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PARIS AIR SHOW INSPIRES UNIQUE AIRBUS FORMATION

For publicity at the Paris Air Show last month, Airbus flew a unique formation showcasing the breadth of aircraft produced by the company's various divisions: the A350XWB airliner, the A400M airlifter, the Eurofighter and the H160 helicopter. See page 48 for some news highlights from the Salon.

Bombardier on lighter wing: no delays for Global 7000

by Kerry Lynch

Bombardier Business Aircraft plans to give the Global 7000 slightly lighter wings, beginning with the fifth flight-test vehicle (FTV), but still expects to receive certification in time for what will become its top-of-the-line business jet to enter service late next year. While not providing any detail about how the wings will shed weight, the company emphasizes that the aerodynamics of the structure will remain unchanged.

Previous issues involving the wing design contributed to the nearly two-year delay in the development program and led to the legal dispute between Bombardier and the wing supplier, Triumph Group, that was recently settled. (*See sidebar on page 34.*)

Triumph disclosed earlier this year that it had filed a lawsuit seeking $340 million from Bombardier, citing costs and delays associated from "Bombardier-directed changes to the original wing requirements." Bombardier had responded the claims were "without merit" and said it would assert its own "major claims against Triumph."

But at the same time, both companies stressed they continued to work collaboratively, and on May 24 a settlement was announced that Triumph said "resets the commercial relationship" between the companies. Triumph said the "comprehensive settlement agreement" resolves all commercial disputes between the two companies related to the Global 7000 wing. The companies did not disclose the terms of that settlement.

"We are pleased with the settlement with Bombardier regarding our Global 7000 program contract, which we believe is mutually beneficial," said Daniel Crowley, Triumph's president and CEO, noting that the accord was a year in the making. "Our aerospace structures business has been dedicated to supporting Bombardier on this critical program since entering into the contract and remains committed to the program's continued success as the aircraft transitions from flight-testing to entry into service."

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Trump jumps into ATC debate as House, Senate begin work

A push to carve the U.S. air traffic control organization out of the FAA remained the single most controversial aviation issue confronting the House and Senate as lawmakers began work on comprehensive FAA reauthorization bills late last month.

On Capitol Hill, most legislators have reaffirmed their previous stances on the issue. Similar to last year, Senate lawmakers were expected to unveil a bill late last month that addresses numerous aviation issues, but omits any independent ATC proposal. Also similar to last year, House lawmakers were expected to offer a reauthorization bill that calls for an independent ATC organization. Also similar to last year, most aviation groups have dug into their positions either for or against it.

But a couple of notable changes have occurred. First, chief advocates in the House at press time were rolling out a reform proposal that attempted to assuage concerns of business and general aviation and rural organizations by exempting Part 91 and 135 from user fees and including access protections.

The second significant change is the White House.

The Obama administration was largely

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Aircraft

Civil supersonics
Driven by a desire to cover more territory in less time, the supersonic segment is experiencing a revival, and business aviation is a prime market. **page 42**

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ATC

Presidential TFRs move north
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BY EMBRAER

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- Bill Midon, Owner, Intervest International Ltd.

Watch Bill's story and request more information at
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As we go to press

A 'LOST DECADE' FOR BIZJET MARKET

Noting that supply has evened out with demand, business aviation market analyst Brian Foley predicts that the market for new business jets will remain flat for the foreseeable future. In his recent forecast, Foley likened the current market to what he referred to as the "Lost Decade," a period between 1986 and 1996 when business jet deliveries stagnated in the region of 350 aircraft each year. "It's going to potentially be even longer," Foley said, adding that, on the upside, deliveries will average between 650 and 750 per year over the next few years, rising to between 775 and 825 after that through 2025.

LAWMAKERS UNVEIL OPPOSING FAA BILLS

House and Senate lawmakers began moving forward late last month on their respective version of comprehensive FAA reauthorization bills. As expected, the six-year House version would separate ATC from the FAA, but the new proposal would exempt Part 91 and 135 from new user fees and include access protections for general aviation. Also as expected, the four-year Senate version calls for reviews and other reforms of NextGen, but does not include the ATC provisions. The general aviation community renewed its opposition to the new House proposal and embraced the Senate bill as a bipartisan effort that takes a "consensus-driven approach." Both bills address myriad other issues, among them certification reform and aviation safety. The Senate bill includes measures to ease access to general aviation airport funding and a provision to look at supersonic regulations; the House bill would expand remote tower pilot projects and protect contract towers, as well as create panels to review possibilities for a Stage 3 phase-out and Part 135 flight and duty-time regulations.

EXECUJET LANSERIA TO HOST AfBAC EXPO

The African Business Aviation Association has selected ExecuJet South Africa's Lanseria facility as the host venue for its dedicated African Business Aviation Conference and Exhibition (AfBAC Expo), to be held November 29 through December 1. AfBAA said Execujet's hangar provides space for 30-plus booths, and its apron can accommodate 20 static-display aircraft.

FAA, UK IN TALKS ON AVIATION POST-BREXIT

The UK's exit from the EU will have "consequences" in the aviation sector that will require the U.S. FAA and UK "to work collaboratively to manage," according to FAA Administrator Michael Huerta. "Upon exit from the EU, the UK will no longer have status under the U.S.-EU Safety Agreement." This is important because, with few exceptions, UK aviation products are currently certified by the EASA, while service providers—including MROs—are approved via EU regulations and EASA procedures. "If the UK does not maintain an associated or working arrangement with the EASA upon exit from the EU, the UK will quickly need to re-establish competencies in specific areas, especially around the certification of new aviation products," Huerta noted. The FAA is engaged in technical discussions with the UK DoT and CAA about specific steps that must be taken.

DAHER SHOWS COMPOSITE WING RIB

Daher showed off its capabilities with new materials last month at the Paris Air Show by exhibiting a thermoplastic composite wing rib that will be used in the company's yet-to-be-revealed future long-range business aircraft. It declined to discuss details of the program, although it did confirm that the new aircraft will not form part of the TBM series of turboprop singles. According to Daher, the new thermoplastic technology could save up to 35 percent in weight compared with a metal wing rib for the same cost.

SKILLS SHORTAGE LOOMS FOR BIZAV

The business aviation industry needs to prepare for a looming skills shortage, according to a study published recently by Korn Ferry Hay Group and conducted on behalf of the European Business Aviation Association (EBAA). "We need to raise awareness among our members and in the wider industry and find ways to attract more talent to the sector," said EBAA CEO Brandon Mitchener. "This includes developing a compelling brand proposition for the sector, concerted talent marketing activities, initiatives to attract more women and a sector-wide information plan." The study concluded that there is little awareness of workforce shortages within business aviation, particularly for pilots and maintenance technicians, and demand for highly skilled aviation professionals is increasing.

BEECHJET FLAMEOUT MARKS FIFTH IN TYPE

A Beechjet 400A operated by Travel Management Company diverted and safely landed at Buffalo Niagara International Airport in New York on June 10 after the left engine flamed out over northwestern Pennsylvania during cruise at FL390. This marks the fifth in-flight engine flameout involving a Beechjet; in three cases, both engines flamed out. TMC Flight 460 departed from Louisville, Ky. and was en route to New Jersey's Teterboro Airport.

Presidential TFRs: attention shifts north

by Kerry Lynch

While President Trump's travel to Mar-A-Lago in Florida has quieted for the season, the business and general aviation community is now wary of the airspace restrictions that are accompanying his recurring travel to Bedminster, N.J. A similar security protocol has been established for those trips and two airports—Solberg-Hunterdon Airport in Readington (N51) and Somerset Airport (SMQ) in Somerville—are caught within the 10-nm inner core, with all operations halted during temporary flight restrictions.

As with the Florida TFR, the New Jersey TFR institutes special procedures for business and general aviation aircraft flying in the 30-nm outer core and covers the airspace from the surface through 17,999 feet msl.

With the TFR airspace just west of the New York City area in North-Central New Jersey, FAA facilities also have to enforce required reroutes around the blocked airspace when the TFR is active, NBAA notes. This affects both standard arrival and departure routes for Teterboro (TEB), Morristown (MMU) and Essex County (CDW), as well as flights to the area from major cities such as Miami, Chicago, Denver, Fort Worth, Minneapolis Los Angeles and Seattle.

The reroutes, in one of the busiest airspace corridors in the world, become more difficult as inclement weather sets in, noted Doug Carr, vice president of regulatory and international affairs for NBAA. The association has been pushing for as much notice as possible and continually urges operators to check TFRs. New York-area operators are bracing for the possibility of encountering a number of TFRs. The first few were already in place by early June.

Half a dozen were implemented above the Palm Beach area over the winter and early spring, shuttering Palm Beach Park Airport (LNA) in Lantana, Fla. and making operations at Palm Beach International Airport (PBI) much more difficult during a busy season. Industry advocates had urged security chiefs to find a possible alternative to complete shuttering of the airports, but to no avail. Carr noted that industry groups were evaluating the experiences with the Mar-A-Lago TFRs to find areas where improvements might be made.

A key is the proliferation of gateway airports for operations into PBI, which is one of the busiest business aviation facilities in the nation, he said. Gateways were limited to Orlando (MCO) and Fort Lauderdale, Fla. (FLL) in the south; and Dulles (IAD) near Washington and TEB and White Plains (HPN) in the north. Operations from the west or east were forced to route through these points as well.

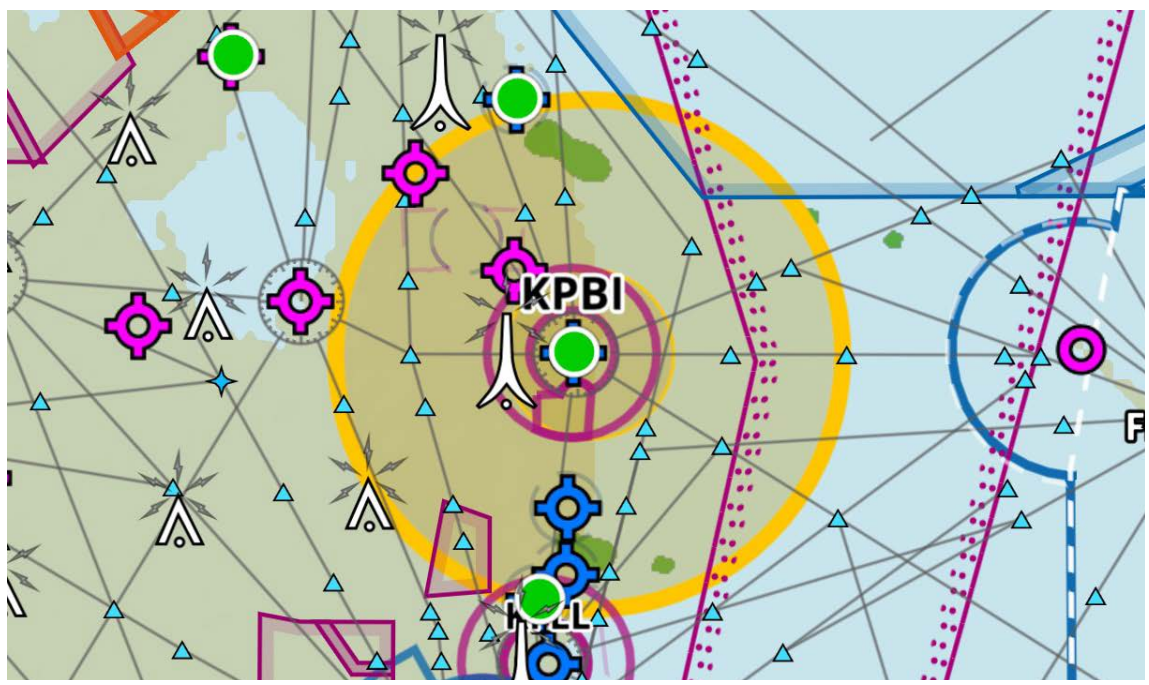
Effect on Local Business

Carr noted that screening hours did increase, which helped. But the TFRs took their toll, he said, noting anecdotes of business dropping by well more than half at some PBI facilities and other anecdotes of owners of based aircraft beginning to look for alternative locations to house their aircraft. The fear, he said, is that business could be lost permanently.

