboulafia also said he didn't see the market returning to peak levels until at least 2017.

Business jet deliveries fell by about one third in 2009, dipping below the 2006 level, and—as forecast by the Teal Group—continued to slide each year until 2012, reaching 672. Since then, deliveries have stabilized, going up slightly for three years until dropping back down to 661 in 2016, half of the 2008 high-water delivery mark.

These dynamics though—dynamics that few could foretell—completely upended long-term forecasts, at least from a unit shipment standpoint. GAMA data shows that 9,129 business jets were delivered between 2006 and 2016, almost 3,000 shy of the Honeywell 11-year predictions from 2006. For Embraer's 10-year outlook presented that same year, the deficit was almost as much. Bombardier's forecast for 2007-2016 also was off by close to 1,700. This was a pattern repeated throughout most closely followed forecasts. Even Teal's forecast, which had tended to be more conservative than others, had overestimated deliveries by 1,518.

Billings Greater than Forecast

The plunge in deliveries has been an incomplete picture. Until the most recent years, the market for small aircraft has languished for most of the past decade. Ultra-long-range and long-range aircraft have fared better, and a market once dominated by midsize and small aircraft has shifted notably.

With a higher number of the top-end aircraft reaching market, the revenue brought in by those aircraft pushed billings upward. As such, forecasts in the billings area were actually conservative when compared with the billings brought in over the past decade. In 2006 Teal forecast $141 billion in billings through 2015 and Honeywell in 2006 saw a market value of $195 billion in business jets through 2016. In fact, according to GAMA data, that value was $193 billion through 2015 and $211 billion when including 2016 data.

While billings growth had been impressive, Aboulafia cautioned in 2014 that "All of this growth came from large-cabin jets…All the smaller segments remained firmly stuck in first gear."

These dynamics have made it all the harder for forecasts; few predicted that this recovery would be much different from other recoveries. It took several years before the realization of a "new normal," with deliveries at rates that would remain lower than the 2007-2008 peaks.

Gaetan Handfield, currently senior manager for market research at Honeywell Aerospace, recalled the difficulties of all forecasting when the market crashed. In 2009, while he was with Pratt & Whitney Canada, industry officials were at a gathering attempting to evaluate different recovery scenarios. "We had W-shapes, V-shapes, hockey-stick shapes, flat shapes, U-shaped recovery, and we were all speculating in that room, forecasters from different companies, and nobody predicted that eight years later we would see this many used aircraft for sale," he said.

MARK WAGNER

Market analyst Brian Foley in a recent forecast noted that 2008 marked a near perfect storm: credit was easy to obtain; a weak dollar made it cheaper to buy U.S. products; a number of markets were emerging; and commodity prices were soaring. That changed almost overnight and hasn't returned. "Today, it is almost a complete flip-flop," he said. "If you are not in the U.S., you are probably seeing some sort of economic weakness. The dollar is a lot stronger, so buying offshore is more expensive…and commodity prices fell off a cliff."

While corporate profits came back, Foley pointed to a "business mentality in corporations that you have to do more with less. Even though economic indicators are up, everyone is still a bit skittish."

"What we have seen in the last eight or nine years is that the corporate profit engine has been primed by corporate cost reduction rather than top-line growth," added Vincent, underscoring the difficulty of nailing down exact forecasts.

So many factors have fed into market uncertainties that it continues to make forecasting difficult, echoed Handfield. "You've got so many changing factors. Sometimes it's politics; sometimes it's the economy. Look at the price of oil. The price of oil went up to $100 a barrel, and more than that… creating lots of demand from international markets," he said. "It was all fun for guys in international markets. But then in 2014-2015 the price of oil crashed to $29 a barrel. Nobody saw that."

He pointed to the influx of used aircraft coming to countries like Russia and Brazil, as well as from the Middle East. "In 2010, nobody was predicting this would be so tough because of the changing environment."

Hennig noted that forecasters have changed some of their approaches to predicting the future, looking much more closely at external factors—such as oil pricing—than they did decades ago. Also, regional factors weigh more heavily now. "It's gotten much more complicated than corporate profits and GDP growth," he said.

Despite these uncertainties, Foley would argue that forecasting might be easier now given that aircraft deliveries have remained flat most of this decade, with a standard deviation of 25. "One could safely assume 2017 will fall somewhere in that band," he said, and added, "Waiting for a 'recovery' is a misnomer. The market was unsustainably high in 2008. To think we need to recover to that is simply unrealistic. It's curious that the industry continuously asks 'What's holding the market back?' when maybe the question to ask is 'What's holding the market up?'"

But Vincent also points out that "this is a young industry that has been growing steadily by almost every measure since the 1950s." He projected, "We have much, much more growth ahead of us."

To whit, JetNet forecast a $223 billion business jet market through 2026. Teal is coming in at $239 billion for traditional business jets (not including bizliners or regional jet conversions) through 2026, and in its most recent forecast Honeywell is projecting $249 billion in sales through 2027.

Teal, too, is beginning to return delivery forecasts to numbers similar to those of a decade ago—seeing potential for 11,434 shipments over the next decade. But others are remaining conservative in light of the changed environment. JetNet predicted 8,436 deliveries through 2026, and Honeywell is even more conservative at 8,300 through 2027. ❑

Genesys certifying new Part 25 digital autopilot

by Matt Thurber

Genesys Aerosystems is well into the STC process for the new S-Tec 5000 digital flight control system (DFCS) autopilot, which was introduced at EAA AirVenture Oshkosh in July. The autopilot received TSO approval in July, and the next big step is the STC for the Citation 501 and (the company's first such approval for a Part 25 jet) the 550 Citation II. Genesys expects to receive the STC for the S-Tec 5000 in June next year.

"The Part 25 STC cycle is much longer than [that for] Part 23," said Jamie Luster, Genesys Aerosystems director of sales and marketing. "This is a completely new autopilot, from the ground up, certified to DO-178B Level A software."

The S-Tec 5000 brings to the Part 25 market features that haven't been available as retrofits, specifically envelope protection and level recovery capabilities with a straight-and-level button. "We've talked to a lot of pilots," she said, "and it's clear that these features are regarded as 'must-haves' for this category of aircraft—especially in higher-workload, single-pilot applications." Later Genesys plans to add automatic descent capability for pressurization emergencies.

The three-axis S-Tec 5000 offers altitude preselect, IAS hold, compatibility with RVSM avionics, flight director, precision approach and missed approach (go-around mode), GPSS, course intercept and all-new servos for $125,000. All-axis trim is an option.

Market for Retrofit

In the Citation 501 and 550 STC, the S-Tec 5000 flight control computer is panel-mounted, because some of those jets have a mixture of analog gauges, older EFIS displays and sometimes modern equipment. "We want to be able to install it in any model [of these jets]," Luster explained. Genesys is also developing remote-mount flight control computers that would interface with modern avionics displays. The company is working with some OEMs that are considering adopting the S-Tec 5000 autopilot, she added.

The S-Tec 5000 offers a retrofit autopilot option in a market where there aren't many products that are affordable or even available, she said. For older airplanes with autopilots, those "are becoming obsolete or expensive to maintain," Luster said. "For slightly more than the cost to repair an old autopilot, I can install a new autopilot with a new warranty."

So far Genesys has tested the S-Tec 5000 in its Beech Baron and in a Casa C-212 and Dornier Do-228. "It's gone well," she said. "It's smooth, and when you capture an altitude it doesn't fly through and then jerk you back down, which is nice in a large aircraft. You don't have to [manually] slow down the rate of climb."

After the Citations are STC'd, Genesys plans to certify the S-Tec 5000 in the Beech 1900D twin turboprop, then other aircraft. "We'll start looking for more partners to determine which ones to pursue next," she said. "The autopilot could be installed in any size business jet. It's just a market we've seen neglected for retrofit autopilots. Since we are the autopilot people, we want to make sure we help address that. It gives owners a cost-effective way to upgrade the avionics without a full cockpit redesign." ❑

NEWS UPDATE

New Network Will Add High-speed Satcom Alternative

SES launched 03b mPower, a combination of space and ground telecommunications capabilities that will serve airliners and private jets. The space-based network will consist of seven medium Earth orbit (MEO) satellites, which are being manufactured by Boeing Satellite Systems. Launches are expected next year and in 2019, with full 03b mPower network service beginning in 2021. The system will cover four-fifths of the Earth's surface, to +/- 50 degrees latitude, according to SES, "with 30,000 fully shapeable and steerable beams that can be shifted and switched in real time."

ForeFlight 9.3 Adds Route Options

ForeFlight has released Version 9.3 of its aviation app, which features several new capabilities.

The new preview of route options allows the user to see all route options for a flight depicted on the interactive map. Tapping the desired route highlights it so it can be selected and added to the flight plan. To account for flight planning for jets that must step-climb before reaching cruise altitude, the ForeFlight navlog now supports step-climbs. "The flight-planning engine calculates the highest possible initial altitude, then automatically creates step-climb legs as the aircraft weight decreases," according to ForeFlight. Flight planning has also been enhanced with an "add next flight" button that carries forward details such as departure, aircraft information, payload, fuel policy and so on. Flight plans can be exported in ICAO format, saved in ForeFlight Documents or printed, emailed and shared via AirDrop. Users filing flight plans via ForeFlight can now receive push notifications when ATC has issued a revised expected route or when adverse weather might affect the route, the company noted.

ForeFlight has added a Time Slider control, which lets the user play back radar and satellite weather layers frame-by-frame. Subscribers to SiriusXM Pilot for ForeFlight and flying with the SiriusXM SXAR1 aviation receiver can now display icing, turbulence and surface analysis layers.

Ballard Unveils Server/Router Box

Astronics subsidiary Ballard Technology unveiled the webCS wireless communications aircraft server, which the company said shortens the path to adding data-capture technology to aircraft.

WebCS is an integrated aircraft interface device (AID)/server/router with built-in cellular and Wi-Fi interfaces that can transfer data off the aircraft. The box—which is 7 inches wide, 5.1 inches deep and 2.75 inches high, including an integrated antenna—can stream live data via an onboard connectivity system. The combination of functionality gives operators a cost-effective, flexible option for adding data-capture and communications functions to their aircraft, Astronics believes.

With these capabilities, operators can use webCS to support electronic flight bags, quick access recorders, collecting maintenance data and other third-party applications. WebCS also acts as a server with the ability to process data real time. *—Matt Thurber*

Garmin's new 10.6-inch TXi display offers full touchscreen functionality, but pilots can also use two concentric knobs instead of the touchscreen. The HSI map offers features similar to Garmin's NXi G1000 upgrade.

Garmin touchscreens will light up more cockpits

by Matt Thurber

Garmin has developed a new series of retrofit touchscreen displays, the TXi line, that updates the G500 and G600 and adds a new G700 display and a standalone engine information system (EIS) unit, as well as EIS available on the individual displays.

The new touchscreens come in three versions: a 10.6-inch display and two seven-inch displays (one landscape, one portrait orientation). Each of the primary categories targets certain aircraft classes by mtow, starting with the G500 for Part 23 Class I/II (airplanes weighing less than 6,000 pounds); the G600 for Class III aircraft up to 12,500 pounds; and the G700 for Part 23 Class IV and Part 25 airplanes that weigh more than 12,500 pounds. Garmin is not yet targeting the helicopter market with the TXi displays, although that might be a future offering.

An approved model list STC covering 600 airplane makes and models is expected in the fourth quarter for the G500 and G600 TXi displays. Prices start at $11,995 for the seven-inch G500 TXi and $15,995 for the 10.6-inch G500 TXi. EIS can be added to a G500 TXi display for $4,995.

The G600 TXi seven-inch display will start at $18,995, and the 10.6-inch G600 TXi will start at $24,995. Garmin's synthetic vision technology is standard on the G600 and a $2,995 option on the G500. Garmin is offering trade-ins for airworthy G500/G600 displays, and customers that do so can transfer "enablements" from the old system to the new without paying additional fees.

An example of a standalone seven-inch EIS TXi display is one for a Beechcraft Baron with six-cylinder Continental engines, and its price starts at $17,935. The EIS capability and standalone EIS display is currently available only for piston engines, but Garmin hopes to offer turbine-engine capability later.

Pricing for the G700 displays will be announced at a later date.

What makes the TXi lineup compelling as a retrofit option is the variety of ways the new displays can populate a cockpit. The initial AML-STC will offer 26 different configurations, ranging from a single seven-inch display to combinations of 10.6-inch displays with single or dual seven-inch displays and an additional 7-inch display as a standalone EIS. Up to four displays can be installed in a cockpit.

On the displays themselves, customers will have more options for the way information is formatted. For example, the 10.6-inch displays can be configured as a PFD, MFD and EIS, with three separate panes, one for each function. The seven-inch display can be set up by installers as standalone displays for each of those functions. Additionally, the HSI on the PFD is the new style that Garmin introduced with the NXi upgrade to the G1000 flight deck, with overlay options on the HSI such as map information, Nexrad weather, terrain and traffic.

Customization Options

The touchscreen isn't the only way to control the displays, and each comes with two concentric knobs that can provide access to all the features. Garmin redesigned the touchscreen zoom so that the pilot can use just one finger to zoom in and out, or optionally the traditional pinch-zoom gesture. The touchscreen user interface is modeled on the GTN navigator design, so there is harmony between the new displays and Garmin's current line of touchscreen avionics.

A separate navigator is required to provide GPS and flight-planning information for the new displays, and this can be any of the Garmin GNS (including the GNS 480) or GTN units. TXi displays are compatible with Garmin's new GFC 600 autopilot and other types of autopilot.

Each TXi display can be purchased with an integrated attitude and heading reference system (AHRS) and a display-mounted air data computer (ADC), or a remote-mounted ADAHRS (combined ADC and AHRS) can be used. When trading up from G500/G600 systems, the existing Garmin sensors can be retained.

The TXi EIS can download engine and flight information automatically to the Garmin Pilot iOS app, when the TXi is paired with a GTN 650 or 750 equipped with the Flight Stream 510 wireless gateway. The TXi EIS can also store data on SD cards. Data can be viewed on the fly Garmin website.

While the TXi displays are compatible with most third-party standby displays, when two seven-inch TXi displays are installed with the optional back-up battery and dual ADAHRS, a standby instrument is not required.

Other features that come with or are optional on the TXi displays are customizable crew profiles; compatibility with Garmin's GWX 70 weather radar with optional turbulence detection and ground-clutter suppression; Smart Airspace highlights of nearby airspace keyed to the current altitude; WireAware wire-strike avoidance technology on the moving map; optional Class B Taws; compatibility with Garmin's GRA 55 radar altimeter; optional RVSM support; and an optional PFD controller for heading bug, baro setting, altitude bug and other controls. ❑

Aerovie Enhances Free App Features

The latest version of the Aerovie aviation app—Version 4.72—now offers enhanced features for the free plan: geo-referenced approach charts, VFR and IFR high and low maps, free flight plan filing and some weather information.