While LNA is a much smaller airport, he noted the wide range of activity, from sightseeing to FBO operations and training, that ground to a halt. Dave Johnson, president of Palm Beach Aircraft Services, outlined some of the ramifications in a letter to the President earlier this year. Along with his company, 27 others at LNA "rely on 24-hour, seven-day-a-week access to operate aircraft, with 400,000 takeoffs and landings a year," he told Trump, adding that the first weekend alone cost businesses $50,000.

Jonathan Miller, president of Stellar Aviation at LNA, reported to the Palm Beach County Department of Airports that the loss from just two operators based at his facility over an initial weekend was $19,000. "We are small businesses," Miller said. "Even these short-term losses have significant impact on us. Far more concerning is the fact that these short-term losses cannot be sustained for subsequent TFRs without leading to the more serious and permanent long-term losses." One flight-training operator, he noted, immediately relocated its five aircraft out of the county. "This is a most dire situation that requires some resolution," he told the airport department.

While these businesses attempt to recover from the winter, attention has shifted to the affected airports in the north, which also must prepare for the ramifications of recurring TFRs. ❑



Trump's use of Mar-a-Lago as the 'Winter White House' prompted a POTUS TFR over West Palm Beach.

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NEWS BRIEFS Compiled by Chad Trautvetter

Analyst Predicts Drop in Values for Non-ADS-B-equipped Aircraft

Owners of business aircraft that are not ADS-B-compliant or in the queue to have equipment installed risk seeing already depressed residual values fall even further in advance of the FAA's Jan. 1, 2020 deadline, said GAMA president and CEO Pete Bunce. "The value of your asset is going to start dropping even before 2020—this is for rotorcraft and fixed-wing—if you haven't already upgraded or don't have a slot to upgrade. If you're in the business aviation category and you hit 2020 [without an upgrade], the price [of your aircraft] is going to just plummet." While the FAA is adamant that the ADS-B deadline will not be pushed back, Bunce said too many operators are holding out hope that the date will slip. "Because of that belief, right now, we are not on pace to get the fleet equipped by the 2020 mandate," he warned.

U.S. Bizav Flying Sees 'Substantial Increase' in May

Business aircraft operations in the U.S., Caribbean and Canada were up 6.5 percent year-over-year in May, according to Argus's Business Aircraft Activity report. Large-cabin jet flying led the pack with a 9.3-percent gain compared with a year ago; the midsize-jet category recorded a 9.2-percent improvement. Turboprop and light jet activity rose 5.3 percent and 3.8 percent, respectively. By operator type, Part 135 activity climbed 13.3 percent from a year ago, while fractional and Part 91 activity saw growth of 6.9 percent and 2.1 percent, respectively.

Honda Aircraft Adds Canada to HondaJet Approvals

Honda Aircraft received Transport Canada validation for the HondaJet on June 1, clearing the way for delivery of Canadian-registered airplanes. Canada's paperwork becomes the fourth approval for the aircraft, which was granted U.S. certification in late 2015 and later validated in Europe and Mexico. Honda Aircraft called the approval key as it ramps up production of the light jet. Skyservice Business Aviation will provide sales, service and support for HondaJets in Canada. The company has facilities in Montreal, Toronto, Calgary and Ottawa.

IS&S Earns STC for PC-12 Autothrottle

Innovative Solutions & Support (IS&S) has received FAA STC approval for its non-Fadec turboprop autothrottle for the Pilatus PC-12. According to the systems integrator, the retrofit allows pilots to automatically control power settings of the PT6 engine to prevent overtorque and over-temperature conditions while providing speed-envelope protection. The autothrottle computes and controls the appropriate power levels and features an automatic takeoff and go-around (TOGA) mode that will bring the engine to max power in a few seconds. Other modes allow the pilot to select the desired torque or airspeed. IS&S plans to pursue further STCs for other PT6-powered aircraft.

TRU's Latitude/Sovereign+ Program Gets FAA Nod

The FAA approved Textron TRU Simulation + Training's Cessna Citation Latitude and Sovereign+ pilot training program, which is now accepting students at the TRU ProFlight Pilot Training Center in Tampa, Fla. The FAA level-D Latitude/Sovereign+ simulator came online at the facility in March. Similarities and common type ratings of the aircraft allow pilots to train for both of the midsize business jets through the same program.

Airbus Helicopters' high-speed concept rotorcraft, dubbed Racer (for rapid and cost-effective rotorcraft), will have a main rotor, two lateral pusher rotors and a joined "box wing" configuration. Racer will cruise at 220 knots, although it will be able to fly at higher speeds.

Airbus hybrid Racer aims for high speed and cost efficiency

by Guillaume Lecompte-Boinet

Airbus Helicopters unveiled a high-speed helicopter concept, codenamed Racer (for rapid and cost-effective rotorcraft), last month at the Paris Air Show. It is being developed as part of the Clean Sky 2 European research program, which will provide €200 million ($224 million) to fund building a Racer demonstrator.

Assembly of the first prototype is scheduled for 2019, followed by first flight in 2020. "We want to offer high speed at the right cost, over a typical range of 400 nm," said Guillaume Faury, Airbus Helicopters' CEO.

The helicopter will have a main rotor, two lateral pusher rotors and a joined "box-wing" configuration. Racer is aimed at markets such as search-and-rescue, passenger transport and possible military applications. The concept resembles the company's self-financed X^3 demonstrator, which flew for the first time in 2010. The X^3 is now in a museum in the south of France.

"Racer will be simpler, with one shaft, so it's easier to maintain," added Jean-Brice Dumont, chief technical officer of Airbus Helicopters. One of the goals is to offer 50 percent more speed than conventional rotorcraft with additional cost limited to 25 percent. So, on average, there will be 20 percent of cost saving per nautical mile, per passenger.

Racer will cruise at 220 knots, although it will be able to fly at higher speeds. Airbus Helicopters declined to elaborate about the maximum speed and the payload. "Racer will carry more payload than the X3, and will be a medium-size machine," said Dumont.

The development of Racer will involve 38 partners (mainly European) from 13 countries. For example, Avio will make the gearbox and GE UK will do the wings. Safran Helicopter Engines will supply the RTM322, which equipped the NH90 and the X3. "This will be an adaptation of the actual RTM322," added a source at Safran Helicopter Engines.

Eco Mode

To reduce fuel consumption and extend range, the engine will be equipped with a new electrically powered "stop and start" system. This "eco mode" concept will allow a pilot to "pause" an engine while in cruise, generating fuel savings of 15 percent and longer range.

"An auxiliary electric smart motor will provide additional power when needed [acceleration, landing or autorotation, etc.]," explained Safran. Box-wing architecture has several advantages: it improves the aerodynamic efficiency, enables better integration of the landing gear, and the pusher rotor will improve safety for passengers.

The Racer will also have a hybrid metallic-composite airframe, though Airbus Helicopters declined to be more specific. It will also be equipped with new high-voltage direct-current electrical generation to save weight.

Airbus Helicopters is pursuing another concept for a heavy helicopter, called X6, which was revealed at the 2015 Paris Air Show, and is designed to replace the Super Puma. Last month the European Commission authorized reimbursable financing of €377 million ($422 million) over eight years for this program.

"We are still in the concept phase with the X6 and this financial help will help it to continue," said Faury. Airbus Helicopters is waiting for a resurgence of the oil-and-gas market before going further, and it's now scheduled to enter service after 2025, rather than around 2020. ❑

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NEWS BRIEFS Compiled by Chad Trautvetter

Simcom Starts TBM 930 Sim Training

Simcom Aviation Training started simulator courses last month for the Daher TBM 930 in a newly approved high-fidelity flight training device (FTD). The aircraft, equipped with a Garmin G3000 touchscreen avionics suite, received EASA and FAA certification last year. Simcom installed the new FTD in its Lee Vista Training Center in Orlando, Fla. Built by Frasca International, the device features an actual G3000 suite in the Daher-supplied cockpit. Pilots can receive initial and recurrent training on touchscreen avionics techniques, including using the weather radar and synthetic-vision terrain-awareness system and traffic-advisory system. The Orlando center also has training devices for the TBM 700 and TBM 850/900 series.

UBS: Bizjet Market Softens

The business jet market shows signs of weakening slightly, according to UBS's latest Business Jet Market Index. The index, which measures market strength by surveying the business aviation and financial industries, dipped 4 percent from the previous survey, coming in just below the break-even level at 49. UBS noted the survey had remained around the break-even measurement of 50 since it bounced late last year. "This move is beginning to resemble the false start that we saw in late 2014/early 2015," the firm said. The market for small-cabin aircraft leads the index at 52, but that is down by 6 percent from last month. The midsize-cabin market measured at 49, while the large-cabin sector was the weakest, at 46.

WingX: Bizav Activity in Europe Climbs

"Following a blip in April, the growth trend in business aviation activity in Europe this year resumed in May, evident mainly in the largest markets of France, Germany and the UK," said WingX Advance managing director Richard Koe. According to the company's latest business aviation monitor, there were 77,068 business aircraft departures in Europe in May, up 3.3 percent from a year ago and the "busiest month so far this year." Year-to-date, activity is up 3.2 percent from last year, WingX said.

Dassault Falcon Jet Trims Workforce

Citing continuing market challenges, Dassault Falcon confirmed plans to reduce its workforce company-wide by 6 percent. The plans follow a previously implemented "adaptation plan" at the completion center in Little Rock, Ark., that involved an early-out program, thinning of contractors and an effort to shift certain manufacturing work from subcontractors back in-house, the company said. "The current business aviation market conditions remain challenging throughout our entire industry," said John Rosanvallon, president and CEO of Dassault Falcon. As a result, he said, the company has made adjustments to the Falcon production schedule, necessitating a reduction in the number of employees. The French manufacturer estimated in March that it would deliver 45 Falcons this year, down from 49 last year and 55 in 2015.

ARSA to Lawmakers: Give FAA Time on Drug and Alcohol Testing Rules

The Aeronautical Repair Station Association (ARSA) is urging lawmakers to give the FAA appropriate time to implement expanded drug and alcohol requirements. In a letter to key House and Senate leaders, ARSA noted that Congress in the past held up foreign repair stations' certification for five years because of delays in security regulations. Congress last July mandated that the FAA extend drug and alcohol testing to certain foreign repair station employees within a year. But that rulemaking had not progressed. ARSA noted that the FAA must use caution in proceeding with such rules.

Under the transition to the Surf Air brand, Rise will replace its fleet of Beechcraft King Air 350s with Pilatus PC-12s.

Surf Air expands with Rise buy

by Chad Trautvetter

Surf Air has acquired Dallas-based Rise, the California-based company's second-largest competitor in the "all you can fly" membership air travel category, the companies announced on June 7. The move will establish Surf Air in both California and Texas, bringing the number of weekly flights to 445 across 17 destinations.

As part of the agreement, Surf Air plans to expand to more markets within the next 18 months: Las Vegas; Bentonville, Ark.; Midland, Texas; New Orleans; Scottsdale, Ariz.; and Taos, N.M. It will also offer weekend service for "certain membership levels" to Cabo San Lucas, Mexico; Aspen, Colo.; and Sun Valley, Idaho. The membership airline will also start Monday-through-Friday service between Texas and California later this year.

Under the transition to the Surf Air brand, Rise—which flies routes between Dallas, Austin, Houston and San Antonio—will phase out its current fleet of Beechcraft King Air 350s and replace it with Pilatus PC-12s, Surf Air's choice of aircraft for U.S. operations (it will fly Phenom 300s in Europe). According to a Surf Air spokeswoman, the combined U.S. fleet will number 12 airplanes.

Surf Air's corporate and operational headquarters will remain in Santa Monica, but it will have a "significant presence" in Dallas, with Rise founder and CEO Nick Kennedy taking the role of president of the Texas and Southeast region for Surf Air, reporting to Surf Air chairman and CEO Sudhin Shahani. All Rise employees will be retained, the companies said.

Since Surf Air and Rise were launched in 2013 and 2014, respectively, they have flown a combined 69,383 flights and carried 203,908 passengers. "Existing members of both providers will see immediate benefits, with expanded access to the existing all-you-can-fly monthly membership model," Surf Air said.

"For nearly five years we have been drastically and fundamentally changing the way frequent business travelers in California fly," said Shahani. "Our current routes from the Los Angeles to San Francisco areas already corner one of the largest short-haul markets in the country. Now, with our acquisition of Rise, we're taking a significant step into expanding this footprint across the Southeastern U.S. through the substantial operation already established by Rise in Texas." ❑

TEXTRON ROLLS OUT FIRST PRODUCTION CITATION LONGITUDE

Textron Aviation rolled out the first production Cessna Citation Longitude early last month from the Plant IV facility at Beech Field in east Wichita. Five of the super-midsize twinjets are now on the production line, which Textron Aviation senior vice president of integrated supply chain Ron Draper said incorporates "a number of new and innovative fabrication and assembly techniques."

According to the company, one of these new technologies is monolithic machining, where major assemblies are milled from a single piece of metal, reducing the number of parts and resulting in more precise tolerances for easier assembly. Textron Aviation also has expanded vertical tooling on the assembly line of the Longitude.

The twinjet is expected to enter service later this year. To date, the four flight-test Longitudes have logged more than 550 hours. A fifth Longitude will join the flight-test program this summer. The first production airplane will also join the company's demonstration fleet this summer.—*C.T.*

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NEWS BRIEFS Compiled by Chad Trautvetter

Piaggio Renews Bizav Focus

Italian aircraft manufacturer Piaggio is refocusing on business aviation, reported CEO Renato Vaghi. "Last year, we restructured as a clearer [more focused] company," he told **AIN**. "We're going through a big transformation." Part of this restructuring includes spinning off its engine business, which makes components and assembles for the PW206 and PW207 under license from Pratt & Whitney Canada. That will leave Piaggio as purely an aircraft company, with the Avanti Evo turboprop twin as its commercial product and in-development Hammerhead UAV on the defense side.

GKN Rebrands VIP Completions Unit

Fokker VIP completions has been rebranded as Fokker Techniek, effective last month. The new entity will remain a division of GKN Aerospace, which purchased all Fokker business units in 2015. Fokker Techniek is being led by long-time GKN executive Jeff Armitage, who is the managing director, and chief commercial officer Shaun Collins. Fokker Techniek represents the segment of the company that has specialized in private airliner completions and will continue to focus on that market. But Collins said the company will keep an open mind for other platforms, larger or smaller. Fokker Techniek corporate and sales offices will be consolidated under one roof in The Netherlands.

Jetex Supporting Edeis French Network

Jetex Flight Support is providing FBO services and ground-handling support for 15 locations in the Edeis Airports network in France. These locations offer global trip planning, fueling and concierge services. In the future, the partnership is expected to expand to other airports managed by Edeis. Per the agreement, Jetex will support Angloulême, Annecy Mont Blanc, Auxerre, Bourges, Châlon, Cherbourg, Dijon Bourgogne, Le Havre, Nimes Camargue Cévennes, Reims, Tarbes Lourdes Pyrénées, Toulouse Francazal, Tours Vale de Loire, Troyes and Vannes Golfe du Morbihan. These 15 locations bring the number of Jetex locations in Europe to 25.

SMO Picks Runway Shortening Option

The Santa Monica city council chose one of two options for shortening Santa Monica Airport's 4,973-foot runway to 3,500 feet, as permitted under a settlement agreement/consent decree with the FAA reached on January 28 this year. The council elected to essentially center the 3,500 feet on the existing runway, with equivalent amounts of unusable runway—about 736 feet—at each end. Shortening the runway is expected to cut business jet traffic by 45 percent, but provides an extra safety margin for overruns at each end of the runway. The city hopes to complete the shortening by year-end, although it is not yet clear whether that will include removing the excess runway material or merely marking off the unusable portion of the shortened runway.

Elvis's Former JetStar Sold

A 1962 Lockheed JetStar, sitting untouched at the aircraft boneyard in Roswell, N.M., since 1982 and once owned by Elvis Presley, was auctioned to the highest bidder in late May. However, the aircraft fetched a lot less than the auctioneers had hoped. Liveauctioneers and GSW Auctions had estimated the airplane's value at $2 million to $3.5 million, but the bidding topped out at $430,000. The name of the buyer and plans for the aircraft were not immediately disclosed. The aircraft would have to have its wings removed if it is to be shipped to a location where it could be renovated. The four engines and many cockpit instruments are missing, but the passenger compartment remains as designed by Presley.

Supreme Court mulling review of Flexjet management fees challenge

by Kerry Lynch

The U.S. Supreme Court late last month was weighing whether to review a case Bombardier filed against the Internal Revenue Service over the taxation of management fees charged by its former Flexjet fractional operation. The case was scheduled for a Supreme Court conference session on June 22 and a decision on the review was anticipated shortly thereafter. Chances of acceptance are small since the Supreme Court rarely takes on tax cases, one industry official noted, but said its acceptance could have wide-ranging implications.

On February 19 Bombardier asked the Supreme Court to overturn earlier court determinations that the IRS has properly taxed fractional operation management fees as commercial air transportation activities. Bombardier contends, and has received support in the form of amicus briefs from industry associations and other fractional operators, that the IRS has been inconsistent in its approach to management fee taxation and has put Flexjet at a competitive disadvantage with other fractional operators that have had different tax treatment.

Government Claims

The U.S. Solicitor General filed its response to the Bombardier filing on June 6, asking the court to reject Bombardier's appeal. In the document the government reiterated its belief that the previous courts had properly sided with the IRS. The filing noted that court found in favor of the IRS interpretation of "command, control and possession" of aircraft in determining that the fees constitute commercial activity.

The government further dismissed the arguments of inconsistent and unclear guidance, saying a 2004 memorandum clearly outlined the IRS intent. As for disparate treatment, the Solicitor General's filing notes that the IRS applied the same approach to both Flexjet and its competitor NetJets administratively. It was a U.S. District Court ruling—that was not appealed—that resulted in the differing treatment.

Further, the government noted that in another case, involving IBM, the courts have found that the IRS must be consistent toward the same entity and rejected arguments that "the outcome in petitioner's case run[s] afoul of any 'unfair competitive disadvantage principle.'" The government said the courts were "not faced with dueling IRS rulings issued to competitors at the same time based on identical facts."

Bombardier Claims

But in response, Bombardier argued that the government's brief in opposition "does not explain or justify the errors" of the earlier courts' findings; it only repeats the reasoning.

"There is an express, acknowledged circuit conflict concerning the test for determining whether a payment is subject to the 'ticket tax,'" Bombardier said. "That circuit conflict, however, is a symptom of a larger problem: persistent, widespread confusion about the application of…. fees charged by aircraft-management companies like petitioner."

That confusion, Bombardier added, stems from the IRS's failure to issue clear, uniform guidance. "Worse, the IRS has affirmatively taken inconsistent positions at different times and with respect to different companies," the company said. By upholding the IRS assessments, the courts "eviscerate…the IRS's duties to provide deputy tax collectors clear notice of their collection obligations and to treat like taxpayers alike."

Bombardier added that "correcting those errors" of the earlier court determinations "is vital not only for the aviation industry—as the multiple amicus briefs filed by industry participants attest—but also for the wide range of entities charged with collecting various taxes on the IRS's behalf, including excise, sales and employment taxes." ❑

AIN's BUSINESS JET TRAVELER TAKES HOME TWO AWARDS

AIN Publications' *Business Jet Traveler* magazine won a pair of awards at the annual Aerospace Media Dinner before the opening of the Paris Air Show last month. Held at the Aero Club de France in Paris, the dinner brings together media professionals to celebrate "excellence in aerospace journalism and publishing." Mark Huber, familiar to readers of this magazine for his coverage of rotorcraft, took top spot in the Gulfstream-sponsored "Best Business Aviation" category for his *BJT* article "New Aircraft Preview-Aerion AS2." *BJT* itself won the Bell Helicopter-sponsored "Best International Publication" award.

Of 10 categories overall, **AIN** writers and editors were on the short list for five awards: Best Aviation Image (David McIntosh); Best Safety, Training and Simulator submission (Matt Thurber and Curt Epstein); and Best Business Aviation submission (Curt Epstein).

Business & Commercial Aviation editor-in-chief William Garvey received the event's Lifetime Achievement award. *—M.P.*

MARK WAGNER

Editor-in-chief Matt Thurber, left, and* AIN *Publications group publisher David Leach celebrate the awards* Business Jet Traveler*, sister publication of* AIN*, won last month at the Aerospace Media Dinner.

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NEWS BRIEFS Compiled by Chad Trautvetter

HondaJet Fractional Announced

Honda Aircraft has received multiple aircraft orders for a new hybrid fractional-share program called FlyHonda, which allows share owners either to fly their jet or travel as passengers. Based in the Isle of Man, FlyHonda joins two other HondaJet operators in Europe. The first, Privateways, is a jet charter company in Germany that launched in April. European Aero Training Institute Strasbourg, based in France, is set to launch charter services under an air operator certificate this summer.