For Avidyne navigators Aerovie has introduced two-way flight plan transfer, display of attitude information using the Avidyne AHRS data, location using the Avidyne GPS position information and ADS-B IN weather and traffic.

The Aerovie airports section has been updated with easier-to-read frequencies and new waypoint management features such as waypoint deletion, go direct-to and add to flight plan. For airports that don't have a depiction available from FAA data, Aerovie now draws its own thumbnail view. According to the company, "On an iPad, you can now drag the airport window around the screen and reference it while using the map simultaneously. On the iPhone, swipe it up and down to reference information while using maps."

National Weather Service forecasts are now available in the Aerovie weather section's local forecast option. *—M.T.*

An early Bombardier CS300 takes off from the company's facilities in Mirabel, Quebec.

Airbus agrees to take majority stake in C Series

by Gregory Polek

Airbus has agreed to take a majority stake in the Bombardier C Series program under the terms of a contract signed on October 16. Under the deal, Airbus will take a 51.1-percent stake in the C Series Aircraft Limited Partnership (CSALP), while Bombardier and the Quebec provincial government retain 31 percent and 19 percent, respectively.

CSALP's headquarters and primary assembly line will remain in Québec, while more C Series production migrates to Airbus's manufacturing site in Mobile, Alabama.

Airbus CEO Tom Enders said that discussions began in August, well ahead of the U.S. Commerce Department's preliminary ruling to impose up to 300 percent worth of tariffs on Bombardier's sale of 75 CS100s to Delta Air Lines at the behest of Boeing. The duties would effectively disqualify the C Series from sale in the U.S., removing the biggest market from Bombardier's available pool of potential customers. The eventual manufacture of the C Series in the U.S. could theoretically remove that barrier to sale there.

However, Bombardier CEO Alain Bellemare denied that the Commerce Department case motivated the agreement, notwithstanding his acknowledgment that, in fact, domestically produced aircraft in the U.S. would not fall subject to any tariffs. "It's very clear that we're not circumventing anything here," said Bellemare. "[But] the fact is when you produce an aircraft in the U.S. it is not subject to any import duty under the current U.S. rules." Enders agreed, adding that the European company hasn't yet decided whether the Mobile facility would export the C Series outside the U.S.

Although he said the companies haven't definitively committed to building Delta's CS100s in Mobile, Bellemare also said the option "is on the table," meaning the airline would need to agree to reschedule first deliveries for some time beyond the current target of spring next year. "Delta has been clear that it loves the aircraft and that it would be willing to wait to get the C Series," he reported. "Enders added, however, that Airbus could establish C Series production in what he termed a relatively short period of time.

While the addition of the C Series certainly adds value to Airbus's product portfolio, it also appears likely to spell the end of efforts to sell the A319, which has a seating capacity overlapping that of the CS300. "We haven't sold any A319s since 2012," said Enders. "I think that says it all."

Under the terms of the deal Airbus will enter into commercial agreements related to C Series sales, marketing and procurement management. At closing, expected in next year's second half, none of the program partners will contribute any cash.

"[Airbus] has an amazing marketing network and a great aftermarket support organization that is unleashing so much value that we expect to more than double the current value of the program," said Bellemare.

Bombardier and Airbus attempted to reach a similar agreement in 2014, but the deal fizzled when Airbus's due diligence failed to find a compelling case for it. In this case, Enders quipped that "the stars were aligned this time."

"It's an entirely different situation from two or three years ago," said Enders. "At the time there was no certified C Series; now we have the CS100 and the CS300 certified. At the time...we didn't have the A320neo, we didn't have the A350 ramp up going well…so with the achievements we've made and the achievements that Bombardier has made with the C Series, that decision was far easier for us to take." ❑

MITSUBISHI, BOEING INVESTIGATE SUSPECT METAL PARTS SHIPMENTS

Mitsubishi Aircraft and Boeing have each begun to review records of shipments of parts made with aluminum and copper from Japan's Kobe Steel after the supplier reported that employees had improperly rewritten inspection certificates to reflect that they met minimum specifications. In a statement issued on October 8, Kobe Steel said the "improper conduct" came to light following self-inspection and emergency quality audits of the compliance status of products shipped between Sept. 1, 2016 and Aug. 31, 2017. The materials in question involve 19,300 tons of flat rolled and extruded aluminum products; 2,200 tons of copper strips and tubes; and 19,400 tons of aluminum castings and forgings. Apart from Boeing and Mitsubishi, several automotive companies have also received shipments of the non-conforming parts.

Kobe said its own inspections have so far not revealed any specific problems that might cast doubt on the safety of the products in question. For its part, Mitsubishi said its investigation on each of the affected parts used in the MRJ has revealed no safety deficiencies and found that they meet all design standards. The company also said it would continue to fly the four MRJ flight-test aircraft and that it anticipates no effect on the program's certification schedule.

Boeing, too, said its own analysis shows no reason to believe any shipments contained compromised material. "Boeing has been working closely and continuously with suppliers since being notified of the issue to ensure timely and appropriate action, including comprehensive inspections and analysis throughout our supply chain," it said in a statement. "Nothing in our review to date leads us to conclude that this issue presents a safety concern."

Neither Boeing nor Mitsubishi would immediately identify which parts or materials their investigations involve. —*G.P.*

NEWS UPDATE

Qatar Takes Stake in Meridiana

In late September Qatar Airways closed on a 49-percent acquisition of AQA Holding, the new parent company of Italy's Meridiana. Previous sole shareholder Alisarda has kept 51 percent of the company. The deal follows Qatar's failed attempt to take a stake in American Airlines, whose protestations over the plans eventually convinced Qatar management to drop the effort. Doha-based Qatar began negotiations over the Meridiana acquisition a year ago. Qatar connects passengers to 150 destinations from its Italian outposts. Meridiana's fleet consists of Boeing 737s, 767s and MD-82s.

Under the terms of a contribution and shareholders' agreement signed in July 2016, Alisarda maintains the right to appoint the majority of AQA's board members. In late September the board appointed Alisarda chairman Marco Rigotti chairman of AQA Holding and Francesco Violante the new chairman of Meridiana. Violante served for 13 years as CEO of SITA until the end of June last year. Qatar said it would announce a new business plan and appoint a new CEO for Meridiana "in due course."

Boeing Opens Office for NMA Study

Boeing Commercial Airplanes has established an office dedicated to the study and potential development of an airplane sized to fit between the 737 and the Dreamliner known as the NMA (new midsize airplane). In a letter to employees dated September 25, Boeing Commercial Airplanes CEO Kevin McAllister stressed that the announcement does not amount to a program launch, but rather another step in the process toward deciding on whether or not to proceed.

McAllister has appointed 787 program executive Mark Jenks as vice president and general manager of the new office, which Boeing will base in Renton, Washington.

The company has named 777 general manager Brad Zaback to fill Jenks's position as vice president and general manager of the 787 program.

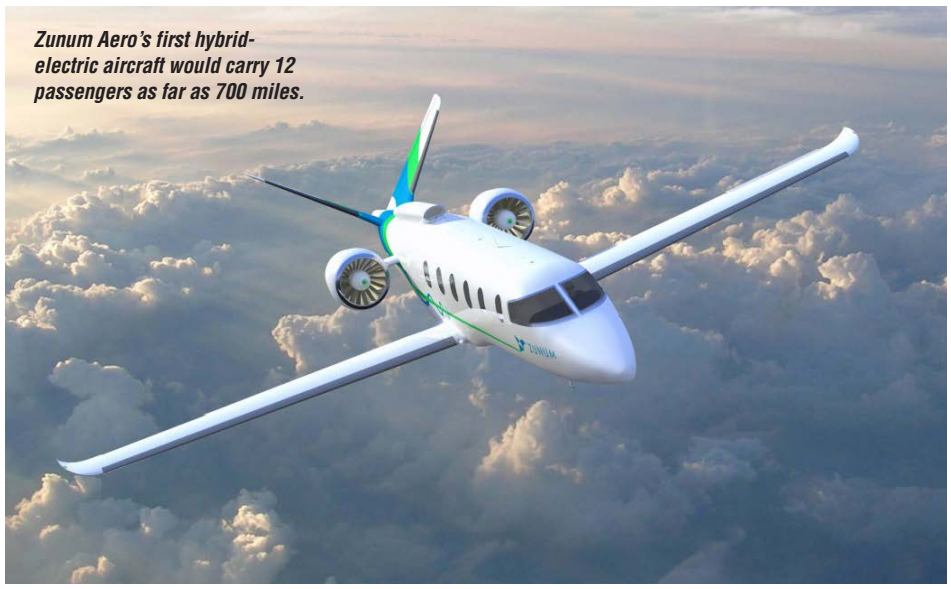
NMA studies have concentrated on a plan for a two-variant series of airplanes to seat between 220 and 270 passengers and to fly between 4,000 and 5,000 nm.

UAC, Comac Name New Widebody

Russia's United Aircraft (UAC) and China's Comac have agreed to name the new widebody airliner on which they have begun to collaborate the CR 929-600. During a ceremony at Comac headquarters in Shanghai, the companies also revealed plans for a smaller variant of the airplane called the CR 929-500 and a stretch variant designated the CR 929-700.

The letters C and R denote the project participants: C for China and R for Russia. CR also appears as the first two letters in the name of the joint venture dubbed China-Russia Commercial Aircraft International Company (Craic), which leads the program.

Having defined the program's concept and preliminary characteristics, the partners next plan to move toward the initial design phase and accept requests for proposals from systems and equipment suppliers. The new widebody would seat 280 passengers and fly 6,500 nm, placing it roughly in the category of the Airbus A330-900. Schedules call for first flight in 2023 and entry into service in 2026.—*Gregory Polek*



Zunum Aero's first hybrid-electric aircraft would carry 12 passengers as far as 700 miles.

Zunum details plans for first hybrid-electric regional aircraft

by Gregory Polek

Kirkland, Washington-based startup Zunum Aero has decided on a 12-seat hybrid-electric airplane capable of flying as far as 700 miles as the launch vehicle for a series of electric aircraft that would start to reach the market by 2022, the company announced last month. Designed to operate cheaply enough to rejuvenate a network of 5,000 underused regional and general aviation airports in the U.S., the Zunum 12-seater would offer a direct seat-mile cost of 8 cents or $250 an hour. Flying at a maximum cruise speed of 295 knots, it would take off from runways as short as 2,200 feet and produce 80 percent lower noise and emissions than a typical turboprop it would replace.

Underlying technologies that would allow for such performance include a battery-type "agnostic" powertrain engineered for what Zunum calls a seamless transition from hybrid to fully electric power; quiet electric propulsors with variable pitch fans, enabling a 40-percent reduction in runway length needs and a 75-percent drop in community noise; wing-integrated batteries that allow tailoring of onboard battery capacity and quick swap or recharge at airports; and a so-called optimization and control platform that provides real-time flight energy optimization, power management, fault detection and recovery.

Zunum, which expects to start flight-testing in 2019, recently opened a second development center in the Chicago area. Recent hires include senior technologists with leadership roles across power electronics, electric motors and propulsors on programs such as the Boeing 787, Lockheed Martin F-35 and the Rolls-Royce Ultrafan.

Although Zunum's longer-term plans call for a vehicle that could carry as many as 50 passengers, Zunum Aero CEO and founder Ashish Kumar told **AIN** in April that initial efforts center on first introducing an FAA Part 23 certified airplane. The company does not plan to build its own assembly line, but will rely on partners for production capacity. "We do have a plan of record for that first aircraft…and that's the basis on which we've gone out and raised investment," he said. "We never intended to build the whole thing ourselves…What we will say is our focus all along has been to be a U.S. manufacturer and that's one of the reasons we ran for so long under stealth, because we intentionally limited the set of investors that we approached."

Along with backing by Boeing's HorizonX "innovation cell" and JetBlue Technology Ventures, Zunum has formed a long-term partnership with the Center of Power Optimization of Electro-Thermal Systems, an NSF engineering research center at the University of Illinois. Separately, the team has engaged with the FAA since 2014 on certification standards for electric aircraft. The company said it expects the U.S. agency to develop the first set of standards for electric aircraft next year. ❑

Safran testing open-rotor engine

by Guillaume Lecompte-Boinet

French group Safran is ground-testing the first open-rotor engine demonstrator. The company expects the new unshrouded engine to burn15 percent less fuel than the new Leap series of turbofans, built by the CFM joint venture between Safran and GE.

Safran built an open-air test stand at its facility in Istres, in the south of France, and has been running the open-rotor demonstrator since May. Developed within the framework of the European Clean Sky 2 research program, the open-rotor study carries a funding budget of €65 million ($77 million) over eight years. Tests will continue until the end of the year to validate the demonstrator. "We will have all the technology on the shelf, available to aircraft manufacturers," said Safran CEO Philippe Petitcolin.

The primary target market for the open-rotor concept, at least initially, is single-aisle airliners, the heart of the CFM customer base. Safran has conducted development research independent of open-rotor studies by GE. The partners will coordinate under CFM in the event they launch an open-rotor program. An open-rotor engine would not be certified before 2030, according to Safran.

The breakthrough for the open rotor is a significant boost in bypass ratio, to 30:1 from 11:1 on the Leap. The absence of a nacelle allows for larger fans, thus the increase in bypass ratio. The higher the bypass ratio, the better the energy efficiency of the engine.

The disadvantage lies with the need to completely reconfigure the aircraft. An open-rotor engine cannot be mounted on a wing, but must attach to the rear of the fuselage. The demonstrator has two contra-rotating fans, the blades of which consist of 3D woven carbon composite, like those of the Leap. GE subsidiary Avio of Italy manufactured the gearbox.

Wind-tunnel tests in 2013 helped solve the noise challenge, one of the main hurdles in open-rotor development. "Our demonstrator has the same sound levels as a Leap, thanks to the aerodynamics of the fan blades," explained Safran research and technology director Stéphane Cueille. The company has not scheduled flight-testing.

Airbus, a partner of Safran in Clean Sky 2, has expressed a preference for a more conventional engine architecture known as the Ultra High Bypass

Safran has been running an open-rotor demonstrator at its facility in Istres, France, since May. The engine configuration could burn 15 percent less fuel than the CFM Leap.

Ratio (UHBR) engine, which is encased in a nacelle but offers a bypass ratio of 15:1. The UHBR would burn between 5 and 10 percent less fuel than the Leap, according to Safran. The UHBR, which could enter service by 2025, also does not require much adaptation of the aircraft configuration. "Everything depends on the choice of the aircraft manufacturers," said Petitcolin. "Either they want an evolution of the current single-aisle by 2025-2027, and the UHBR will be possible, or they want a new design beyond a more distant horizon. And that would allow open rotor."