TrueNorth Adds Voice to Datalink Unit

TrueNorth has expanded its communications products with release of the DLU-vox datalink and voice Iridium satellite communications system, which combines datalink and flight-deck safety services voice capabilities in a single box. The DLU-vox will comply with current and foreseeable TSO specifications, according to TrueNorth, which is a division of Satcom Direct. It also has the same dimensions as TrueNorth's TSO'd datalink unit (DLU), which is the only system currently TSO'd by the FAA, Transport Canada and EASA for Fans over Iridium datalink communications. The DLU-vox can be used for datalink communications via Acars, ADS-C (contract) and controller-pilot datalink communications, and it is compatible with a variety of multipurpose control and display units and FMSs. The DLU-vox supports simultaneous voice and data transmissions through a dual-element Iridium antenna.

Airbus Rolls Out 700th H130

Airbus Corporate Helicopters has rolled out the 700th H130 light single for delivery to an undisclosed private customer. Since it entered service as the EC130 in 2001, the model has accumulated 1.8 million flight hours with 340 operators worldwide, becoming a mainstay of the helitour business and finding popularity for medevac work. The H130 features a wide cabin, expansive windows and a fenestron ducted tail rotor. Effective this year, all H130s are offered with a glass cockpit.

FlairJet To Manage Surf Air Phenom 300

UK-based aircraft management company FlairJet has inked an agreement to manage and operate Surf Air Europe's first Embraer Phenom 300. "I am excited to forge this partnership with FlairJet, given that our business objectives to further expand European operations on both fronts align significantly," said Surf Air Europe CEO Simon Talling-Smith. "This is an important move as we work to expand our footprint globally and bring our successful [all-you-can-fly membership charter] product from the U.S. to new members in the growing intra-European business travel market." Since launching in 2009, FlairJet has accepted 13 Embraer Phenoms and paved the way for commercial operations with the Phenom 100 and 300 in Europe.

LCY To Add Remote ATC Tower

London City Airport is installing the first remote digital air traffic control tower in the UK. To be operational in 2019, the newly constructed tower will use 360-degee high-definition cameras and sensors to provide a live feed with a panoramic view of the airfield to a new NATS control room in Swanwick, Hampshire. NATS, the UK air traffic control services provider, is working closely with London City Airport on the plans for the new tower, which will be developed by Saab Digital Air Traffic Solutions. Construction will begin later this year and is slated to be completed next year. The tower will be tested for more than a year. Images and data will be sent to the new operations room at the Swanwick NATS control center, where controllers will provide the usual ATC services.

Bombardier celebrated a significant delivery on June 2: the 3,000th Learjet is also the 100th 75.

Bombardier hands over 100th Model 75, 3,000th Learjet since the original 23

by Kerry Lynch

Bombardier's ceremonial handover of a Learjet 75 to Leggett & Platt early last month marked two major milestones: the 3,000th Learjet manufactured and the 100th Learjet 75 delivery. The milestone comes five decades after Bill Lear helped pioneer the business aviation industry with the introduction of the Lear Jet 23, which lays claim to being the first purpose-built business jet to enter production. The nascent Lear Jet company, which had established a home in Wichita, handed over the first Model 23 to Chemical and Industrial Corp of Cincinnati, Ohio, in 1964, about a year after first flight, according to the U.S. Centennial of Flight Commission. Originally known as Lear Jet (two words), the company built about 100 copies of the $540,000 Model 23 before moving to the 24 in 1966, followed by a succession of larger models. Along the way, its corporate brand changed to one word, Learjet.

Bombardier bought the storied manufacturer in 1990 and in 1997 introduced the Learjet 75 predecessor, the Learjet 45. The 75, offering Mach 0.81 and 2,000-nm range, introduced a number of enhancements over its predecessor, among them new canted winglets and other aerodynamic improvements; and the Garmin G5000 touchscreen-controlled avionics suite, the first application of this system in a Part 25 jet. The first Learjet 75 was delivered in late 2013.

Leggett & Platt, the recipient of the 100th Learjet 75, is a repeat customer for Bombardier; this 75 is its second. Founded in 1883, the company is also a pioneer, but in sleep technology. Leggett & Platt introduced its first bedspring nearly 125 years ago and now manufactures products found in homes, automobiles and offices. It operates 130 facilities in 19 countries.

"The Learjet 75 offers an indispensable productivity tool to help us keep pace with the complexity and cadence of our operations," said Jeffrey Presslor, director of aviation for Leggett & Platt, of the company's new airplane. Along with Presslor, other Leggett & Platt executives, Bombardier officials, Kansas Governor Sam Brownback, Rep. Ron Estes (R-Kan.) and local Wichita and Sedgwick county officials were on hand for the celebration.

"This is an impressive milestone that required the contributions of generations of Learjet workers and reflects the resilience of a location that not only manufactures Learjets, but also performs flight-testing for new aircraft as well as aftermarket services for aircraft," Brownback said. "Today is an exciting day in Bombardier Learjet history," added David Coleal, president of Bombardier Business Aircraft. ❑

ONE AVIATION TO SWITCH TO WILLIAMS ENGINE FOR CANADA

One Aviation has selected the Williams FJ33-5A-12 turbofan for the EA700 "Project Canada," marking a departure from the Pratt & Whitney Canada PW600 series that powers the Canada's predecessors, the Eclipse EA500 and EA550. The VLJ manufacturer announced the engine for the Canada during the Eclipse Jet Owners and Pilots Association (EJOPA) Annual Convention last month.

Unveiled last year, the aircraft will succeed the EA550 and offer a longer wing with two-foot extensions on each side; more cabin volume, with a 14-inch stretch to the fuselage; and Garmin G3000 avionics.

The FJ33, which can produce up to 1,900 pounds of takeoff thrust, will be de-rated to just under 1,200 pounds and provide at least 1,470 nm range at max cruise speed with NBAA reserves (100-nm alternate). The original FJ33 was certified in 2004. The -5A, which also powers the Cirrus SF50 Vision Jet, was certified last year.

"I look forward to working with Williams and to all the possibilities the FJ33 brings to the Canada project," said Alan Klapmeier, CEO of One Aviation. "The additional power and efficiency of the Williams engines will once again change our customers' view of personal jet performance."

Selection of the Williams engine is a shift from the PW615, which One earlier considered for the Canada, and it comes as the aircraft manufacturer eyes ceasing production of the EA550, possibly as early as this year. —*K.L.*

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A message from AIN's new editor-in-chief

In 1986, a gentleman named Jim Holahan took a chance on a young pilot and A&P mechanic who was seeking a job at an improbably named magazine called *Aviation Convention News*. My interview with Jim took place at the restaurant at Lincoln Park Airport in northern New Jersey.

At the time I was working as an associate editor at *Flying* magazine. As much fun as that was, the commute into New York City was a killer. Then I got married and work logistics banished us to the verdant valleys of New Jersey, so I cold-called Jim one day, and he invited me to the airport for a meal.

I had first come across ACN when a transient pilot left a copy on the magazine pile in the flight school that my father owned in Plymouth, Mass. I was blown away by the quality of the writing and the depth of the news. I'd never seen anything like this in aviation. Most other magazines were aimed squarely at private pilots and, with the exception of *Aviation Consumer* (with which Jim had some early involvement), avoided saying anything accurate and factual that might offend an advertiser. The ACN name eventually was changed to the more suitable *Aviation International News*, and the rest is history. Or is it?

L to r: Editor-in-chief Matt Thurber with former editors Charles Alcock and R. Randall Padfield.

MICHELE HUBERT

I am now on my third round with **AIN**, having left twice before to pursue other interests: back into the field as a mechanic working with a team of talented technicians tasked with keeping 60 flying club airplanes safe and reliable; and later to take on editorship of another magazine. Then there was an opening at **AIN** and I chose to return. More recently, Charles Alcock, the third editor-in-chief in **AIN**'s history—after Jim Holahan and Randy Padfield—decided to follow his heart and move back to his home city, London, and a new job as director of communications for rotorcraft safety organization HeliOffshore.

As **AIN**'s new editor-in-chief, I and the rest of the **AIN** team aim to continue delivering high-quality editorial content to a diverse group of readers as well as providing a compelling platform for advertisers that need to reach out to the members of the **AIN** community.

To that end, my mission is **AIN**'s mission: "To provide timely, accurate and balanced aviation and aerospace news, analysis and data around the world." Whether it is the monthly edition of *Aviation International News*, our daily airshow issues, the family of e-newsletters that includes **AIN**alerts, Defense Perspective and Air Transport Perspective, **AIN**tv videos and **AIN**'s growing online presence, I and the entire **AIN** team are here to tell your story. We welcome your feedback and your news tips and look forward to a long and fruitful relationship. —*M.T.*

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Bills to ease GA airport funding

by Kerry Lynch

House and Senate lawmakers introduced companion bills last month designed to free up funding for general aviation and small airports and ease the process for improvement projects at those airports.

Introduced by Sens. James Inhofe (R-Oklahoma) and Tammy Duckworth (D-Illinois) in the Senate and Reps. Sam Graves (R-Missouri) and Cheri Bustos (R-Illinois) in the House, the bills would reform "non-primary" airport entitlement funding to ensure GA facilities have the time to obtain the necessary FAA funding and have access to discretionary funding.

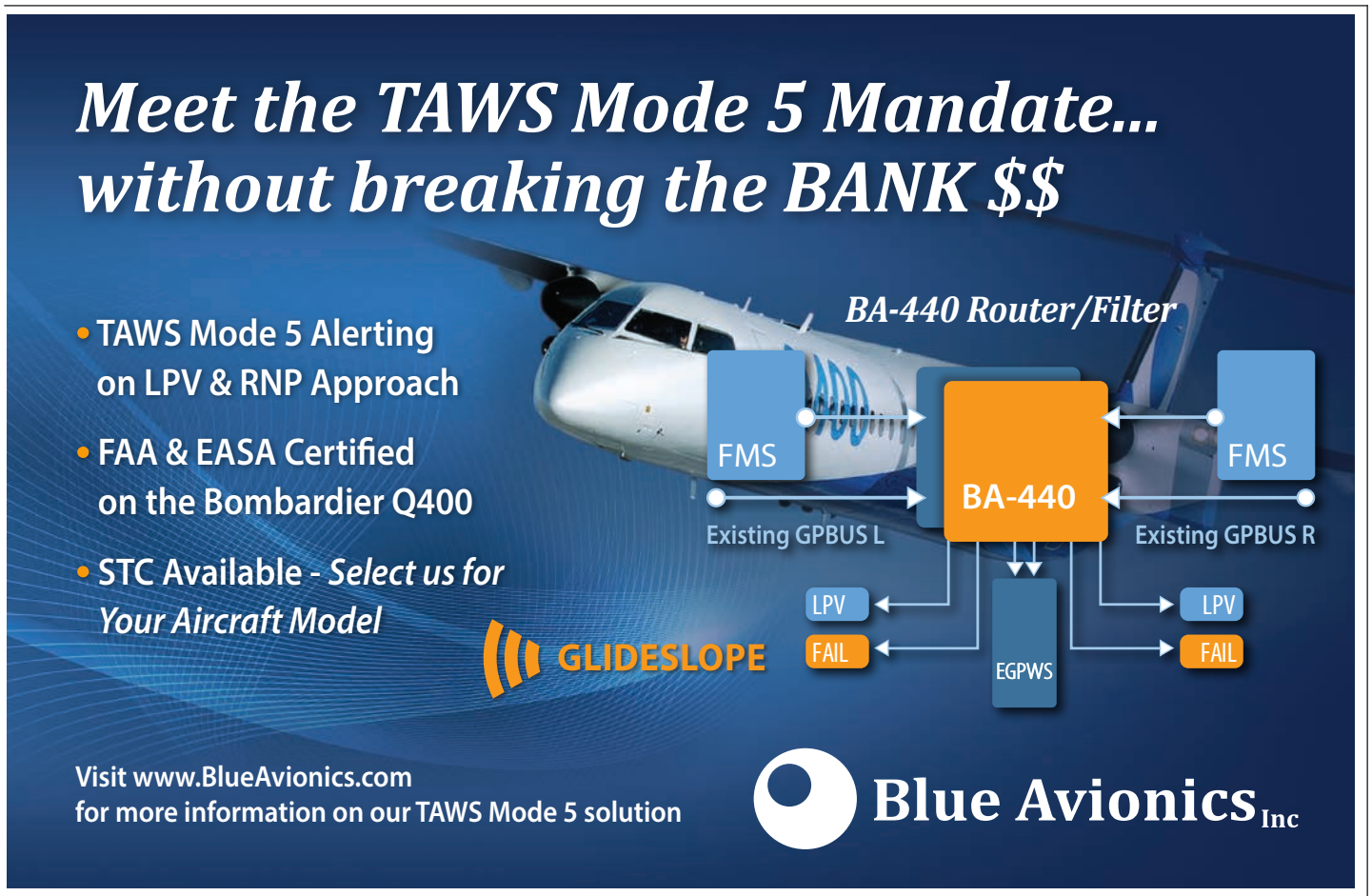
The bills further would expedite the environmental review process in certain cases, establish a public-private partnership to enable general aviation airports to attract private investment and designate certain airports as "disaster relief airports" to enable access to emergency planning and other funding. Finally, the companion bills would clarify definitions to ensure that construction of recreational aircraft is considered aeronautical activity at airports.

"Oklahoma is home to 96 GA airports, which will need $303 million in critical infrastructure updates over the next five years," Inhofe said in introducing S.1320, the Forward Looking Investment in General Aviation, Hangars and Tarmacs (Flight) Act of 2017. "As a pilot myself, I know firsthand the needs of the GA community, and the Flight Act makes a number of needed reforms to facilitate GA airport infrastructure investment."

"Our facilities need to be modernized to continue providing reliable service to [small and rural] communities," added Graves in introducing the companion H.R.2879. "The Flight Act will give GA airports investment flexibility by opening up existing funding sources, presenting a much needed commonsense solution to the problems facing our nation's small airports."

The bills were introduced as House and Senate lawmakers begin to assemble comprehensive FAA reauthorization legislation, providing a possible vehicle for consideration if they do not move forward as independent bills. A cross-section of general and business aviation, airports, states and other organizations strongly backed the bills. Nearly 30 of those organizations wrote to the lawmakers endorsing the legislation, saying the measures would provide "long overdue flexibility, within existing budget parameters."

The organizations noted that for a number of reasons, non-primary airports have not been able to fully use their federal airport grants on upgrade and infrastructure projects. "The Flight Act addresses these concerns in a fiscally sound manner," they said. ❑



FOURTH FLIGHT-TEST G600 TAKES TO THE AIR

Gulfstream Aerospace's fourth flight-test G600 completed its maiden flight on June 21, just six weeks after the third aircraft joined the flight-test fleet. The G600, registered as N740GD, departed Savannah-Hilton Head International Airport at 6:50 p.m. on a 1 hour 18 minute flight, during which it climbed to 51,000 feet and reached Mach 0.925.

"To have four first flights and fly more than 570 hours in less than six months is a remarkable achievement," said Dan Nale, Gulfstream's senior vice president of programs, engineering and test. "The rapid maturity of this program is due to the work we did before the flying even started—the strategic planning, the research, the lab development—combined with the success we've had in the similar G500 program."

Meanwhile, the fifth G600 test aircraft was recently delivered to the Savannah Completions center, where it will be outfitted with a production interior. It will be used to validate interior elements.

According to Gulfstream, the G600 is "on schedule" for FAA certification next year, with customer deliveries slated for later that year. Its G500 sibling is expected to receive FAA certification and enter service by the end of this year —*C.T.*

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TORQUED | Full-throttle opinion from former NTSB member John Goglia

Professionalism and videotape

Like many of you, I've been shaking my head at the recent viral videos of passenger encounters with airline and airport personnel. Starting with the violent removal of a doctor from a United flight, videos have emerged—and gone viral—of an American Airlines crew encounter with a tearful mother with infants, and a Delta flight attendant threatening a passenger with jail because he wanted to use a seat he had paid for to transport his infant in an approved child seat.

But even before this recent spate of airline-contempt-for-passenger videos, there were other memorable videos for those of us who make our livelihoods in aviation. A number of videos have been posted on YouTube over the years of baggage handlers tossing and kicking passenger bags. Many maintenance workers on the ramp are clearly visible from aircraft cabins and the terminals themselves. Just the other day at a major mid-Atlantic airport, there were far too many examples of unprofessional conduct by maintenance workers to list here. Among them, I noted a maintenance worker shaking a ladder with a worker on it—hard enough that the worker dropped his tool. Judging from the animated response from the worker on the ladder, which I could see but not hear, the worker was not pleased.

Act as if You Have an Audience

My point here is how important it is in this age of ubiquitous video recording to be professional and demonstrate integrity. It used to be taught to all aspiring aviation workers—from the cockpit to the hangar to the ticket counter—that it is always important to do the right thing even when no one is looking. For years, I have taught this mantra to my aviation safety classes and in appearances before aviation groups.

But I've always known—as you all know—that it's an easy thing to say but difficult to do with the constant pressure of moving aircraft. Cutting corners can quickly become the norm. Threatening passengers to the point that every incident becomes a security threat, with calls to airport police for enforcement, has become the far too frequent response to passengers who are the least bit assertive.

If we needed reminding, the recent rash of viral videos has done just that. Certainly those in the industry who are the face of aviation to customers should know that passengers are watching them. And that at the first sign of a problem, they're whipping out their phones and taping. (That's the new norm, I guess.)

But those who work out of view of passengers are also under constant surveillance by cameras of all kinds in almost all places. Certainly the airports themselves, large and small, are under video surveillance. Hangars and baggage areas are as well. And while few cockpits have cameras now, many—corporate jets among them—have voice recorders, with cameras likely in the future. The NTSB has been pushing for cameras in airliners for years, and I myself have recommended cameras in corporate aircraft to help ensure that safety procedures are routinely followed.

The question now becomes doing the right thing when you're pretty sure at least someone or something is watching… and recording. So what should aviation workers do, knowing both that they're judged by their employers on how quickly and efficiently they move aircraft and knowing that sometimes speed and efficiency don't either jibe with the regulations or provide the best customer experience?

For one, employees should follow procedures. But not so mechanically that when a difficult situation presents itself—especially one involving an unusual circumstance—they don't stop and seek further guidance. The just-get-it-done mentality needs to slow down when there are changes in normal circumstances. This applies to every aspect of the operation.

And if, in the wake of all this bad publicity over viral videos, managers and supervisors don't do this on their own, I would recommend that unions and other employee groups address this concern to management so that individual employees, under the pressure of a quick turn-around, aren't stuck making these decisions at the risk of their and the company's reputation.

Employees should have clear instructions on how to address unusual circumstances and guidelines on how to elevate concerns to supervisors and company management quickly when a situation they're uncomfortable with begins to develop. Yes, this might mean slowing down sometimes. But clearly a little time up front can save lots of time and money down the road. I bet the CEO at United would agree. ❑

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U.S. trade body votes to continue investigation into C Series dumping

by Gregory Polek

The U.S. International Trade Commission on June 9 voted to affirm there is "reasonable indication" that imports from Canada's Bombardier threaten material injury to U.S. industry, thereby clearing the U.S. Department of Commerce to continue its anti-dumping and countervailing duty investigations on imports from Canada. *(See* **AIN**, *June, page 38.)*

The case involves the sale to Delta Air Lines of 75 C Series jets, delivery of which Bombardier expects to start next spring. In an April 27 complaint to the ITC, Boeing charged that Bombardier sold each airplane for $13.8 million less than they cost to manufacture.

Bombardier has disputed the figures cited by Boeing, calling the allegations "absurd." In a written statement, Bombardier said "Boeing's number is materially wrong; it is off by millions. We are confident that the government investments and our commercial activities comply with the laws and regulations in the jurisdictions where we do business."

The Canadian airframer argues that the C Series does not compete directly with the Boeing 737 Max 7, the single-aisle airplane that the U.S. manufacturer claims has suffered material harm from Bombardier's sale of its product for well below cost and illegal subsidies from the government of Canada. It also notes that Boeing executives have acknowledged it does not make an airplane that Delta Air Lines sought, and that it instead attempted to sell used Embraer E190s it carried in its inventory from trade-ins.

Meanwhile, the case has created a rift between the governments of Canada and the U.S., prompting Canadian officials to reconsider their procurement plans involving 18 Boeing F/A-18 Super Hornets.

"Boeing's petition is clearly aimed at blocking Bombardier's new aircraft, the C Series, from entering the U.S. market," said Canadian minister of foreign affairs Chrystia Freeland. "Boeing admits it does not compete with exports of the CS100, so it is all the more difficult to see these allegations as legitimate, particularly with the dominance of the Boeing 737 in the U.S. market. Furthermore, many of the C Series suppliers are based in the United States…the C Series [is] directly supporting high-paying jobs in many U.S. states." ❑

Delta Air Lines holds a firm order for 75 Bombardier CS100s.

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COMPLETIONS & REFURBISHMENTS

by James Wynbrandt

New cabins, refurbishment options and products to make interiors ever more comfortable and capable are keeping the completions and refurbishment sector forward focused, regardless of lower demand for green execliner completions at the top of the food chain. With the performance of coming business jets rising, cabins are keeping pace. From the top of the airstairs rearward to the back of the aft lav, here are developments, projects and trends shaping the interiors of business aircraft. Cabin connectivity, Wi-Fi and IFE are key parts of many cabin completion and refurbishment projects, and a subject in their own right. See next month's Cabin Connectivity and Electronics special report for further coverage.