Safran is working in parallel with GE on the UHBR, but on different technological building blocks. It expects to test the first UHBR demonstrator after 2020. ❑

UK's MONARCH AIRLINES ENDS OPERATIONS

The UK Civil Aviation Authority and the UK government deployed 30 airplanes to return 110,000 stranded passengers to the UK following Monarch Airlines' October 2 bankruptcy and cessation of operations. The government asked the CAA to charter the airplanes, at no cost to the passengers, in an operation that amounted to the establishment of what would be one of the UK's largest airlines for a couple of weeks. Monarch ranks as the largest UK airline ever to enter administration, according to the CAA.

The CAA advised all customers booked on Monarch flights due to depart the UK not to go to the airport.

"We know that Monarch's decision to stop trading will be distressing for all customers and employees," said CAA chief executive Andrew Haines. "This is the biggest UK airline ever to cease trading, so the government has asked the CAA to support Monarch customers currently abroad to get them back to the UK at the end of their holiday at no extra cost to them.

"We are putting together, at very short notice and for a period of two weeks, what is effectively one of the UK's largest airlines to manage this task. The scale and challenge of this operation means that some disruption is inevitable. We ask customers to bear with us as we work around the clock to bring everyone home."

Monarch has struggled in recent years to turn a profit in the face of stiff competition from low-fare carriers, particularly in short-haul markets. Most recently, the airline has suffered from cost pressures resulting from a weaker pound following the so-called Brexit vote.

In October 2014, Monarch Airlines and other parts of UK leisure travel group Monarch Holdings completed a restructuring program and sale of 90 percent of the group to Greybull Capital under which it secured £125 million ($200 million at the time) of permanent capital and liquidity facilities. Immediately after the deal closed, the UK Civil Aviation Authority renewed the group's operating license.

Only a week after securing new ownership and the much-needed capital infusion, the airline finalized an order for 30 Boeing 737 Max 8s. The order, announced at the 2014 Farnborough International Airshow, included options for another fifteen 737 Max 8s and was to mark the beginning of the carrier's transition to an all-Boeing single-aisle fleet.

Greybull assumed control of Monarch from the Mantegazza family after the former owners agreed to pay £30 million ($48 million at the time) toward reducing the company's substantial pension plan deficit. Other concessions came from employees, among them an agreement to accept pay reductions of up to 30 percent and 700 "redundancies." *—G.P.*

The AW609 recently finished artificial ice testing and will soon begin natural ice trials, as well as fatigue testing.

Leonardo reports progress on AW609 civil tiltrotor

by Mark Huber

The AW609 civil tiltrotor will enter service in 2019, Leonardo Helicopters reported in a detailed program update provided to **AIN** on October 18. "The team is fully committed and well integrated with the regulatory authorities to achieve this timeline. We continue to finalize the plans for all of the certification documentation with the FAA," the company said.

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. By year-end, Leonardo will begin fuselage fatigue test certification. In Poland, a full-scale fuselage will be loaded to simulate actual conditions during fatigue testing. Additional supplier component certification tests are proceeding as planned, the company reported.

Another major milestone was passed last month when Transport Canada certified the AW609's 2,000-shp Pratt & Whitney Canada PT6C-67A powerplant. FAA validation of the engine is expected by year-end. The PT6C-67A has a new compressor with advanced aerodynamics, and the engine's turbines are made with more modern materials. Together, the new compressor and turbine produce more power from less fuel than earlier engines. The engine has also been certified for continuous operation in vertical flight.

In accordance with development plans, a production engine was recently retrofitted to AC3 to complete the integration and prepare the aircraft for certification testing. Test and regression flights with the production engines on AC3 were imminent at press time and will continue through year-end. Retrofit of AC1 is nearly complete and that aircraft will start certification "load level" surveys next year.

Assembly of test aircraft AC4 is progressing and Leonardo expects to roll it out next year. Following ground runs, it will be dedicated to avionics development and certification, capitalizing on the integrated lab results and testing already in progress.

The company continues development and engineering work to integrate avionics on AC4 for the first flight. Cockpit integration tests are conducted regularly with the support of the integration lab to finalize man-machine interface and the correct display of all flight information.

Leonardo said it is also closing in on collaboration with the International Civil Aviation Organization (ICAO) to finalize the first version of the "Tilt-Rotor Guidance Material." The first production aircraft is expected to be in service in 2019, and the company said it is on track to have training manuals and technical publications ready for that milestone. ❑

Wildfires boost business at Columbia Helicopters

by Mark Huber

The wildfires that ravaged Northern California's wine country last month are part of a pattern of larger and more destructive infernos that have dominated the 2017 fire season nationally, according to the National Interagency Fire Center (NIFC). From January 1 through October 16, 8.77 million acres had burned in the U.S in 51,277 fires, compared with 4.913 million acres in 49,986 fires for the comparable period last year. (The NIFC reports the 10-year annual wildfire average is 56,465 fires burning 6.014 million acres.)

"The number of fires is about the same, but the acreage is way up. They've been larger fires," noted Keith Saylor, Columbia Helicopters' director of commercial operations. "That's why we've done so much better. This is an above-average year for us. Our firefighting operations are doing rather well." Saylor said

Continues on page 59 ▶

A Columbia Boeing CH-47D fights the Rice Ridge Fire in Seeley Lake, Montana. The company employed the same aircraft fighting the recent fires in California's wine country.

NEWS UPDATE

Waypoint Tops 150

The Waypoint Leasing fleet has eclipsed 150 helicopters, the company announced. Waypoint said that through the beginning of last month it had executed 20 remarketing placements, eight new deliveries and had three new deliveries pending this year. In business since 2013, Waypoint has built a portfolio worth $1.6 billion supporting 32 customers in 30 countries.

Enstrom To Sell 280FX to Pakistan

In a sale managed by Global Services & Solutions of Islamabad, its representative in Pakistan, Enstrom will sell 280FXs to Pakistan. These will be the first Enstrom aircraft to be sold into the country. Deliveries are scheduled to start by year-end, with the remainder arriving early next year.

CHC Wraps Hums Testing on AW139

CHC Helicopter has successfully completed testing a health and usage monitoring system (Hums) and cockpit electronic flight bag system on an AW139 in collaboration with Leonardo Helicopters and SkyTrac. The system provides in-flight Hums analysis with air-to-ground exceedance alerts, automated downloads to Leonardo's HeliWise analysis software, live weather and marine AIS feeds to the cockpit, and automatic downloads of flight data monitoring (FDM) data whenever the aircraft is in range of a company-secured WiFi hotspot at home base.

Chilean Company Takes Bell 505

Bell Helicopter delivered two 505 Jet Ranger X light singles to Eagle Copters South America in Santiago. The aircraft will be used for corporate transportation.

Ka-62 Certification Tests Imminent

Russian Helicopters plans to begin a two-year certification test program for the Ka-62 medium twin next year. CEO Andrey Boginsky said he is confident that demand for the multi-role helicopter will build.

eVTOLs Making Progress

A prototype two-seat Volocopter eVTOL air-taxi made its first autonomous unmanned flight in late September in Dubai. Dubai hopes to have a low-altitude urban air-taxi network in place in time for the World Expo there in 2020 and by 2030 plans to handle up to 25 percent of all urban transport with autonomous vehicles. The current design can fly up to 30 minutes per charge at 54 knots.

Airbus Helicopters has completed full-scale testing for the propulsion system of the four passenger CityAirbus eVTOL demonstrator. During this test phase, the company checked the performance of the ducted propellers, the integration of the full-scale propulsion unit with two propellers and the electric 100-kW Siemens motors and all electrical systems. First flight is anticipated at the end of next year.

Settlement Awarded to Families

A Kentucky county jury has awarded $21.7 million to the families of a medevac crew who perished when their Bell 206L-1 crashed into a parking lot in June 2013. Eight family members had sued Bell after the accident. The NTSB found that the probable cause of the accident was "the pilot's loss of helicopter control because of spatial disorientation when he in-advertently encountered night IMC, which resulted in the in-flight separation of the main rotor and tailboom."—*Mark Huber*

Last month's Helitech show gives rotorcraft industry a lift

by Ian Sheppard

Held in London this year, Helitech International will take place in Amsterdam next year before returning to London in 2019.

This year's three-day Helitech International show, held at London's Excel exhibition center from October 3 to 5, saw 200 exhibitors show their wares and served as the venue for a raft of industry announcements. The show also had a temporary heliport and indoor static area.

On the first day of the event, **Safran** launched the Aneto engine series for the super-medium and heavy helicopter market. The AW189K is the first application.

Leonardo signed a contract with Uni-Fly A/S of Denmark for two AgustaWestland AW169s. The aircraft will enter service in next year's first quarter supporting wind-farm operations for Dong Energy at Hornsea Project One in the North Sea. The order marks the first contract for the AW169 in Denmark as well as the first wind-farm duty for the type in the UK. It also announced the sale of two more AW139s to customers in the UK for corporate/VIP passenger transport, among them Starspeed (part of Luxaviation Helicopters). In the static display area, Leonardo showed an AW169 equipped for emergency medical services. Recently the Norwegian Police ordered the AW169 for law enforcement operations, with more aircraft slated to enter service next year. The Italian OEM also demonstrated an AW169 Virtual Interactive Procedural Trainer, the Skyflight mission planning app and Helitwise Hums analysis services.

Bell Helicopter said it had signed a purchase agreement with Air Zermatt for a Bell 429 to be used in search-and-rescue missions.

Airbus Helicopters officially handed over the first H145 for Midlands Air Ambulance, and in the static display it had a mockup of the H160, currently in development with three test aircraft based near Marseille. Airbus Helicopters also revealed at HeliTech that the Rig'N Fly (Rig Integrated GPS approaches with eNhanced Flyability and safetY) automatic oil platform approach mode for the H175 has received EASA certification. It had already been certified for the H225. "With 19 helicopters now in operation, the H175 continues to evolve to meet the demanding mission needs of the oil & gas industry," said Marc Allongue, head of the H175 program.

Waypoint Leasing, the largest independent global helicopter leasing company, said its fleet has surpassed 150 aircraft in 30 countries with 32 customers. At the Helitech temporary helipad, the Airbus H225 that Waypoint leases to Global Helicopters Services was on display. Ed Washecka, Waypoint CEO, said this year "thus far has proved to be an active year for Waypoint as the helicopter market begins to recover from a multi-year downturn. Our team has executed eight new delivery placements with a further three in closing, two sale-leaseback transactions, and twenty remarketing placements…The growth of our business has been further bolstered by our success in the debt markets, with the recent closing of a large term loan facility over the summer." Waypoint also has a new leasing product in China (in Tianjin and soon Hong Kong) and has placed two aircraft with customers in China thus far this year, notably a Waypoint new-delivery H135 to Shanghai Skyway General Aviation Company (Skyway).

Airbus Helicopters showed advances in onboard image processing for VTOL systems. The aim of project Eagle (Eye for Autonomous Guidance and Landing Extension) is to develop an onboard image processing management system to allow automatic approaches and landing in challenging conditions, as well as paving the way for future sense-and-avoid applications on autonomous vertical takeoff and landing (VTOL) systems. The system could find applications in urban environments, said Airbus, and could be embedded in a variety of existing and future Airbus VTOL aircraft. It relies on a gyro-stabilized optronics package with three high-resolution cameras and processing units, as well as onboard video analytics providing object detection and tracking, digital noise reduction and deep learning. Future versions of the Eagle system will integrate a laser, which combined with the high processing capability could open the door to other applications such as a new generation of searchlights, obstacle detection and 3D terrain reconstruction.

Airtelis said at the show that it has ordered three Airbus H215s for power line construction and maintenance missions, with financial support from Nova Capital. The first aircraft will be delivered this month, complementing Airtelis's existing two H225s.

Coptersafety announced a partnership with Nordic Airbus Helicopters distributor **Østnes** to improve the operational safety of Airbus H125s (previously AS350s) in the Nordic countries, as well as appointing Østnes an authorized dealer for Coptersafety's training services, which take place out of Coptersafety's dedicated training center near Helsinki International Airport in Finland.

BBA Aviation Global Engine Services company **H+S Aviation** announced the recent approval of **Motorflug** as a Rolls-Royce 250 authorized service center under H+S Aviation's current 250 Amroc agreement. It bolsters regional support, such as field services, to R-R 250 customers through Motorflug Baden-Baden's OEM-approved capabilities.

Next year's Helitech will be held in Amsterdam, from October 16 to 18. ❑

The third Airbus H160 prototype logged its first flight on October 13.

H160 flight-test fleet expands, service entry on track for 2019

by Mark Huber

The third Airbus Helicopters H160 prototype (PT3) logged its maiden flight at the company's headquarters in Marignane, France, on October 13. PT3 has a cabin interior configuration similar to that of a serial production aircraft and will join the flight-test program as the company continues to push for service entry in 2019.

"The third prototype incorporates a significant number of modifications based on feedback resulting from the first two years of testing by development, production and support teams," said Bernard Fujarski, Airbus Helicopters senior vice president and director of the H160 program. "It plays an essential role in delivering a mature aircraft at entry into service and it is also closer to the serial definition with an interior lining and transport cabin configuration" he said.

Airbus Helicopters said the first two prototypes have logged 500 flight hours since first flight in June 2015. In that time, the flight envelope has already been fully tested. Remaining development activity such as complementary hot-weather testing, antennas and optional equipment will be done using all three aircraft.

The company added that the helicopter's final assembly line in Marignane is in the closing stages of preparation and will be ready to start production shortly. Customer support activities are being prepared in parallel thanks to the extensive involvement of maintenance teams, through the "operator zero campaign," using the prototypes and test means to check and improve the maintenance plan, digital work cards and technical documentation and tooling ahead of actual operations.

The first version of the H160 slated to enter service in 2019 will be for commercial passenger transport configured for oil and gas, followed by the EMS version.

PT3 joined the test program after undergoing successful lightning indirect effect and power-on testing this summer. The three aircraft are augmented by two non-flying testbeds for dynamic and systems integration. The flight-test campaign for the medium twin has thus far included cold weather and snow trials in Canada earlier this year and testing of antennas and inlet barrier filters. Development and performance flights are continuing. To date, the H160 has achieved maximum cruise speeds up to 155 knots and flights beyond 400 nm. Final range is expected to "significantly" exceed that number, the company said. A spokesman said letters of intent for a number of the helicopters have already been signed and that Airbus Helicopters plans to announce launch customers by year-end.

The H160 has an all-composite airframe, flat-floor cabin, oversized cabin windows and a baggage compartment that can hold 661 pounds. The cabin can be configured to seat four or eight passengers in luxury layouts or utility seating for 12. The H160 incorporates a variety of new technologies, among them Blue Edge active tracking main rotor blades in a five-blade system with a double sweep design that reduces noise and makes the ride smoother and new Safran Arrano engines that offer 10 to 15 percent lower fuel consumption. ❑

Leonardo signs customers for AW189 and EMS AW169

by Mark Huber

The first AW169 configured for EMS operations will enter service in the U.S. in the later part of next year. Travis County, Texas, has placed an order for three of the helicopters.