MARK WAGNER

Cessna Citation Hemisphere

Embraer Lineage 1000E

CABIN DEBUTS

Textron Aviation has gone large with the debut of the cabin mockup of the Hemisphere, Gulfstream unveiled the finalized G500 interior, and Bombardier overhauled the Global 5000/6000 with the introduction of Premier interiors. Today, "The key with customers is flexibility," said Tray Crow, Gulfstream's interior design director, talking about the G500, but that watchword is echoed by execs and expressed in the cabins of all new business jets: flexibility in the choice of interior outfittings and options, and in the interior itself, with seats fully berthable, or credenzas that transform into a couch. Technology is available at the touch of a finger but typically remains out of sight. Side ledges and extra-wide armrests hide storage compartments replete with charging ports. It's an integral part of the globe-girdling performance of next-gen jets in which these interiors are cocooned.

Cessna Citation Hemisphere

The Citation Hemisphere, slated to enter service in 2020, will be Cessna's first large-cabin jet, and the company unveiled the expansive, three-zone interior at the NBAA Convention last year in a full-scale cabin mockup. The design and outfitting benefit from the input of an advisory board of 20 large-cabin jet operators (95 percent non-Textron Aviation customers), bringing "a significant focus on what the passenger and customer experience needs to be," said Kriya Shortt, former senior vice president, sales and marketing (now senior vice president, customer service).

Twenty large windows and skylights in the forward cabin and aft lavatory provide ample natural lighting. The cabin is an inch shy of eight feet wide (the same as Gulfstream's forthcoming G500), 6 feet 2 inches tall and 43 feet long, and its three zones are flanked by a forward galley, fore and aft lavatories, and in-flight accessible baggage compartment. Among the galley options are an oven and wine chiller, reflecting an expressed preference among 75 percent of prospects for having a cabin attendant aboard, said Christi Tannahill, senior v-p, turboprop aircraft and interior design at Textron Aviation, Cessna's parent company.

Zone one in the mockup has four seats in club configuration and a stone-surfaced workstation. In zone two, a dining/worktable separates two pairs of facing seats across from a fold-up couch that converts into a long credenza, the latter illustrating the company's recognition that "flexibility is a critical element," said Shortt. The more relaxed zone three provides a three-seat couch opposite two large club seats. Contrasting light and dark motifs create subtle defined spaces for each zone.

The 30-inch-wide fully berthable seats embody thermoelectric technology for more precise heating and cooling comfort. Designed and made by Textron in house, they can fold out to create a 70-inch bed. The four-inch-wide armrests allow space for storage, and concealed USB ports and seat controls. A shower for the aft lavatory is optional. Seats, cabinetry and interior furnishings will be designed and made in house.

Gulfstream G500

Underscoring the accelerated pace of the development program, Gulfstream Aerospace showcased the redesigned cabin of the G500 at NBAA last year not in a cabin mockup, but installed aboard the fourth test aircraft to join the certification program. Gulfstream "will be making tweaks in the cabin based on interior flight-tests," said Crow, helping to ensure smooth entry into service later this year. The redesign reflects feedback received on the proposed G600 cabin, introduced a year ago, along with continuing input from the customer advisory board.

At 7 feet 11 inches wide and 6 feet 4 inches high, the cabin of both models is designed to provide ample elbow and shoulder room for seated passengers and headroom as passengers move about the cabin. Fourteen large panoramic windows provide natural light. The full-size galley can be installed either fore or aft and outfitted with refrigerator, beverage maker and optional steam oven. De rigueur customizable F/List wood and stone flooring options are available for the entry, galley, and fore and aft lavatories.

The 27-inch-wide seats have an articulating footrest, with diamond quilted custom stitching and contrasting threads on the edges suggesting "a classic sports car," said Crow, while the pinstriped wool divan is "classically inspired, also built for comfort."

Gulfstream G500

The design aims to "drive the discussion with customers to elicit their feedback on where they are aesthetically" as designers work with them on creating a cabin that perfectly reflects their tastes and needs. The demonstrator has lower sidewalls finished in a burled veneer, but could be finished in leather or painted for a more contemporary look.

Choices include handmade carpets of silk or cashmere, hand-stitched leather dyed to any color found in nature, and wood veneers sourced from around the world. Gulfstream design teams will assist throughout the new cabin design process. Gulfstream acousticians engineered the interior to be quiet enough for passengers to converse in normal tones in flight.

Bombardier Global 5000/6000

With anticipation growing for the Global 7000's scheduled service entry next year, Bombardier Aerospace has kept the Global 5000 and 6000 in focus, introducing the Premier cabin for the in-production jets. The "strong family resemblance between this aircraft and the Global 7000 is deliberate," Tim Fagan, the OEM's manager for aerospace industrial design, said at the cabin's first showing, aboard the company's Global 6000 demonstrator at EBACE in May. "We've developed our knowledge so much on the 7000," he said, and "when we figure out something about comfort, we want it on all of our products."

Bombardier also wants to emphasize "a common look and feel across the Globals," Fagan said. The next-generation seats, developed and built in house, exemplify the improvements, with enhanced ergonomic features such as higher armrests, a sculpted backrest, and resculpted cushion upholstery that improve lumbar support, all combined with elements such as hand-stitched finishing and sleek side ledges. "In business aviation 20 or 30 years ago, people were deciding what aircraft to buy based on how far it flew, how fast it flew, how big the cabin was," said Brad Nolen, v-p of marketing. "But we're getting to the point where the customers

Continues on next page

COMPLETIONS & REFURBISHMENTS


Bombardier Global 5000/6000

are looking at the finer elements of the aircraft: smooth ride, noise levels and fit and finish. That's how people are deciding today between buying aircraft A or aircraft B."

The Premier Interiors furnishings, like the Global 7000's, are functional, with touches like recessed cup holders and discreet cabin-comfort controls on the divan. "We want these pieces to look like a piece of furniture that was purchased and brought into the home," Fagan said.

Non-slip hardwood or natural stone tile flooring are now options in the entrance, galley and lavatories. The galley has been streamlined and modernized, and cabinetry lines straightened, boosting storage volume slightly in the process.

Bell 525 Relentless

Bell Helicopter and Italian interiors specialist Mecaer Aviation Group have teamed on the Grandeur luxury interior for the super-medium 525 Relentless. The interior shown in the full-scale cabin mockup unveiled at the Farnborough International Airshow last year had a forward-facing executive arrangement with large individual seats in creme upholstery. But multiple seating and configuration options like a wrap-around divan are "taking luxury helicopter transport to a new level," said Patrick Moulay, Bell's executive v-p of global sales and marketing.

Underneath the exquisite furnishings and finishings, the cabin incorporates advanced ergonomic design and noise mitigation in what Armando Sassoli, co-general manager of the Italian company, calls "the perfect blend of style and technology."

An in-flight entertainment enhanced lounge (I-Feel) incorporates Wi-Fi, moving maps, ambient light controls and audio/video functions, all controllable via smart device. Large cabinets provide storage space and house retractable monitors. Electrochromic controls change cabin windows from clear to full tint, while a speech interference level enhanced noise system (Silens) with limousine-style privacy window quiets the cabin, allowing passengers to converse without using headsets.

Bell 505 Jet Ranger X

Mecaer also introduced an interior for the Bell 505 Jet Ranger X light single, incorporating leather-wrapped flight control boots; new interior panels, headliner and overhead passenger service unit; adjustable interior mood and reading lighting; and utilitarian touches such as coat hooks, cup holders, stowage pockets and smart device holders. Company or personal logos can be stitched into headrests or engraved into the door thresholds.

Mecaer hopes to have the interior certified by next year's first quarter by the FAA, Transport Canada and EASA, along with approvals by Brazil and Russia. The interior will cost between $90,000 and $120,000 and can be installed in about a week, Sassoli said.

Embraer Lineage 1000E

Embraer Executive Jets' flagship Lineage 1000E is typically delivered to customers green, but the Brazilian OEM can handle the completion in house for a turnkey delivery, as it demonstrated with the Lineage on static display at EBACE. Olive trees and branches, the universal sign of peace, create the subtle background motif, seen in the olive branches embossed in the pearlescent leather inserts in the entrance foyer, and woven into the silk and wool carpet.

"This is our peace machine," said Jay Beever, Embraer's v-p of interior design, the interior motif underscoring the cabin as a refuge "from the aggression of the world." The last of the three zones is a master stateroom outfitted with a queen-size bed, and two-person shower in the lav (see "*Lavatories Get More Attention*"). Customers who work with company designers have "endless opportunities to customize" the interiors through choice of configurations and outfittings that the OEM designs and installs, Beever said.

Airbus ACJ330

Airbus Corporate Jets announced at EBACE in May that it will offer a private version of the A330neo. The ACJ-330neo will fly 25 passengers 9,400 nm, sufficient range for nonstop flights between Europe and Australia. The widebody's cabin "readily accommodates conference/dining areas, a private office, bedroom, bathroom and guest seating, and can be customized to suit customer needs," Airbus said. No cabin concepts were offered; ACJ announced in April its exit from providing completions for the execliners it sells.

FLEET REFURBISHMENTS & REFINEMENTS

Fleet refurbishment programs reflect the recognized value of legacy airframes, whether the upgrade is ordered by an operator, developed by a third party or performed by an OEM (the Citation X Elite, for example).

Constant Aviation redesigned and refurbished the interiors of JetSuite's 10 owned and operated Phenom 100s. The Cleveland MRO updated the cabins with recovered taupe and coal leather seats, refinished cabin panels, leather cabin drink rails and "luxury options that will add to JetSuite customers' experience,"

Continues on page 24

Lavatories Get More Attention

Embraer Executive Jets offers the option of a two-person shower in the flagship Lineage 1000E, with several notable features and advantages over showers in other executive aircraft, as Jay Beever, Embraer's v-p of interior design, pointed out at EBACE aboard the first Lineage being shown with the new shower. The floor, made of stone veneer from F/List, is completely flat, not angled, providing a better sense of stability when showering aboard an aircraft in flight. The aircraft's 6-foot 7-inch cabin height provides enough room to raise the floor, allowing water to flow over the sides to a drain below.

An exterior window in the shower also gives occupants a view of the horizon, adding to their positional awareness and sense of stability. It has both a rainwater showerhead and wand, and also contains a cabinet for holding towels, so bathers don't need to step through the shower door to the adjoining lav to dry off. Embraer says the 30-gallon dedicated water tank provides enough water for 40 minutes of showering. In development for three years, the expanded shower does not intrude on cabin space, instead occupying some unused volume in the baggage hold.

Daher introduced the Elite Privacy quick-change lavatory compartment option with the 2017 TBM 900-series turboprop singles, integrating a lavatory in the aft fuselage. When not in use it provides a bench seat, and converts to a private toilet compartment at the push of a button, the multi-segment partition deployed by a pair of electric motors. The Elite Privacy compartment weighs 90 pounds and can be installed/removed by a mechanic in 30 minutes; two of the TBM's standard six seats are sacrificed in the process. An onboard lav will be important to prospective charter operators in Europe, now that commercial use of single-engine turboprops has been


Daher Elite

approved there, said Nicolas Chabbert, senior vice president of Daher's airplane business.