Travis County in Texas plans to add three Leonardo AW169s to the Star Flight EMS program beginning in October next year. The helicopters will be the first EMS-configured AW169s to enter service in the U.S. The AW169s will also be used to support the county's search-and-rescue, fire-suppression and law-enforcement missions in the area surrounding Austin, Texas.

The AW169s will allow Star Flight to expand operational capabilities and transport patients longer distances. The helicopters will be configured with a multipurpose interior with specialty EMS equipment and stretchers that can be reconfigured to incorporate search-and-rescue and firefighting kits. Additionally, Travis County's AW169s will be equipped with a hoist and a 300-gallon Simplex belly tank.

According to Leonardo, agreements for 160 AW169s have been signed by 70 customers in 30 countries.

Separately, Leonardo has secured orders for the AW169, AW139 and AW189 in firefighting configurations and signed contracts with the Yamaguchi Prefecture Firefighting and Disaster Relief Agency for one AW169 and with the Shizuoka Prefecture and Fukushima Prefecture Fire Fighting & Disaster Relief Agencies for one AW139 each, adding to an established fleet of 50 in all market segments. The contract with the Yamaguchi Prefecture represents the third AW169 to be sold into Japan and the first for firefighting. A contract with the Tokyo Fire Department for an AW189 marks the debut of that model in Japan. All aircraft are expected to be delivered between 2019 and 2020 and will feature a bambi bucket, rescue hoist and searchlight as well as customer-specific equipment. The Tokyo Fire Department AW189 has 19 seats, dual hoist and extended-range auxiliary fuel tank for long-range missions to remote islands. The AW139 for the Shizuoka Prefecture Fire Fighting & Disaster Relief Agency will carry out rescue operations in the area of Mount Fuji and will also be equipped with a belly tank and a gyro-stabilized camera with microwave downlink (Heli-TV). The AW139 for Fukushima Prefecture is equipped with snow skis, while the Yamaguchi Prefecture Fire Fighting & Disaster Relief agency AW169 will have a full glass cockpit with four-axis autopilot and the Heli-TV system.

Nearly 120 Leonardo helicopters are in service in Japan today. ❑

XTI unveils redesigned TriFan 600 VTOL

by Mark Huber

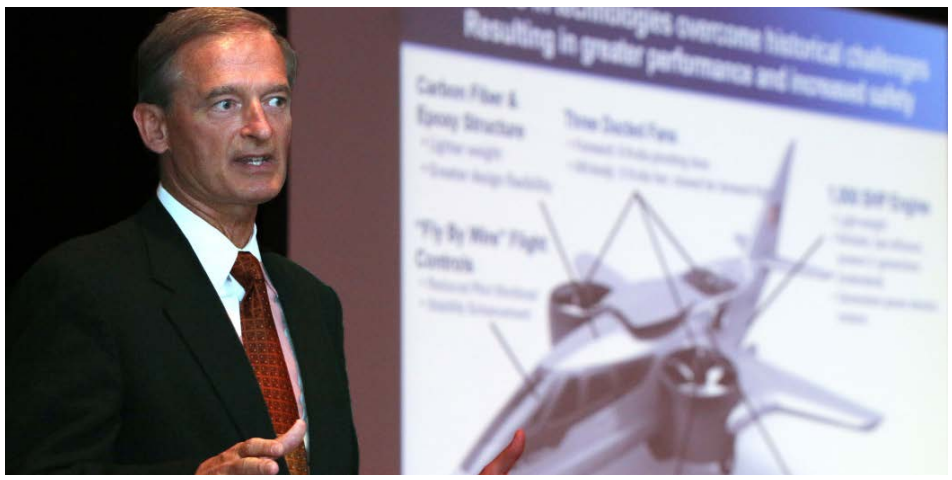
At last month's NBAA convention XTI unveiled a new prospective hybrid electric design for the six-seat, $6.5 million TriFan 600 VTOL aircraft that cuts gross weight and improves efficiency. The redesign reduces empty weight by 1,000 pounds from the original concept, which featured only dual turboshaft engines, thanks to the incorporation of electric generators in place of complex gearing for vertical flight.

As envisioned, the TriFan will be equipped with a triple-redundant fly-by-wire control system with a high refresh rate to accommodate gust loading, said XTI chief engineer George Bye. "The electric propulsion system in the ducted fans will allow for rapid adjustments to gusts in the critical phase of flight as you are lifting up and away," he said.

The turboshafts will be connected to three generators powering six electric motors, two for each of the TriFan's three ducted fans. Takeoff power will come from onboard battery packs. Bye said the batteries can handle the task as the takeoff phase is brief before the two wing-mounted ducted fans rotate forward to cruise flight position and turboshaft power takes over for cruise flight.

Batteries would be supplemented by solar cells in the wings. In the event of main engine failure, the electric motors can be re-engaged to provide limited-duration power for landing, and the TriFan will also be equipped with a whole-aircraft ballistic parachute system.

The TriFan will have a range of 670 nm taking off and landing vertically and 1,200 nm taking off conventionally. Conventional ground run is estimated at less than 500 feet. Useful load in vertical takeoff mode is 1,800 pounds; 2,800 in conventional. Fuel capacity is 125 gallons, but fuel load is limited for vertical operations and hence reduces the range.



MARIANO ROSALES

XTI chief engineer George Bye said the updated Trifan 600 design is lighter and more efficient than the original. The company believes there is a market for at least 1,000 TriFan VTOL aircraft over 16 to 18 years.

Maximum cruise speed is estimated at 300 knots or better and the service ceiling will be 29,000 feet with an 11 minute time to climb. Empty weight is 3,500 pounds. Direct operating costs are estimated at $350 per hour.

XTI CEO Robert LaBelle said the company thinks it can sell 1,000 TriFans over 16 to 18 years and "probably more." He said XTI has already received orders for "a few aircraft" and capital from 500 investors via crowdfunding. XTI currently employs 20 engineers in Denver.

LaBelle said the company plans to fly a 60-percent-scale prototype within 11 months and begin fielding certification test aircraft within three years. He said the TriFan could be certified and put into production four years after that. "We have a conservative financial plan," LaBelle said. ❑

News Note

Tokyo-based AirX last month launched CodeShare, an Uber-like helicopter ride-sharing service that provides per-seat lift from the Shinkiba Tokyo heliport to Narita International Airport, Hakone and Hatsushima for prices ranging from $530 to $620. The service matches reservations to available helicopters from partner providers; however, it is not geared to the extemporaneous traveler as three-day advance reservations are required for passengers with luggage, 24-hour advance booking for those without. AirX can also arrange for ground transportation and baggage handling. ■

Columbia firefighting

▶ *Continued from page 57*

demand for Columbia's tandem-rotor Chinooks on fires has been up 25 percent this summer.

Through mid-September, two million acres were ablaze in the U.S and federal agencies had already spent $2 billion battling them. In the recent Northern California fires, 14 separate fires burned 213,000 acres, destroyed an estimated 5,700 structures and killed 41 civilians through October 16. Through mid-October 40,000 residents remained evacuated from the fire area.

Some 73 helicopters and 30 airplanes were called in to fight the blazes, among them three Columbia aircraft that flew into the Sonoma-Napa area when the fires started in early October: one CH-47D with a 2,800-gallon internal tank, one CH-47D with a 2,600-gallon Bambi bucket, and a Boeing 234 with a 2,600-gallon Bambi bucket. Thirty support staff accompanied the helicopters that were contracted for by the California Department of Forestry and Fire Protection (Cal Fire) under a "call when needed contract;" they flew an average of six hours per day each and were employed in daylight operations only. Maintenance averaged four to six hours per night.

Saylor said the firefighting operations were fairly typical, with the exception that the fire had "gone through so many houses." The helicopters dropped suppressants and retardants but the majority of the drops were on active fire. Doing drops in a more urban environment meant pilots needed to be aware of the presence of infrastructure such as communications towers and power lines. Precise drop locations were orchestrated by Cal Fire's air attack aircraft in coordination with the ground crews.

Columbia's pilots were rotated in and out of theater as part of their flying duty limit of 36 hours in six days. ❑

Maintenance News

BARRY AMBROSE

Some features of Piaggio's third-generation Avanti, the Evo, are now available as retrofits for older aircraft.

PIAGGIO SPOTLIGHTS SUPPORT OPTIONS

Piaggio is backing the Avanti Evo with new customer support initiatives, and some of them will benefit operators of older Avantis. The Italian turboprop manufacturer is offering Evo customers a forward-wing care program. The five-year agreement covers scheduled and unscheduled airframe and component parts and labor. Work can be done at Piaggio's facility in Villanova d'Albenga, Italy, or at any of the company's 15 authorized service centers, eight of which are in the U.S.

Piaggio is also beefing up U.S. parts inventory. Half of the 220-strong Piaggio fleet operates in the U.S., so positioning more parts there helps shorten lead times.

The company is setting up an AOG support network with Constant Aviation. Expected to be in place next year, the network will complement Piaggio-authorized service centers, which will also have more spares on hand, noted Paolo Ferreri, vice president of customer support for the Americas.

BOMBARDIER FACILITIES CONTINUE HIRING

Bombardier Business Aircraft's service center and support network is keeping the "help wanted" sign out, as the facilities are filling to capacity with work. The company recently participated in an Aviation Day as an element of the recruitment effort.

In the U.S., Bombardier maintains service centers in Dallas; Fort Lauderdale, Florida; Hartford, Connecticut; Tucson, Arizona; and Wichita. They are part of a worldwide network of nine facilities and 16 customer-response team mobile units. The network has been growing, with business up 20 percent last year and the trend continuing.

Derek Penn, general manager of the Wichita Service Center, noted that his center has been at near capacity, if not "completely full." Earlier this year, Bombardier Business Aircraft's service center and support network had already added close to 200 employees to keep up with demand.

RAISBECK TO ACQUIRE BUTTERFIELD

Raisbeck Engineering has signed a definitive agreement to acquire the assets of Butterfield Industries. The deal was expected to close by the end of last month; terms were not disclosed. Butterfield produces King Air replacement parts such as floorboards, fuel point pans, oil residue collection systems, air/oil separator systems and flow-through anti-ice kits. Based in Meridian, Idaho, Butterfield has manufactured King Air parts for 30 years.

"Wayne Butterfield, the founder of Butterfield Industries and principal product inventor, has been a corporate partner and a friend dating back to 1982," said Raisbeck founder and chairman James Raisbeck. "Many of the aircraft that carry Raisbeck modifications also carry Butterfield systems."

JET AVIATION CLOSES LAST U.S. MRO LOCATION

Jet Aviation has closed the MRO facility at Boston-area Laurence G. Hanscom Field Airport (BED). In a statement released to customers, John Langevin, the company's vice president for North American FBO operations, said, "We're proud to have served your aviation needs until now, but it has become clear that market conditions simply do not support continued MRO operations. We will continue to operate our FBO there through our new FBO building and hangar to deliver all of the flight services you have come to expect from us." He added that an agreement is in place for sister company Gulfstream to use the BED facility to provide routine and unscheduled maintenance.

This comes on the heels of the announcement that Jet Aviation is winding down activities at the St. Louis completions and MRO facility in preparation for handover to Gulfstream as a company-owned service center. The move effectively ends the company's third-party maintenance operations in the U.S., leaving only the location in Burbank, California, an in-house maintenance base dedicated to supporting Jet Aviation's West Coast-based managed fleet.

ONTIC EYES SERIES OF LICENSES, ACQUISITIONS

BBA Aviation's Ontic Engineering & Manufacturing is pursuing a strategy to expand manufacturing activity and support of legacy parts through acquisitions and licenses. The company is in negotiations for up to nine projects that could come to fruition by year-end, said Robert Sadler, director of business development for Ontic.

He said it is too early to provide detail about the projects, but the planned additions span business aviation, commercial and military legacy parts. "They run from avionics to electrical mechanical to fluid pumping," Sadler said.

Since BBA acquired the Chatsworth, California-based company in 2006, Ontic's revenue has ballooned to $190 million from $35 million.

SIKORSKY CONSOLIDATES ONLINE SUPPORT

Sikorsky launched a new customer portal on October 11, consolidating the Sikorsky360 content library and the former customer portal. The company also unveiled the NextGen Helotrac Maintenance Management System, which is integrated with interactive electronic technical manuals (IETMs), maintenance planning, parts ordering and health and usage monitoring services.

Now customers can access technical content, publications and notifications and view subscription-based services at a single website. Operators can also search for and order parts, make claims, check inventory, request quotes and shipments, view historical data and report AOGs. All transactions with Sikorsky can also be done online.

JETSET INTERIORS INTRODUCES NEW SEATS

JetSet Interiors of Dallas introduced a line of seats and a rapid finish process for wood veneer. The new Signature seating series, for Globals and Challengers, offers a wider headrest and armrests, provides a USB port and an iPad holder arm and can be built on the aircraft's existing B/E seat frames. Seating reupholstery, design and refurbishment have long been a specialty of JetSet, and the company is now developing seats for Gulfstreams.

TRAXXALL MX SYSTEM TO SUPPORT EAS OPS

Fractional provider Executive AirShare (EAS) has selected Traxxall Technologies' aircraft maintenance tracking and inventory management system for its 47 business jets and turboprops. Kansas-based Executive AirShare serves the Central U.S. and Great Lakes, operating Learjet 45XRs, Phenom 100s and 300s, Citation CJ2+s and King Air 350is.

Kansas-based fractional provider Executive AirShare is now using Traxxall's aircraft maintenance tracking and inventory management system for its 47 airplanes, the majority of which are Embraer Phenom 100s and 300s.

JSSI COLLABORATES WITH INSURER ON MAINTENANCE

Jet Support Services has added four advisory services, created an asset valuation tool and announced an agreement to manage maintenance events with insurance underwriter Starr Aviation.

The maintenance event management service collaboration complements JSSI's maintenance programs, which provide coverage for nearly all aircraft types and range from engine programs to the tip-to-tail program for the entire aircraft. Under the new agreement, when a Starr Aviation customer has a maintenance-related insurance claim, primarily involving engines and APUs, JSSI will oversee the shop visit and make sure the job is done correctly and efficiently.

The four new advisory services consist of asset inspection, aircraft appraisal, maintenance cost planning and maintenance event management. JSSI also launched a new aircraft-valuation tool, to help provide aircraft value information to clients.

DESERT JET EYES MORE THIRD-PARTY MRO WORK

Palm Springs, California-based Desert Jet Center is bolstering maintenance capabilities in search of more third-party work, according to maintenance general manager James Logue.

"We're adding avionics capability and looking to take advantage of our airframe experience to book more phase checks," Logue said. Seasonal demand means summer is the company's slow period, making it ideal for lengthier projects.

Logue and his team of six mechanics support Desert Jet's fleet, which consists of six Citations, a G200 and a Challenger 300. The company also has Phenom 100/300 capabilities. Logue said his

Part 145 repair station can handle everything from battery reconditioning to airframe work. It also offers engine removal and installation and pre-purchase inspections.

STANDARDAERO EXPANDS HOUSTON PT6A SERVICE

StandardAero has extended PT6A engine field services at Houston Hobby Airport (KHOU) to include on-wing repairs, boroscope inspections, hot-section inspections, engine removal and installation. StandardAero's Houston facility already services light and medium business jets. StandardAero is a Pratt & Whitney Canada PT6A distributor and designated overhaul facility and has 25 years of turboprop experience with technicians specifically trained, and facilities constructed for, PT6A maintenance, repair and overhaul.

ELLIOTT INTRODUCES MAINTENANCE APP

Elliott Aviation has launched Elliott Connect, a maintenance-tracking app. Customers can use the app to manage their aircraft maintenance through a website or mobile app, enabling them to apply change orders and quotes, review invoices and work orders and manage warranty program information, as well as communicate with Elliott team members. Documents and photos related to their aircraft can be uploaded directly from mobile devices. Elliott Connect can be used for work orders covering maintenance, paint, interior or avionics. The application has already been successfully tested with a customer on a Citation 650 Doc 8 inspection.

"The Elliott Connect system is an essential tool in enhancing the communication process for our customers," said Greg Sahr, president of the Moline, Illinois-based company.

TEXTRON AVIATION EXPANDING APPS FOR 1CALL

A year after Textron Aviation launched the 1Call team to provide a single point of contact for customers during unscheduled maintenance, the company has expanded communications capabilities for new and out-of-production aircraft with an app through which operators of older aircraft can provide immediate notification of any potential issue.

Customers can contact the 1Call team, unveiled in January last year, through a dedicated phone line, but the team also receives real-time CAS messages for aircraft equipped with the LinxUs system. Now, pilots can use the apps to connect directly as well.

Last spring, the company released a LinxUs app for newer aircraft to enable immediate contact with the center, and more recently released LinxUs Legacy to cover older Citations, Hawkers and Premier Is. ❑

Textron Aviation's 1Call customer support center provides a single point of contact for operators needing unscheduled maintenance. The center can also receive real-time CAS messages from aircraft with LinxUs.

MISSISSIPPI AIRPORT COMPLETES SALE OF FBO

Airport Management Solutions (AMS) purchased Tupelo Aviation Unlimited from the airport authority earlier this month. The company had managed the airport-owned FBO at Mississippi's Tupelo Regional Airport since 2012. The initial deal addressed the possibility of the purchase of the 12,400-sq-ft facility at the conclusion of the five-year lease as the airport authority sought to exit the FBO business.

The Avfuel-branded FBO offers a large conference room, kitchenette, crew lounge, passenger lounge, snooze rooms, flight-planning room, crew cars, showers and free Wi-Fi. It has 77,000 sq ft of hangar space and the ramp can accommodate a 757.

AMS, which provides light turbine maintenance on the field, also manages the FBO at Greenville Mid Delta Airport in the western part of the state.

JETEX, CFLY TO PARTNER ON FIRST FBO AT BRAZIL'S GUARULHOS

Jetex Flight Support and Brazilian aviation services partner CFly Aviation have won a tender to develop and operate a new general aviation terminal and FBO at São Paulo Guarulhos International Airport, the first such facility to be built at the field. In the past, private aircraft there could remain on the ground at the airport for only a limited time, and they are currently forced to park in a remote area, a 20-minute drive from the main terminal

MARIANO ROSALES

Jetex president and CEO Adel Mardini, left, and CFly CEO Francisco Lyra will join forces to develop and operate an FBO at Brazil's São Paulo Guarulhos Airport.

where they have to clear customs.

Under the terms of the 15-year lease, CFly will provide the infrastructure, while Jetex will manage the facility. "We sought a partner to bring to Brazil the level of service that you would find in Europe or the U.S., so Jetex was the preferred choice for us," explained CFly Aviation partner Francisco Lyra, adding that he expects the new terminal will make the airport more friendly to business aviation.

The companies began operations at Guarulhos last month from temporary structures, while plans for the new facility are currently being laid out, but Jetex president and CEO Adel Mardini expects construction to begin in next year's first quarter, with an eye toward completion by the end of the year.

"Brazil's general aviation fleet is the second-largest in the world, after only the U.S.," said Mardini. "By partnering with CFly Aviation at Brazil's busiest airport, Jetex is positioning itself to provide the highest level of services to an increasing number of Latin American business aircraft operators and their passengers. With Guarulhos as a base, we expect to expand to other key locations across South America in the not-too-distant future." Jetex recently added locations in Santiago, Chile, and Toluca, Mexico.

LONDON SOUTHEND AIRPORT TO DEBUT NEW FBO

Stobart Executive Jet Centre, the FBO that opened at privately owned London Southend Airport earlier this year, will begin operations from a new, larger facility this month with the simpler name of Stobart Jet Centre. The location, 42 miles from the capital's West End, offers planeside car access, six trains per hour at the nearby station for a 45-minute ride to the heart of London, and 10-minute helicopter transfers. Offering onsite immigration and customs service, with pre-clearance available to qualifying passengers, along with enough hangar space to accommodate up to four BBJs, the facility will operate 24 hours a day year-round, except Christmas Day, with no slot restrictions.

Among the amenities at the 6,000-sq-ft terminal are a passenger lounge with complimentary catering and business services and a private crew lounge with refreshments, TV and computers. The facility also claims to offer highly competitive landing, parking and handling prices.

"Convenience, speed and comfort are absolutely vital to the business and private aviation market," noted Stephen Grimes, the FBO's managing director. "The Stobart Jet Centre will offer guests and pilots a smooth, premium experience because we can offer 24-hour availability and departure routes outside London's crowded airspace." He added that the company is confident that the destination will become a "refreshing, hassle-free alternative to London's current, crowded private aviation terminals," and that it expects to handle 5,000 flights a year by 2020.

SECOND HAWKER PACIFIC SHANGHAI FBO GETS CIQ

Six months after ABACE 2017 was held in Shanghai and six months before the next edition of the business aviation showcase (April 17 to 19, 2018), private aircraft activity is growing robustly in Shanghai, according to Carey Matthews, general manager of ABACE host facility Shanghai Hawker Pacific Business Aviation Centre (SHPBASC) at Hongqiao Airport.

Speaking to **AIN** at NBAA 2017 in Las Vegas, Matthews said, "We're having our best year ever in terms of numbers" of aircraft using the FBO. September was a record month, up 11.6 percent from a year ago, he added. "We're seeing robust growth in bizjet ops throughout Shanghai."

Matthews also said that the company's second Shanghai FBO, at Terminal 2 of Pudong International Airport, now offers customs, immigration and quarantine (CIQ) services. Previously Hawker Pacific could offer CIQ only at the Hongqiao FBO. The Pudong general aviation apron area can now be configured for high-density parking. Instead of six wide-cabin, long-range business jets, the apron can accommodate 24, said Matthews. He added that work on SHPBASC's second hangar at Hongqiao, which will add 48,437 sq ft (4,500 sq m) to the existing 43,055-sq-ft (4,000-sq-m) hangar, as well as more office space on three floors, is progressing well. He is "confident" it will be ready for exhibitor stands at ABACE next year.

WASHINGTON STATE FBO REOPENS AFTER REFURBISHMENT

Bellingham Aviation Services, one of two service providers at Washington State's Bellingham International Airport, held a grand opening last month to celebrate the completion of a four-month, renovation of the terminal. Upgrades on the 3,000-sq-ft structure were designed to promote the beauty of the Pacific Northwest, and many of the building's interior walls were removed to provide a more open and

Bellingham Aviation Services recently renovated its 3,000-sq-ft facility at Washington's Bellingham International Airport.

inviting layout, in turn drawing focus to the old-growth maple countertop in the front reception area.

Located 20 miles south of the Canadian border between Vancouver, British Columbia, and Seattle, Bellingham is a U.S. port of entry with 24-hour customs service on the field, and the company says it specializes in quick-turn tech stops for Alaska- and Asia-bound flights. It also has hangar space that can accommodate a GIV.

The company has joined the World Fuel Services (WFS) network as a branded FBO, providing WFS contract fuel, accepting the Avcard and participating in the company's FlyBuys rewards program.

FLIGHT ATTENDANT LAUNCHES SOUTH KOREAN BIZAV CATERER

With the Winter Olympic Games less than four months away, contract corporate flight attendant Young Park has decided to do something about the dearth of private aviation catering options in the host country of South Korea. Korean-born Park, along with her longtime friend and professional chef Sung Nam Yoo, has established Les Chefs Inflight Catering, ahead of the expected influx of business jets to the country.

"The catering options in Korea are limited. Right now either the airport caterer who will provide you with airline food or a local hotel are the only options," said Park, adding that her service will launch in January to provide customized catering to flights operating from Gimpo International and Incheon International Airports, with the support of AvJet Asia. Visiting the NBAA Convention last month in Las Vegas, she met with many global trip-support providers there to describe her plans. "It seems like everyone realized that a proper catering company is needed for their clients," she told **AIN**.

The fledgling company has already confirmed catering contracts from several major Olympics sponsors. Les Chefs is setting up a preparation kitchen in Seoul and creating a menu offering appetizers to dinner, with upscale Western entrees alongside traditional and modern Korean cuisine. It will also be able to handle specialty orders for Chinese, Thai, Sushi and halal food. According to Park, the

CHARTER NEWS NOTES

- **Jet Edge International has added four G550s and a Global XRS** to its managed fleet.
- **Executive AirShare has released an iOS app** that allows customers to communicate with flight crew and view past and future itineraries and arrival and departure information.
- **Deer Jet has assigned its "Dream Jet" 787 for management by UAS International Trip Support**. The 787 can carry 40 passengers and fly 8,600 nm and for up to 18.5 hours.
- **Coleman Jet has installed Gogo Business Aviation's high-speed Avance L5** air-to-ground connectivity system in a GIV that is available for charter.
- **Elliott Aviation added a refurbished Citation Excel** to its charter fleet.
- A new 16-passenger **G650 has joined the Corporate Air fleet**.
- **ExcelAire** is basing a recently **added Hawker 800** at its Ronkonkoma, New York headquarters. air-to-ground connectivity.
- Van Nuys, California-based **Silver Air added a Citation Excel and Challenger 300** to its managed fleet. Silver Air provides free domestic airborne connectivity and a galley stocked with Dean & Deluca snacks and central California wines. ■

Les Chefs Inflight Catering is ready to serve crews and pax heading to South Korea.

business will require the standard order period of 24 to 72 hours before the flight, depending on volume.

AVFUEL ADDS TRIO OF LOCATIONS TO DEALER NETWORK

Avfuel has expanded its dealer network with three additions in the U.S., Europe and the Caribbean: Bohlke International Airways, the lone service provider at St. Croix's Henry E. Rohlsen Airport; WestAir Aviation in Shannon, Ireland; and the Denver jetCenter. The Ann Arbor-based company also recently renewed a partnership with the Sheltair FBO chain of 17 FBOs along the U.S. East Coast.

"Our partnerships with these four companies strengthen our network, incorporating 20 aviation service locations stretching from the Caribbean to New York, and from the west to the UK," said Joel Hirst, the fuel provider's vice president of sales.

Bohlke, which was established in 1959, recently endured Hurricane Maria and is serving as a staging hub for relief missions throughout the region. The location offers charter and FAA Part 145 maintenance service, along with the only hangar facilities in the southern Caribbean.

A U.S.-style FBO, WestAir operates fuel trucks at Shannon Airport. The facility offers a passenger lounge, crew rest area, hangar space, maintenance and a main ramp office for tech stops and quick turns, while the airport provides U.S. Customs pre-clearance.

The most recent addition to the network, Denver jetCenter is one of several service providers at Centennial Airport, 12 miles from the city's downtown. Guests there benefit from catering provider The Perfect Landing, five conference rooms and onsite U.S. Customs.

AUSTIN EXECUTIVE TO RECEIVE NEW TOWER

Austin (Texas) Executive Airport (EDC) has begun construction on a new control tower, which it says will provide an added level of safety for operators and reduce runway congestion at the privately owned facility. Established in 2011, the airport is 15 minutes from downtown Austin and caters solely to business and general aviation.

"We are excited to see how the airport has grown over the last six years," said EDC executive director Andrew Perry, adding that he expects the new tower to be operational by year-end. According to airport manager Jodie Kaluza, the privately funded tower is 55 feet tall with a hexagonal cab. Once completed, it will be staffed with controllers provided by Advanced ATC and operational from 6 a.m. to 10 p.m. 365 days a year.

The construction is the latest development in the master plan at the airport, which has a 6,025-foot runway; the Henriksen Jet Center FBO with an 18,000-sq-ft arrivals canopy; and 113,000 sq ft of hangar space.

Once completed later this year, the new tower at Austin Executive Airport will be staffed year-round from 6 a.m. until 10 p.m.

SKYSERVICE JOINS AIR ELITE NETWORK

The Skyservice chain of Canadian FBOs is the latest to join the World Fuel Services-sponsored Air Elite Network. Skyservice offers four bases: the flagship location is at Toronto Lester B. Pearson International Airport, with other locations at Calgary International, Montreal-Pierre Elliot Trudeau International and Ottawa MacDonald Cartier International Airports. The FBOs provide lounges and amenities, 24/7 concierge service and ramp and hangar space. The company also offers aircraft maintenance, management, charter and sales. It is also the exclusive Canadian distributor for the HondaJet.

The Air Elite network has grown to 77 locations worldwide since its inception in 2011. Each facility must meet airport, facility and service standards to qualify for acceptance. ❑

FBO PROFILE: ACI Jet SNA

CA COMPANY HAS BIG PLANS FOR ORANGE COUNTY SITE

ACI Jet has grown into a new force in the West Coast FBO scene, after securing a hotly contested leasehold at John Wayne-Orange Country Airport (SNA) from incumbent Signature Flight Support in January. Although the ACI Jet lease is for a short term—until December next year—the company's leadership expects to sign a longer lease, and in a sign of confidence about the future has already refurbished the SNA facility.

The $600,000 refurbishment was completed on September 30, modernizing the 1990s-era, 8,000-sq-ft terminal with four A/V-equipped conference rooms ranging from six to 12 seats, a passenger lobby, pilot lounge and two comfortable snooze rooms with full-size beds and shower facilities.

"We [were] looking at a building with good bones and giving it some tender loving care it always needed," said ACI Jet SNA general manager Joe Daichendt.

ACI Jets recently refurbished its terminal at SNA. During the July 28 grand opening of the facility company CEO Bill Borgsmiller presented $25,000 to various charities in honor of a late friend.

The company culture and every employee's passion for aviation is part of the experience. "Pilots can walk up to the front desk and ask for the impossible and our team will deliver," he said. The Avfuel-branded FBO, one of two providers on the airport, offers 80,000 sq ft of hangar space, capable of sheltering the latest big business jets.