The Pilatus PC-24 twinjet, set to enter service this year, boasts many midsize-jet features despite its light-jet cabin size, among them an enclosed and externally serviceable lavatory. The outside servicing provides a decided advantage over other jets in its price range. Though the airplane is designed to operate on unimproved surfaces, the executive interior, by BMW DesignWorks, features soft leathers and rare hardwood cabinetry.

MRO West Star Aviation and seating and interior components provider Aviation Fabricators are developing an STC for a belted lavatory for Hawkers (800A/B, 800XP, 750XP, 850XP, 900XP) not covered by previous lav modification approval, which covers "hundreds" of the jets, according to West Star. The installation allows the seat to be used during takeoff and landing, accommodating an additional, ninth passenger on board. Hawker program manager Kendall Kreiling said the mod can be performed during a scheduled inspection at West Star's Grand Junction, Colo.; Chattanooga, Tenn.; or East Alton, Ill. headquarters facilities, and is expected to be available in the fourth quarter. ■

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said Stephen Maiden, Constant's president and CEO. He noted that in general, "Customers now are retaining aircraft longer. That's putting a greater focus on after-market upgrades." JetSuite CEO Alex Wilcox expressed confidence that "clients will enjoy the new interiors."

Flying Colours of Canada is refurbishing six Hawker 1000s for a niche fractional service, QJet Shares, from Mac Air Group. "You wouldn't know if these [Hawkers] are 10 years old or 10 days old; they have all the amenities, including Wi-Fi," said Pat Reed, of Maine-based Mac Air, which runs QJet Shares. The new program aims to provide owners with lower hourly costs than offered by major fractional programs, and an opportunity to share in charter revenue for the aircraft.

Able Aerospace Services has completed a two-year upgrade program for Air Evac Lifeteam's 90 Bell 206s, outfitting the EMS helicopters with digital flight decks. With last year's opening of the Able Maintenance Center at its headquarters in Mesa, Ariz., and the Air Evac project complete, Able (bought by Textron last year) is offering EMS completions and cabin and cockpit upgrades to other fleet operators.

Founded in 1982, Able has acquired complete MRO capabilities over the years, enabling it to control project timelines and budgets, said Heidi McNary, Able's v-p for engineering. Reducing completions and retrofit costs is critical to EMS operators in this age of uncertainty about government reimbursement rates for EMS flights, she said.

Mecaer Aviation Group added FAA approval for two more EASA-validated AgustaWestland AW139 interiors STCs in response to "growing demand for more options in the U.S." for private AW139s, said general manager Sassoli. Mecaer has customized nearly 200 AW139s with luxury interiors, though primarily in Europe, and expects the new FAA approvals "will assist in a more even distribution" of the installations, he said. The STCs cover eight different interchangeable layouts and configurations, ranging from four seats with multiple cabinets and consoles to eight-seat layouts, and can quickly be changed from one seating configuration to another. Mecaer's Silens and I-Feel are available under both new STCs.

Duncan Aviation unveiled five interior refurbishment designs for owner-flown Citation CJ3s,

Piper M600

complementing the Rockwell Collins Pro Line Fusion flight deck upgrade it created for the light jet. The interiors introduce light upper fuselages with darker lower sidewalls and carpeting, the contrasting tones helping "expand the feel of the cabin," said Duncan's Rachael Weverka, who designed the interiors. Employing maintenance-friendly materials, the cabin refurb and Fusion upgrade can be performed simultaneously, minimizing turn time. The interior refurbishment, with or without the Fusion upgrade, requires a couple of months, according to Duncan. The Michigan-based MRO is also developing six exclusive paint schemes for the CJ3.

Dassault Falcon Service introduced its "low cost" Paris Interiors refurbishment option, a contemporary design package inspired by the OEM's most recent cabin interiors. "We change completely the experience inside the cabin," said Martin Minvielle, DFS marketing manager. The refreshment renews foam and fabric but maintains all structural elements, and thus costs about one-third of a conventional refurbishment. "Certification is a big cost when you remove or modify" cabin elements, Minvielle said. By performing a soft-goods refreshment with small additions, customers "can have the 'Wow' effect without certification cost." Initially designed for the Falcon 900, it is also scalable to the 2000 and 7X. The first project, in conjunction with a C check, is scheduled to commence in September, with completion the following month, Minvielle said.

Piper introduced Expression, or EXP, a personalization program for the flagship M600 turboprop single, giving customers

Weight-saving Initiatives

Being a lightweight in the cabin interiors world is a compliment today, as specialists seek to lighten cabin interior installations even more quickly than customers demand new options that add weight. ACJ president Benoit Defforge acknowledged the importance of cabin weights at the NBAA Convention last fall when he noted that the forthcoming ACJneo's promised performance depends on interior completions' meeting all OEM weight and center-of-gravity requirements, which he stated by way of plugging ACJ's turnkey green completion offerings, with installation weight specifications the company can "guarantee delivering." (ACJ officially exited the private completions business in April this year to concentrate on upgrades for airliners.) Meanwhile, several completion centers appear intent on besting OEM weight targets for interiors.

Jet Aviation recently redelivered an ACJ330 and ACJ319 to a Middle Eastern customer, and the interior weights of both aircraft came in "significantly lighter" than the client's mandated limits, despite the use of high-end finishes and custom designs. That makes the widebody the longest-range private A330 completed to date, according to Matthew Woollaston, vice president, completions sales and marketing, with a range supporting the customer's Riyadh to Los Angeles non-stop mission profile. Meanwhile, robust cabin soundproofing—often sacrificed in executive completions to keep weight down—reduces in-flight dBSIL readings as low as the mid-40s, according to Jet Aviation. Using technology from Gulfstream, the muffling combines accurate sound prediction with targeted soundproofing.

Associated Air Center (AAC) of Dallas redelivered a head-of-state ACJ320 to an undisclosed Middle Eastern customer that exceeded the customer's "aggressive" weight requirements by 10 percent, using "newly developed construction methods," said Chip Fichter, vice president of business development. Designed by London's Andrew Winch, the interior provides a master suite, office, dining lounge, entertainment lounge and specialty seating for guests.

GDC Technics has verified its weight-reduction process for BBJ787 completions, aiming to beat Boeing's recommended mid-weight target by 20 percent. The savings derive from improvements in production processes, materials technology and 3D printing, said Mohammed Alzeer, GDC Technics general partner.

AMAC Aerospace has introduced a lightweight cabinet build process and products that can reduce weight by up to 30 percent in comparison to standard cabinet build, while "the aesthetic look remains high class," according to the Basel-based completion and MRO specialist. The cabinets use a veneer application integrated into a new composite panel, assembled by a new process. Interior monuments can be built with the same process and enjoy equivalent weight savings.

F/List, the Austrian interiors components provider, has added to its roster of weight-saving luxury interior components with lightweight composite materials from its Hilitech joint venture with the Hintsteiner Group, which reduce interior weights by up to 30 percent. Hilitech is already supplying lightweight interior components for Lufthansa Technik and the in-development Pilatus PC-24, for which Hilitech provides tables, dividers, galley, wardrobe and cabinets. ■

Interior
Components & Tools

Ramm Aerospace won EASA approval for Bell 206/407 frameless seat cushions, designed to improve comfort, add lumbar support and reduce maintenance costs. Cushion covers are available in Naugahyde or Ultraleather.

Lufthansa Technik introduced a laser-based "augmented reality" completions and refurbishment installation tool that provides more precise measurements and positioning than conventional alignment methods.

Dassault Falcon Service has introduced a 3D scan tool for repairs, a "revolution for the refurbishment process," which maps damage during a maintenance check so a repair or part can be created specifically for the fix, minimizing repair time.

Lufthansa Technik selected Inairvation, its joint venture with F/List, to coordinate production and sales of its "chair" line of modular seats. Designed in collaboration with Pierrejean Design Studio, "chair" is 9g and 16g ETSO approved.

Pac Seating Systems recently certified, delivered and installed 13 new seats on private airliners: eight fully motorized custom lie-flat sleep seats on a Boeing 747-8, a BBJ and an Airbus ACJ319, and five more for a BBJ777 and 787. The seats provide single, double and triple configurations and incorporate more comfortable foam densities than the harder cushions used in airline sleeper seats, according to the Florida company.

Greenpoint Aerospace will distribute and install Aviation Clean Air's (ACA's) air and surface purification systems under a new partnership. ACA's system eliminates pathogens, allergens and odors, and purifies surfaces throughout the cabin. It can be installed on most business aircraft, with little downtime, says the company.

MSI Coatings' new Blusky Armor 1027 clear coat, created for interior cabinets and trim, cures tack-free within 120 seconds under exposure to UV light to form a thermoset, crosslinked coating that's harder, more abrasion resistant and weathers better than thermoplastic polyurethane and polyester finishes, MSI said.

F/List's new leather flooring, developed with Boxmark Leather, is available with a customized tiling concept in many colors and structures. The Austrian company made its NBAA Convention debut in November, displaying the newly developed soft-touch surface material for cabin linings. The company claims it is the only soft-touch material currently available without memory effect, and impression bumps left in the material by touch or contact with objects vanish within seconds.

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more involvement in their aircraft's design details. "Many of our customers have asked us for a way to put their personal touch on the aircraft, beyond the interior packages currently available," said Ron Gunnarson, Piper's v-p of sales and marketing. Customers can come to the Piper factory in Vero Beach to collaborate, choosing seat stitching patterns, custom livery and other refinements.

Completion Centers

AMAC Aerospace has made a name for itself with completions of Boeing and Airbus private airliners in the 10 years since it was founded. The Basel-based company performed the interior completion on the Boeing Business Jet (BBJ) demonstrator that the U.S. OEM debuted at EBACE this spring, and has also been selected to perform the first completion on an ACJ-320neo by UK-based Acropolis Aviation, launch customer for the next-generation ACJ.

The BBJ demonstrator's 13-passenger interior, designed by Germany's Unique Design, emphasizes the expansive cabin space, incorporating both working environments and room to relax on long flights. Boeing will use the BBJ demonstrator to show off the type's design possibilities, cabin comforts and styling to potential customers.

Boeing chose AMAC for the project after an extensive bidding and vetting process, said Bernd Schramm, AMAC's Group COO. AMAC's previous experience—successful completions on three BBJ777s and a BBJ747-8i on time and budget—was also a factor in the selection, Schramm said. The BBJ demonstrator project was completed on budget and on time in 12 months.

"It is all about comfort and feeling. You need to have a checklist, but at the end you cannot select by checklist; it's your feeling. You work more than two years together, and you need to have a little fun as well in the time."

The ACJ320neo, with an interior designed by Alberto Pinto, will be delivered green to AMAC's Basel completion facility in next year's fourth quarter, and is scheduled for redelivery to Acropolis in the fourth quarter of 2019. AMAC has performed completions on "quite a few ACJ319s and two ACJ320s" among the score of executive and head-of-state completions it has performed, Schramm noted, and had worked with Albert Pinto studios on AMAC's 747-8i completion.