Eye on Santa Ana

The SNA facility is ACI Jet's largest, and it also operates FBOs at company headquarters in San Luis Obispo, Paso Robles and Oceano County airports. Both the SNA and San Luis Obispo operations house FAA Part 145-approved maintenance facilities, and ACI's charter/management division brings in a significant amount of revenue. The latest addition to the charter fleet is a G650.

ACI traces its beginnings to 1998, when founder and CEO William Borgsmiller opened his first FBO at central California's San Luis Obispo County Regional Airport.

Borgsmiller is proud that many of the people on the ACI team have remained loyal to the company. "It's all about finding the right people," he said. "That is a challenge. You have to find people who have the technical expertise to do the complex things we do, whether it's flying an airplane to China in the middle of the night or taking an airplane apart and putting it together properly." ACI Jet employs 100 people, with 24/7 service at the larger facilities. To encourage employees to learn more about aviation, ACI operates a flying club that allows employees to fly for the cost of fuel.

Borgsmiller's goal is to engage a new generation of pilots and especially mechanics, which have become scarce. ACI's maintenance shops promote mentorship and continuing education to help employees earn their mechanic certificate. "The industry needs fresh blood," he said. "We are short of pilots right now, and mechanics are hard to find."

When ACI Jet took over the SNA FBO, it cut fuel prices almost in half, to $3.76 from $7 per gallon. "We made the point that if the airport is not happy with the way things are today, use this opportunity to make a change and you will have a couple of years to look at something different before you make a long-term 20-year commitment," said Borgsmiller.

"So far we have brought positive change to the airport and growth in volume, traffic, business and based aircraft. We are going to be in a really good spot to stay here for a long time."

At the core of ACI Jet's SNA initiative is Daichendt. He began the journey to SNA two years ago, joining a group of frustrated stakeholders at the airport. At that time Borgsmiller was considering acquiring a lease in Santa Barbara but welcomed the opportunity to join Southern California's growing market. "Our hope is that we can take it over the top in every way," said Daichendt. *—Marisa Bojiuc*

PRELIMINARY REPORTS

UPS CARAVAN LANDS OFF AIRPORT AFTER ENGINE FAILURE

Cessna 208B Caravan, July 3, 2017, near Marfa, Texas—A Cessna 208B Super Cargomaster operated under Part 135 by Martinaire Cargo was substantially damaged and its pilot, the sole occupant, sustained minor injuries in a forced landing near Alpine-Casparis Municipal Airport (E38) near Marfa, Texas.

The flight departed E38 on an IFR flight plan en route to Maverick County Memorial International Airport (5T9), Eagle Pass, Texas, just after 6 p.m. in day VMC. While climbing through 500 feet agl the pilot heard a loud bang, followed by a squealing noise, as the engine lost power. The pilot told investigators he released back pressure on the controls and rapidly pulled the propeller control to the feather position. During the forced landing, the right and left wings were damaged when they hit utility poles. The airplane came to rest in a field near Highway 118. Firefighters responded.

U.S.-REGISTERED TBM 700 SPINS OUT OF IMC INTO JAPANESE MOUNTAINS

Daher TBM 700, Aug. 14, 2017, Yao Airport, Japan—A U.S.-registered Daher TBM 700 flown by an experienced Japanese owner-pilot crashed in mountainous terrain in the Nara prefecture near Yao Airport. Some eyewitnesses reported that the airplane spun out of the clouds. Fire consumed the wreckage and the 68-year-old pilot and his wife, the only passenger, were killed.

The airplane departed Yao Airport just before noon in IMC. Just 15 minutes into the flight the pilot told Kansai Approach he wanted to turn back to Yao. Radar contact was lost three minutes later. The Japan Transport Safety Board reached the accident site the next day and commented that the wreckage distribution indicated the turboprop single might have disintegrated in flight.

The airplane had been imported to Japan from the U.S. in early June this year, and a Japanese maintenance company conducted a maintenance check that took several weeks. No maintenance issues were uncovered; however, three days before the accident the aircraft suffered unspecified radio trouble during a flight from Yao to Kobe Airport (UKB/RJBE) and was forced to return to Yao.

STRANGE NOISE ON TAKEOFF MORPHS INTO BIG BANG ON LANDING

Thrush S2R-800, Aug. 16, 2017, Stephan Lake Lodge, Alaska—A turbine-powered Thrush (formerly Rockwell International) S2R-800 on a cargo flight from Willow, Alaska, lost control and departed the runway while landing at Stephan Lake Lodge Airport, Alaska, 46 miles northeast of Talkeetna. The commercial pilot was uninjured. The left wing and the empennage of the airplane sustained substantial damage.

The airplane was registered to and operated by Glenn Air of Palmer, Alaska, and was operating under Part 91 in VMC. The pilot reported that the purpose of the flight was to transport bulk fuel to Stephan Lake Lodge Airport. While taking off from Willow Airport, the pilot reported he heard a "whack" noise from the rear of the airplane, which he attributed to a rock striking a flap. After an uneventful flight, the pilot landed into the wind on Runway 18 at Stephan Lake Lodge Airport.

Upon touchdown on the dirt and gravel runway, the tail of the airplane came down, and the pilot reported he heard a "loud bang." He reported the tailwheel assembly "went clear" to the ground and he had no rudder authority. The pilot managed to hold a straight path on the runway for about 600 feet, but with loss of airspeed the airplane veered to the right and off the runway at about 25 mph, coming to rest after hitting the ditch that runs parallel to the runway. The pilot found that a bolt in the front tail spring attachment assembly had failed.

AEROMEDICAL FLIGHT FOUND INTACT, BUT ALL ON BOARD LOST

Airbus Helicopters BK117-C2, Sept. 8, 2017, Hertford, North Carolina—A commercial pilot, two flight nurses and one patient were killed when the BK117-C2 descended into a ditch and caught fire after losing power near a wind farm in Hertford, North Carolina. The pilot had accrued 1,027 hours in the same make and model as the accident helicopter, and had been employed with Air Methods for nine years.

The day VMC Part 135 flight left Sentara Albemarle Regional Medical Center Heliport (NC98) at 11:08 a.m. destined for the Duke University North Heliport (NC92) and heading northwest at 1,000 feet agl. Eight minutes after takeoff, the helicopter began a turn toward the south. A minute later the transmitted data ended at an altitude of about 1,200 feet msl and a groundspeed of 75 knots, while the helicopter was on a southeasterly track.

Witnesses reported seeing "heavy" or "dark," even "bluish," smoke trailing behind the helicopter while it was in flight. One witness reported that the helicopter was "hovering" and "not travelling forward" while it was a "couple of hundred feet" above the wind turbine farm. Another witness reported hearing a "popping noise" before seeing the helicopter turn left, then right. It then descended quickly and appeared "in control" with the main and tail rotors turning before he lost sight of it.

The helicopter hit the ground in a shallow turf drainage pathway 30 feet wide and 2,000 feet long between two fields of tall grass on a wind turbine farm. The fuselage came to rest in a seven-foot-wide ditch in the center of the pathway, and was oriented on a heading of 261 degrees magnetic. There were no ground scars leading toward or away from the main wreckage.

Examination of the wreckage revealed that all major components of the helicopter were present at the accident site. The cabin had collapsed downward and was partially consumed by a post-crash fire. The tailboom remained largely intact. Flight control continuity was established from the cockpit area to the rotor systems and engines. All main and tail rotor blades remained attached to the rotor hubs. The number-four (red) main rotor blade was found rotated 180 degrees in the hub with its pitch links fractured and partially melted. None of the main or tail-rotor blades exhibited leading-edge damage, chord-wise scratches or other evidence of rotation. The outboard four feet of the number-one (yellow) blade came to rest in the eight-foot-tall grass adjacent to the drainage path. The grass on either side of the blade was undisturbed. The tail-rotor shaft remained attached to the transmission. The transmission could not be rotated by hand.

No foreign object debris damage was found on the axial compressor blades of either engine. No damage was seen on the visible portions of the turbine blades at the rear of either engine. The gas generator of the number-one engine moved freely when rotated by hand. The number-two engine gas generator would not rotate. The number-one engine fuel shutoff valve was found in the open position. The number-two engine fuel shutoff valve was damaged and in the field its position could not be determined. The number-two engine rear turbine shaft bearing showed discoloration consistent with overheating and lack of lubrication. The bearing roller pins were worn down to the surface of the bearing race. The end of the turbine shaft aft of the nut exhibited rotational non-uniform damage.

FAA records show that a 30-hour engine inspection was completed on August 15 this year. At that time the helicopter and both engines had accrued 2,673 hours. Several more inspections were completed during scheduled maintenance on September 1. At that time the helicopter had accrued 2,710 hours. According to the operator, a mechanic performed a daily airworthiness check on the aircraft.

The helicopter was equipped with an onboard audio and video recording system that was damaged by heat; however, the memory device remained intact. The unit was sent to the NTSB vehicle recorder laboratory for examination. ❑

FINAL REPORT

TURBINE OTTER ACCIDENT REVEALED LACK OF SAFETY CULTURE

De Havilland Canada DHC-3T, June 25, 2015, Ketchikan, Alaska—The NTSB blamed the lack of a safety "culture," manifest by extreme pressure put on pilots that encouraged them to fly in hazardous weather, as one of the causes for the loss of a turbine Otter, its pilot and eight passengers on a Misty Fjords excursion package from Holland America cruise lines. The Board also cited the operator, Promech, for lack of a formal safety program and inadequate operational control for releasing flights for departure.

The flight, operating under Part 135, was carrying cruise-ship passengers on a VMC trip over remote inland fjords, coastal waterways and mountainous, tree-covered terrain in the Misty Fjords National Monument Wilderness. The weather was marginal VFR, in changeable conditions.

This operator's pilots could choose between two standard tour routes between Rudyerd Bay and Ketchikan: the "short route" (52 nm) takes about 25 minutes and is primarily over land; the "long route" (63 nm) takes about 30 minutes and is primarily over seawater channels. Although the long route is less scenic, it was generally preferred in poor weather. Route choice was at the pilot's discretion.

The accident pilot chose the short route for expediency and climbed to an altitude that would have provided safe terrain clearance had he followed the typical short route. Instead, he deviated and turned west early, placing the airplane on a collision course with a 1,900-foot mountain. In the final two seconds of the flight the airplane pitched up rapidly before striking terrain at about 1,600 feet. Investigators concluded that the timing of this aggressive pitch-up maneuver strongly suggests that the pilot continued the flight into near-zero visibility conditions and, as soon as he realized that the flight was on a collision course with the terrain, he pulled back aggressively on the elevator control in an ineffective attempt to avoid the terrain.

The airplane was equipped with Class B Taws that would have provided terrain avoidance alerts; however, it is likely it was inhibited, a common practice among tour operators in the area, who routinely fly at altitudes that generate frequent "nuisance" alerts. The airplane was not equipped, and was not required to be equipped, with any crash-resistant flight recording system. However, data retrieved from other devices, such as the Chelton system and passengers' personal electronic devices, as well as ADS-B recorded data, provided information about the flight.

"Promech and at least one other operator that was willing to take more weather-related risks were both able to fly more revenue passengers than two other more conservative operators who cancelled flights that day," the NTSB said in a statement on the findings.

NTSB chair at the time Robert Sumwalt said in the NTSB statement, "Pilot decisions are informed, for better or worse, by their company's culture. This company allowed competitive pressure to overwhelm the common-sense needs of passenger safety in its operations. That's the climate in which the accident pilot worked."

The NTSB held the final report hearing in Alaska, and made a dozen recommendations regarding the safety of operations of tour aircraft in the state, including the establishment of a more conservative set of weather minimums tailored to the air-tour operations conducted in Ketchikan and applicable to all area air-tour operators to help balance competing goals of production and safety and remove the incentive individual operators have had in the past to adopt the lowest possible weather minimums to stay competitive. ■

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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MEBAA™
INSURANCE

Completion & Refurbishment

by James Wynbrandt

Motorized Wheelchair Unit Navigates Airstairs

Powered-mobility specialist Alber makes few sales in aviation, but its lone industry-specific product, Scalamobilfly, proves to be a hit at the NBAA Convention every year. "We bring units for demonstrations every year, and we usually end up selling them at the show," Alber USA business manager Bill Russell told **AIN** at the event last month.

Scalamobilfly is a motorized wheelchair designed to navigate airstairs. The 89-pound, lead-acid-battery-powered unit climbs and descends using a motorized drive-chain system that rotates a small set of wheels around the larger main set. The operator balances the unit, and the drive system does the rest, navigating steps up to 9.8 inches high and at least 5.1 inches deep. The unit breaks down into two parts for convenient stowage. The battery lasts about 300 steps on a single charge and is removable for easy recharging.

Comlux Awarded First BBJ Max 8 Completion

Comlux Completion USA has been awarded the cabin completion contract for the first BBJ Max 8. Richard Gaona, president and CEO of parent company Comlux Aviation, made the announcement at the NBAA Convention last month. The next-generation BBJ will arrive at the Indianapolis facility in next year's fourth quarter, with redelivery scheduled for fall 2019.

In August Comlux Completion was tapped to perform the interior installation on an ACJ320neo for an undisclosed Asian customer. That jet will arrive at the completion center in September 2019 and require 10 months for completion.

Scott Meyer, CEO of Comlux Completion, said, "The first Max 8 signature together with the Neo cabin contract signed in August are paving the way for establishing Comlux as a leader in the VIP completion market." Gaona noted that although the center is getting more business, "We still have open positions for slots" for both completions and refurbishments.

Flying Colours Outfits Global for Repeat Customer

Flying Colours has delivered a cabin for a Global Express that repeats a design the same customer ordered for his Challenger 850 in 2013. Designers made several "engineering and style adjustments" to the original plans for the 850 refurbishment, said Eric Gillespie, executive v-p of the Canadian company. "We had to take into consideration the larger cabin, the different type of usage and the high standards of the Global to recreate the same look and feel."

The Global's floor plan was modified to accommodate a new configuration in the mid-section, and two seats opposite the central divan were replaced with a four-seat conference group, incorporating new Rockwell Collins Global seats. All the seats were upholstered in white leather with a carbon-fiber armrest accent.

Flying Colours designed the cabin of a customer's Global Express to match that of his Challenger 850.

Meanwhile, expansion is under way at Flying Colours' facility in St. Louis, Missouri (KSUS), adding 40,300 sq ft of floor space and 70 employees, a 30-percent uptick in staff. The facility will begin work on several cabinetry projects in next year's first quarter.

3D Design Expanding at Duncan

Duncan Aviation has expanded its 3D design capabilities, adding multimedia artist Dan Ryba, a specialist in 3D illustrations, to the in-house aircraft interior and paint design team. Computer-generated 3D renderings "save a great deal of time and money, so they're popular with all our clients, internal sales and production people," said Ken Reita, who heads Duncan's 3D conceptual illustration services. "Unlike with 2D drawings, we can draw from our extensive engineering database and generate accurate 3D models of the entire interior that are specific to the actual measurements of an aircraft." Added Ryba, "Our clients especially appreciate being able to see exactly what they're getting."

Robinson Aerospace Sets Up Shop at Fort Worth Alliance

Robinson Aerospace (formerly Robinson Aircraft Interiors), a Coppell, Texas-based completion and refurbishment provider, has relocated most activities from a manufacturing warehouse in Coppell to an on-airport facility at nearby Fort Worth Alliance Airport.

"Now we can serve our customers from a major airport location and truly realize our longstanding goal of becoming a turnkey U.S. completion and MRO center," said president Jeff Robinson. The new facility has 217,000 sq ft of offices, conference suites, design showrooms, climate-controlled hangars and integrated back shops. The 14 hangar bays accommodate large-cabin business jets, and the new airport location will allow direct fly-ins by customers. The first project undertaken at the new location, a limited interior refresh and 12-/24-month inspection on a Challenger 604, was completed and re-delivered in September.

ST Engineering's Aeria Gains Some Independence

Singapore-based ST Engineering has incorporated its Texas-based VIP completion and refurbishment business—rebranded as Aeria Luxury Interiors by VT San Antonio Aerospace—as a standalone subsidiary. Aeria was formerly a division of ST Engineering's VT San Antonio Aerospace, a major MRO provider for airlines. The restructuring will enable Aeria to "tailor its processes to be focused on the completion business," thereby making it more competitive, said ST Engineering. Aeria will operate under its own Part 145 repair station certificate, allowing the company "to streamline the completion process and expedite maintenance, refurbishment and completion contracts in the most efficient way possible," the company said.

Aeria, which has performed 20 refurbishment, heavy maintenance and avionics upgrade projects since 2012, recently completed a 14,000-sq-ft expansion that introduced a design showroom. ■

Compliance Countdown by Gordon Gilbert

Within 6 Months

▶ **Dec. 7, 2017 and 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 expands to these altitudes in the entire ICAO NAT region on December 7 this year, and to all flights in this region above FL290 on Jan. 30, 2020, a month sooner than the previous revised date.

▶ **Dec. 30, 2017** ESTIMATED
Many RCO Radio Frequencies To Be Decommissioned
Beginning late this year (exact date to be announced), the FAA is scheduled to start decommissioning 641 remote communications outlet (RCO) radio frequencies used by Flight Service Stations to communicate with aircraft in flight. The frequencies are associated with dedicated RCOs and 237 outlets co-located with VORs. Frequencies in Alaska and those designated for emergency or military use are not affected by this reduction program. A Mitre study done for the agency concluded that as many as 666 frequencies could be removed and the remaining frequencies would still provide from 93 to 100 percent coverage between 1,000 and 5,000 feet msl. Notams will be issued as each frequency is decommissioned.

▶ **Dec. 31, 2017 and Dec. 31, 2020** NEW
Stage 5 Noise Rules Go Into Effect
A more stringent noise standard for newly certified jet airplanes goes into effect starting December 31 for applications for new aircraft with an mtow of 121,254 pounds or more, and starting Dec. 31, 2020, for aircraft less than 121,254 pounds. The agency stressed that the rule, known as Stage 5, is "intended only for new aircraft and is not signaling the start of an action aimed at phasing out the existing noise standards that apply to the production or operation of current models."

▶ **Jan. 1, 2018**
Deadline for European 8.33-kHz Spacing
Starting January 1 next year, aircraft might not be able to operate in any EU member state's controlled airspace unless they are equipped with communications systems that have 8.33-kHz voice-channel spacing. Eurocontrol says extending 8.33 kHz below FL195 down to ground level is important, as "Europe has a known shortage of voice communication frequencies." The 8.33-kHz requirement for higher altitudes in controlled airspace has been in effect for some time. According to Eurocontrol, the consequences should this shortage of com frequencies not be addressed are "significant: there will be more air traffic delays; it will be harder to implement safety improvements; and we will lose flexibility in introducing operational enhancements."

▶ **Jan. 3, 2018** NEW
New EASA Rule Would Ease non-Etops Ops
The European Aviation Safety Agency has issued a notice of proposed amendment (NPA) that would permit larger European-certified multiengine business jets used in on-demand charter service to operate with 120- to 180-minute one-engine inoperative (OEI) diversion times without obtaining approval for extended range twin-engine operation performance standards (Etops). This NPA proposes to extend the current non-Etops operation mtow threshold to accommodate business jets with an mtow of more than 100,000 pounds and remove the specific type design approval for non-Etops operations between 120 and 180 minutes. Comments are due by Jan. 3, 2018.

Within 12 Months

▶ **June 16, 2018 and Jan. 1, 2019**
Upgraded CVRs and Underwater Locators Required
New regulations from the European Aviation Safety Agency (EASA) will require upgraded CVRs and underwater locating devices (ULDs) to be installed. Starting June 16 next year, 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 very long detection range." Also by Jan. 1, 2019, all CVRs with 30-minute recording duration must be replaced by units that can record for two hours. CVRs recording on magnetic tape must be replaced by solid-state units.

Beyond 12 Months

▶ **Jan. 1, 2020**
U.S. ADS-B Out Mandate
ADS-B Out equipment must be operational starting Jan. 1, 2020, in aircraft that fly in the U.S. under IFR and where transponders are currently required, namely class A, B and C airspace.

▶ **Jan. 1, 2020**
Taiwan ADS-B Out Compliance
The Republic of China has pushed the deadline to Jan. 1, 2020 for compliance with ADS-B Out equipment within the Taiwan FIR above FL290. China was forced to delay compliance because too few aircraft were equipped to render the original ADS-B plan achievable. The new deadline for Taiwan coincides with the Jan. 1, 2020 U.S. mandate for ADS-B Out compliance.

▶ **Jan. 1, 2020, Jan. 1, 2023 and Jan. 1, 2028**
Aircraft CO_2 Emissions Standards Adopted
The first international standards for CO_2 aircraft emissions have been enacted by ICAO and apply initially to large subsonic jets, including business jets, for which the application for a type certificate was submitted on or after Jan. 1, 2020. The standard would apply to new deliveries of current in-production large aircraft starting Jan. 1, 2023. All covered in-production airplanes must meet the standard by Jan. 1, 2028. Jet airplanes with an mtow of less than 12,500 pounds are exempt, as are piston-engine airplanes and turboprops with an mtow of less than 19,000 pounds.

▶ **June 7, 2020**
European ADS-B Out Mandate
The ADS-B Out retrofit requirement in Europe takes effect June 7, 2020. This date is about six months later than the U.S. ADS-B Out mandate. ❑

Jim Ziegler, who has served as president and CEO of *Greenwich AeroGroup* for the past eight years, is taking the new role of vice chairman. Ziegler, a former Jet Aviation and Bombardier executive, will continue to steer business strategy, industry relations and acquisition activity. **Ralph Kunz**, a six-year company veteran who has served as vice president and general manager of Greenwich's Summit Aviation and TruAtlantic Manufacturing businesses, has taken the newly created role of COO. Kunz has three decades of aerospace experience, having formerly served with Parker Hannifin, Vector Aerospace, Keystone Helicopters, SEI of America and Airborne Tactical Advantage.

Exclusive/Custom Jet Charters appointed **Ralph Michielli** president. Michielli helped launch ExcelAire in 1993 and most recently was COO for the company.

The *Aerospace Industries Association* has named former secretary of the Army **Eric Fanning** president and CEO, effective January 1. He steps into the role currently held by **David Melcher**, who recently informed the association that he plans to leave on December 31. Fanning has served with three military departments and with the office of the secretary of defense.

Stratajet appointed **Donovan Frew** chief technology officer. Formerly CTO of Secret Escapes, Frew has a 20-year background as a software engineer and technology leader.

The *European Business Aviation Association* brought in **Robert Baltus** as COO and **Eric Drosin** as communications director. Baltus brings 20 years of business aviation experience, including stints with Executive Jet Management and NetJets, and has advised and supported senior management and executive boards of several aviation-related companies. Drosin has a background in communications and journalism that spans 20 years.

VSE Aviation hired **Rishiraj (Rishi) Singh** to serve as senior v-p of international business development.

Constant Aviation named **Mark Larsen** vice president of sales. Larsen is a 35-year aviation veteran who most recently had led Larsen Aviation Consulting.

Mark Steinbeck, president of maintenance tracking and inventory specialist *Traxxall Technologies*, has joined the NBAA Maintenance Committee.

Bryan Johnson joined *Aviation Management Consulting Group* (AMCG) as a consultant in the Colorado office.

Signum Aviation named **Kerry Borrosso-Zakula** business development manager for the U.S. Borrosso-Zakula previously serve with Air Routing International, Rockwell Collins, Jet Aviation and Avfuel.

Horizon Jet Management (formerly Starbase Jet) appointed **Luis Barros** CEO, **Rob Rosenberg** managing partner and **Randall Mize** president. The executives move over to the new rebranded entity after Starbase was recently acquired. Joining them is **Phil Gibson** as director of operations.

Uğur Kalkan, founder, partner and general manager of MNG Jet, left the company to form *Seres Aviation*. Based in Istanbul, Turkey, Seres is focused on aircraft/engine trading and aviation consultation.

Western Aircraft hired **Mike Turner** as an avionics sales account manager.

Steve Ell joined *Blackhawk Composites* as manager of engineering and production.

Euro Jet appointed **Paul Lourenco** manager of the operations control center in Prague, Czech Republic. Lourenco has 20 years of aviation experience with NetJets Europe and American Airlines.

Gulfstream Aerospace named three regional sales managers to oversee territories in the U.S. and Latin America. **Kirsten Krueger** will be responsible for the Western U.S.; **Pedro Ruiz** for Latin America and Florida; and **Luiz Cezar Vieira Alves** for Brazil.

BACA—the Air Charter Association added **Glenn Hogben** to the council. Hogben is operations director for ACC Aviation. ❑

Final Flights

Nathan Young, a veteran FBO professional who led Monterey Jet Center in California for two decades, died on September 12 shortly after his 54th birthday.

Born Sept. 6, 1963, in Seattle, Young grew up in Redmond, Washington, where he spent a lot of time as a child at Boeing Field. His father, Jim Young, was a partner in the Cessna dealership at the airport.

He became involved in the FBO business as a teenager, joining Galvin Flying Service as a line service technician in 1983. Young spent the next several years working and attending the University of Washington, achieving a BA in business administration.

Clay Lacy hired Young in 1990 to oversee the line and customer service departments at the facility in Van Nuys, California. In 1997, Young was offered the position of general manager of the then startup Monterey Jet Center. There he remained over the next 20 years.

"This kind, gentle man was a thoughtful, caring husband and father, as well as a dear friend," his colleagues at Monterey Jet Center wrote of Young. "Nate was a motivated, dedicated, passionate aviation business leader. Well liked by all is an understatement."

He is survived by his wife, Jennifer, and sons James, Daniel, John and David.

Howard Blair Christenson, one of the few remaining World War II bomber pilots, passed away recently at the age of 96. Originally from Spring Valley, Wisconsin, Christenson flew B-26s in the Sicily, Sardinia and Anzio campaigns and earned the Distinguished Flying Cross.

He flew dozens of missions, one so harrowing that mechanics counted more than 300 bullet holes in the aircraft after he had returned, family members recall.

Following the war, he was a teacher and tree farmer, raising three children with his wife, Edna. He is survived by his wife and children Harlot and Emily and nine grandchildren. He is predeceased by daughter Irene. ■

Awards & Honors

Jet Advisors founder *Kevin O'Leary* was honored with the Aerospace Human Factors Association's Stanley N. Roscoe Award. The association presents the award annually for the best doctoral dissertation in an area related to aerospace human factors. O'Leary wrote his dissertation on factors influencing pilot error.

The National Association of State Aviation Officials (NASAO) honored *Nel Stubbs*, Conklin & de Decker v-p and co-owner, with the association's President's Award. The award recognizes individuals who have made long-standing contributions to NASAO and to state aviation. Stubbs has spent 30 years providing industry expertise on federal and state tax issues, as well as advising on tax planning, cost and financial analysis, budgeting, aircraft ownership, operating structures and tax audits. She has served with Conklin & de Decker since 1999. Stubbs is involved with a number of aviation associations.

The National Aeronautic Association named *Jack Pelton, Phil Woodruff, Stephen Alterman, Ali Bahrami, Maj Gen Charles Bolden* and *Jeff Hamiel* recipients of the 2017 Wesley L. McDonald Distinguished Statesman of Aviation Award. Established in 1954, the award honors "outstanding Americans who, by their efforts over an extended period of years, have made contributions of significant value to aeronautics and have reflected credit upon America and themselves."

Currently Experimental Aircraft Association chairman, Pelton has a long background in manufacturing as former chairman and CEO of Cessna, as well as holding roles with Douglas Aircraft and Dornier Aircraft.

Woodruff is recognized for his contributions as director of education for the FAA, where his efforts led to the creation of aviation education programs in every state.

Alterman has spent 42 years protecting interests of the cargo air carrier industry, joining the then Air Freight Forwarders Association, now Cargo Airline Association, in 1975 and becoming president of the association in 1982.

Bahrami, former v-p for civil aviation for the Aerospace Industries Association, is now FAA associate administrator for aviation safety. Bolden, the 12th person to serve as NASA Administrator, has been a Naval aviator, commanding general and astronaut. Hamiel has served in a number of roles for the Metropolitan Airports Commission in Minnesota over the past 40 years. ■

Jim Ziegler

Rishiraj (Rishi) Singh

Mark Larsen

Mark Steinbeck

Kerry Borrosso-Zakula

Associated Air Center to shut doors at year-end

by Kerry Lynch

Associated Air Center (AAC) is closing at the end of this year, just shy of its 70th anniversary. AAC parent StandardAero announced the plans in September, saying current and future volumes of work aren't sufficient to support the costs necessary to run the facility. StandardAero made "multiple attempts to sell the business" before coming to the decision to shutter it altogether, the company said.

After a "thorough analysis," StandardAero concluded that AAC is no longer an economically viable business for the company and its investors. "The limited pipeline for new business opportunities, excess industry capacity and slowing demand in the VVIP aircraft marketplace have all contributed to this decision." The move, StandardAero added, is in line with near-term growth plans to expand the group's core engine MRO capabilities.

StandardAero plans to help the 170 AAC employees find positions within other business units or provide "a variety of company-funded redeployment and outplacement assistance and services," the company said. Meanwhile, the Dallas-based facility will either be leased or sublet by the end of the year and the assets will be sold or otherwise disposed of before then.

The company says it will continue business as usual as it fulfills existing contract obligations, warranty services and other projects already under way. Employees will be retained as necessary to complete this work over the next few months. The remaining work primarily involves warranty and MRO services, but no full completions projects are under way.

The decision comes as the private airliner market has experienced a lull in recent years, with Airbus Corporate Jets delivering only one aircraft since the beginning of last year and Boeing Business Jets handing over seven aircraft in that same time, according to General Aviation Manufacturers Association data. This compares with the four ACJs and 11 BBJs delivered in 2015 alone. Both Airbus and Boeing, meanwhile, are in the midst of a transition to "Neo" and "Max" variants, respectively, of their traditional lines.

While AAC has historically been a dominant player in the market, the private airliner completion business has become increasingly competitive, with companies such as Lufthansa Technik, GDC, Jet Aviation, Greenpoint, AMAC Aerospace, ST Aerospace, Comlux and Aloft AeroArchitecture all fighting for the limited market. The competition is so great that, in late December, Airbus also revealed plans to exit the execliner completion business this year, refocusing the Airbus Corporate Jet Center in Toulouse from ACJ completions to airliner upgrades.

For AAC, the move marks the end of an era. The company opened a hangar at Dallas Love Field in 1948, originally as a three-man operation to install surplus radio equipment in former military aircraft. Over the years it evolved into more expansive MRO capabilities for large transport aircraft and in 1978 completed its first conversions on two Boeings for the President of Mexico. The first wide-body completion, a Boeing 747SP, followed in 1998.

In addition to being among the pioneers of private airliner completions, the center also played a role in the introduction of EFIS, forward-looking radar, EGPWS, Tcas and satellite communications in large transport aircraft modifications.

The decision to close the business comes two years after investment firm Veritas Capital acquired StandardAero from Dubai Aerospace Enterprise (DAE) for $2.1 billion.

Associated Air Center came under the StandardAero umbrella through a series of acquisitions and mergers involving Piedmont Hawthorne, The Carlyle Group and then DAE beginning in June 2000. These mergers also involved the Garrett Aviation chain, as well as the original StandardAero brands. As each entity merged and was rebranded, the Associated Air Center name was so well established that executives opted to preserve it. ❑

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Paid/requested in county subscriptions	0	0
Paid/requested sales through dealers and carriers, street vendors, counter sales, and other non USPS paid distribution	6,748	6,631
Other classes mailed through the USPS	0	0
Total paid and requested circulation	23,635	23,789
Free distribution by mail: outside county (samples, complimentary and other free)	8,977	8,534
Free in county by mail	0	0
Other classes mailed through USPS	78	70
Free distribution outside the mail	389	327
Total free distribution	9,444	8,931
Total distribution	33,079	32,720
Copies not distributed: office copies	733	675
Total	33,812	33,395
Percent paid/and or requested circulation	71.45%	72.70%
Requested and paid electronic copies	8,015	8,015
Total requested and paid print copies + requested/paid electronic copies	31,649	31,894
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AIN Calendar

See www.ainonline.com for a comprehensive long-range aviation events calendar.

DAVID McINTOSH

EBACE 2017

NOVEMBER

MACAU BUSINESS AVIATION EXHIBITION 2017…November 4, Macau International Airport, Macau. Info: www.eventbank.cn/event/11781/agenda.html.

AVIATION FORUM HAMBURG… November 7-8, Hamburg Messe, Hall A3, Hamburg, Germany. Info: +49 (0) 511 473 147 90; www.aviationforumhamburg.com/.

AEA SOUTH PACIFIC CONNECT CONFERENCE… November 8-9, Shangri-La Hotel, The Marina, Cairns, Australia. Info: debbiem@aea.net; www.aea.net/connect/southpacific/.

▲●◆ **DUBAI AIRSHOW**… November 12-16, Airport Expo, Dubai, UAE. Info: +97 1 4286 7755; www.dubaiairshow.aero.

NATA ADVANCED LINE SERVICE REGIONAL WORKSHOP…November 14-15, Base Operations at Page Field, Fort Myers, FL. Info: safety1st@nata.aero; http://nata.aero/2017-Advanced-Line-Service-Workshops/ALS-Workshop-Ft-Myers-FL.aspx.

FOURTH INTERNATIONAL POWERLINE SYMPOSIUM…November 14-15, Hilton Alexandria Old Town, Alexandria, VA. Info: Communications@eurocopter.ca; www.cvent.com/events/4th-international-powerline-symposium/event-summary-4280a735212045cda36df47fd84cd576.aspx.

ELECTRIC & HYBRID AEROSPACE TECHNOLOGY SYMPOSIUM…November 16-17, Koelnmesse, Cologne, Germany. Info: andrew.boakes@ukimediaevents.com; www.electricandhybridaerospacetechnology.com/index.php.

US CORPORATE AVIATION SUMMIT… November 17, Cozen O'Connor, Washington, D.C. Info: mail@aeropodium.com, www.aeropodium.com/uscas.html.

EUROPEAN CORPORATE AVIATION SUMMIT… November 20, Hill Dickinson LLP, London, England. Info: mail@aeropodium.com; www.aeropodium.com/ecas.html.

AIRCRAFT ECONOMIC LIFE SUMMIT… November 28, Gibson Hotel, Dublin, Ireland. Info: events@everestevents.co.uk; www.everestevents.co.uk/event/aircraft-economic-life-summit-2017/.

FIFTH EASA AD WORKSHOP…November 28, EASA Headquarters, Cologne, Germany. Info: airworthiness.directives@easa.europa.eu; www.easa.europa.eu/newsroom-and-events/events/5th-easa-ad-workshop.

AFBAC CONFERENCE AND EXPO… November 29-December 1, ExecuJet South Africa, Johannesburg, South Africa. Info: info@afbaa.org; http://afbaa.org/conference_expo?destination=/events.

DECEMBER

AIRCRAFT ACQUISITION PLANNING SEMINAR…December 5-6, Scottsdale Plaza Resort, 7200 Scottsdale Rd., Scottsdale, AZ. Info: (800) 832-2025; www.conklindd.com.

EASA 11TH ROTORCRAFT SYMPOSIUM… December 5-6, Cologne Marriott Hotel, Cologne, Germany. Info: rotorcraft@easa.europa.eu; www.easa.europa.eu/newsroom-and-events/events/11th-rotorcraft-symposium.

RUSSIAN BUSINESS AVIATION SUMMIT… December 7, Radisson Blu Hotel, Moscow Sheremetyevo Airport, Moscow, Russia. Info: mail@aeropodium.com; www.aeropodium.com/rba.html.

JANUARY 2018

NBAA REGIONAL FORUM…January 24, Palm Beach International Airport, West Palm Beach, FL. Info: info@nbaa.org; www.nbaa.org/events/forums/2018pbi/.

FEBRUARY 2018

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 Center, Singapore. Info: info@singaporeairshow.com; www.singaporeairshow.com/public/.

▲●◆ **HELI-EXPO**…February 26-March 1, Las Vegas Convention Center, Las Vegas, NV. Info: heliexpo@rotor.org; http://heliexpo.rotor.org/.

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/.

WOMEN IN AVIATION CONFERENCE… March 22-24, Peppermill Reno, Reno, NV. Info: www.wai.org/conference.

NBAA INTERNATIONAL OPERATORS CONFERENCE…March 26-29, Las Vegas, NV. Info: info@nbaa.org; www.nbaa.org/events/ioc/2018/.

AEA INTERNATIONAL CONVENTION & TRADE SHOW…March 26-29, MGM Grand Las Vegas, Las Vegas, Nevada. Info: www.aea.net/convention/2018/.

SINGAPORE AVIATION SEMINAR…March 26-28, Singapore Aviation Academy, Singapore. Info: https://flightsafety.org/event/4th-annual-singapore-aviation-seminar-sass/.

APRIL 2018

▲●◆ **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/.

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

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

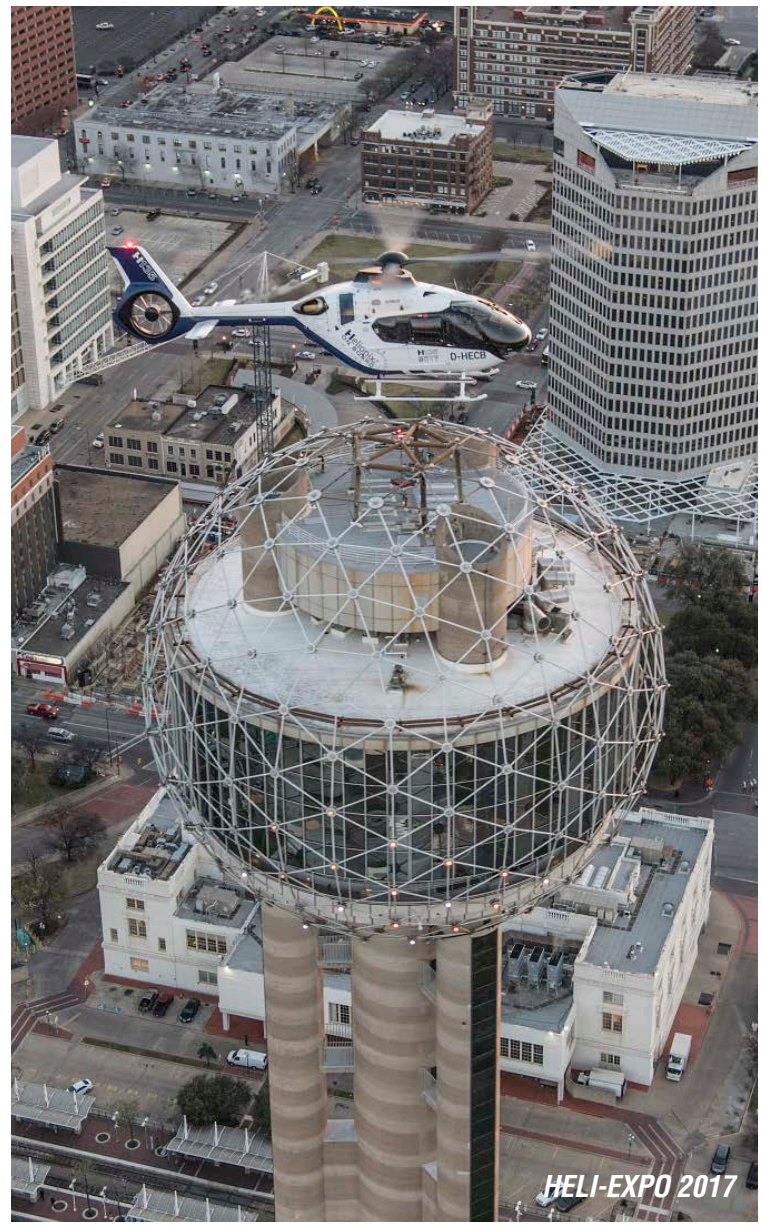
▲●◆ **FARNBOROUGH INTERNATIONAL AIRSHOW…**July 16-22, Show Centre, ETPS Rd, Farnborough, England. Info: +44 (0) 1252 532800, enquiries@farnborough.com; www.farnboroughairshow.com/trade/.

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/.

OCTOBER 2018

▲◆● **NBAA BUSINESS AVIATION CONVENTION & EXHIBITION**…October 16-18, Orange County Convention Center, Orlando, FL. Info: (202) 783-9000; www.nbaa.org.



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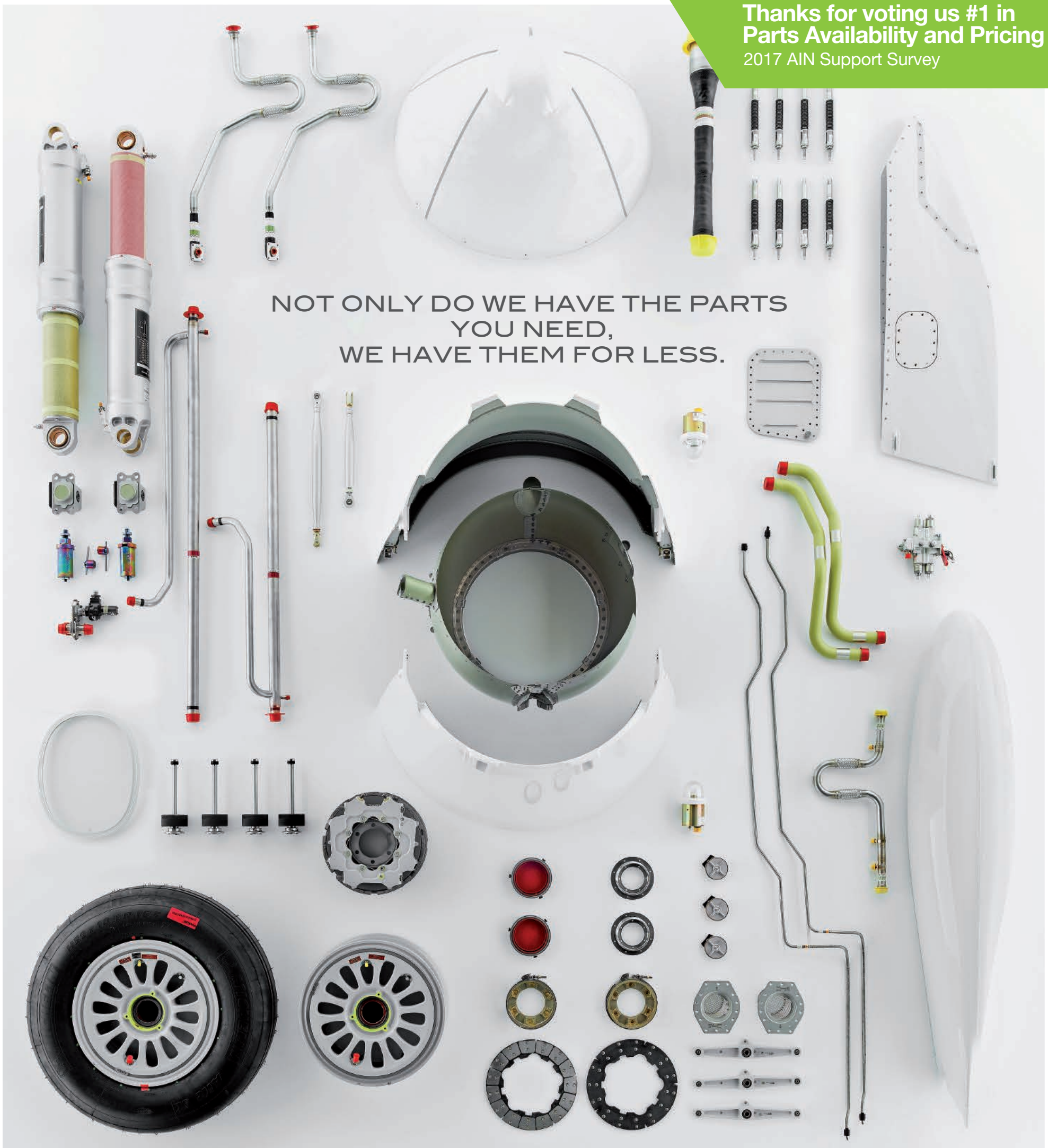

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