BBJ demonstrator

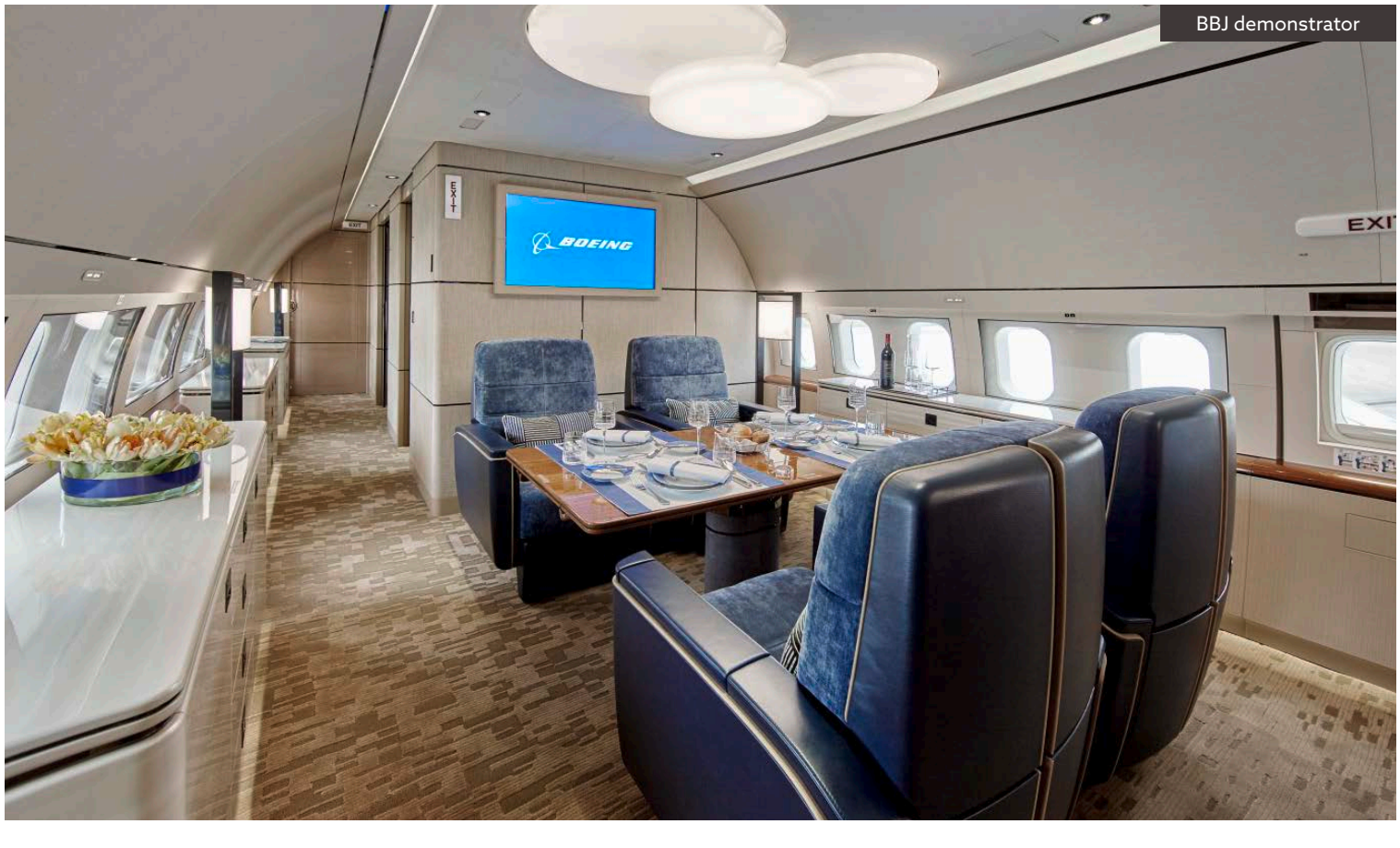
Acropolis CEO Jonathon Bousfield said, "We needed to select the right outfitter to bring Alberto Pinto's amazing vision to life, and from our point of view AMAC demonstrated to us it had the skill and creativity to do this better than anyone else."

While the BBJ and ACJ projects are major coups, Schramm said AMAC isn't resting on its laurels. "We cannot focus on marketing what we achieved; we have to focus on improvements, how we can make the cabin lighter and streamline the completion process. We have to demonstrate at each maintenance visit, each A check and C check, each satcom installation, that we can fulfill the expectations of the customer, and the expectations of the customer are higher now."

In a new slant on combi interiors, **Associated Air Center** (AAC) removed the custom executive cabin from a Boeing 737-200 and reinstalled it in a 737-500, finishing the interior with custom components designed for the larger airframe. "Our customer came to us with an unusual and challenging request to combine interior fittings from two different airplane models," said Tony Brancato, president of the Dallas-headquartered completion center.

The project was planned around existing cabin interfaces to allow a cost-effective installation and minimize downtime. AAC designed and engineered the interfaces required to address the differences between the two models. The cabin installation also added a new lavatory, fabricated by AAC. The program's success gives operators more options in outfitting custom aircraft cabins, Brancato said.

Comlux Aviation delivered the first EASA-certified interior in a Sukhoi Business Jet (SBJ), designed, engineered and installed by the Swiss company's U.S. narrow-body completion center, Comlux America. The 19-passenger execliner features a contemporary corporate interior with a VIP area in the forward cabin anchored by club-four



BBJ demonstrator

Interior
Components & Tools

Aircraft window shading manufacturer **Aerospace Technology Group is developing an electromechanical and electronic dimmable window**, Panacea, that controls natural light entering the cabin, from complete blackout to light control that adjusts automatically to changing outside light or manually to a light level selected by a passenger.

AMAC has developed a cocoon seat in collaboration with Pac Seating Systems, AMAC and the Alberto Pinto studio, certified on the 747-8i and "easily certified for other jet types," according to AMAC.

Aircraft Lighting International introduced new LED lights: a King Air exterior wing light and square lamp; and a PMA plug-and-play lamp for 5800 LED series cabin lighting originally made for the Gulfstream IV, GV and G200. A PMA for the L1309 reading light is pending.

NC Carpet Binding & Equipment, long-time supplier of sewing and upholstery machines to the aviation industry, **set up shops for Embraer Executive Jets'** Melbourne, Fla. factory, **and Airworthy Aerospace**, a Wisconsin-based airline interiors provider. For companies that make their upholstery in-house, "the cost of the finished product will be exponentially less," said Mal Maher, CEO of the New Jersey-based company.

Moore & Giles launched a water-resistant leather, Tidal, the latest addition to the company's satin suede collection. To create Tidal, polymers are added in a drum, and adhere to the Moccasin point pattern on the leather, making it resistant to water damage. Tidal is available in four colors: stormy, super white, smoke and blue moon.

Vision Systems Aerospace and PPG are developing new applications for Vision Systems' electronically dimmable window shading. Both companies supply electronically dimmable window shading, and the anticipated co-developed products "will offer aircraft manufacturers and operators exciting new shading options," said Catherine Robin, group managing director of France-based Vision Systems.

Aviation Fabricators (AvFab) offers its AvFabulous interior upgrade kits for 90/200/300-series King Airs, introducing an arm ledge table system, pleated window shades, lateral tracking seat bases and aft jump seat. AvFab serves MRO providers primarily, but also sees significant sales to aircraft brokers eager to update legacy King Airs before offering them on the pre-owned market, according to company co-founder G.R. Lowe III. ■

Continues on page 28

DUNCAN AVIATION

Extending an Active Gulfstream's Useful Life

Duncan Aviation recently refurbished a 12-year-old Gulfstream G550, giving it a whole new interior, a new exterior paint scheme, and an upgraded CMS (Cabin Management System). During this refurbishment, we also performed scheduled maintenance to minimize the impact of the downtime for the client's flight schedule. "Because of the reliability of Gulfstream aircraft, they continue to be dependable business tools, regardless of age," says Completions/Modification Sales Manager Nate Klenke.

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- Durable two-toned leather drinkrails
- First Honeywell Ovation CMS installed on a G550
- flush-mounted, 22-inch monitor on the right-hand forward partition and one 19-inch monitor mounted aft on the sidewall over the credenza

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seating across from a side-facing sofa, and a section with 15 first-class seats behind. The SBJ, the private version of the Sukhoi Superjet 100 airliner, is owned by Kazakhmys Corp in Kazakhstan.

Jet Aviation is in the midst of a trio of green Boeing widebody completions, led by a head-of-state interior installation in the world's first BBJ787-9 Dreamliner. Designed by London's Andrew Winch for a Middle Eastern customer, the Swiss company said it is developing "new technologies and processes to support the completion of this new-generation aircraft." Redelivery is scheduled for next year. Boeing has also commissioned the Swiss company to perform green completions on two BBJ777-300ERs on behalf of an Asian government, the company's first BBJ777 head-of-state completions. The first of the -300ERs has been delivered to the Basel completions center.

Among Jet Aviation's recent single-aisle completions is a BBJ3 with an interior design inspired by the golden age of travel, with vintage patterned carpets and wingback leather armchairs custom made in house, executed in a bold red-and-blue color scheme. The master suite has a full-height rain shower, and an interconnected cinema and dining room can be used as one large space or separated with electrochromic glass panels. Showing its practical side, the aft section has business and economy seating, complementing the more luxurious design elements.

After delivering three green BBJ completions last year Aloft AeroArchitects finds the market "a bit stretched, without a lot of brand-new completions," and the Delaware-based MRO is focusing "on scheduled maintenance and interior refurbishments and refreshments," said John Eichten, senior v-p of sales and marketing at the BBJ specialist. Aloft won't limit these activities to its signature Boeing airframe work, having recently added the Global Express to its Part 145 approvals. Eichten noted "a lot of Globals are coming due for heavy maintenance." Many owners will likely want to refresh their cabins and upgrade entertainment and communication systems at the same time, Aloft anticipates.

Greenpoint Technologies is nearing completion of a luxury interior on a Boeing 777-200LR for Crystal AirCruises. Reflecting the design motif aboard Crystal's cruise ships, the interior provides a grand lounge with stand-up bar, sofas and tables, said Greenpoint Design director Annika Wicklund. The seats in the 84-passenger cabin can recline to lie-flat beds, each equipped with flat-screen TV, Wi-Fi and IFE system. Greenpoint worked with Crystal AirCruises' design team on the interior, which is being installed

Boeing 777-200LR for Crystal AirCruises

The Shape of Interiors to Come

To meet the interiors needs and preferences of tomorrow's customers, Comlux America recently teamed with four key industry designers—Alberto Pinto Design, DesignQ, Unique Aircraft and Winch Design—to develop multiple interior decor and floorplan concepts for the next-generation single-aisle interiors, specifically the ACJneo and the BBJ Max-8. The goal, Comlux said, is to gather perspectives and concepts that capture the different cultures, styles and tastes of potential customers, and create "concept books" to help customers when planning completions.

BBJ completion specialist Greenpoint Technologies and Spike Aerospace, developer of the Spike S-512 supersonic business jet, signed an MOU for Greenpoint to provide interior design, engineering and technology services for the jet, projected to be airborne in the 2020s. The interior "will reflect modern comforts for the next generation to conduct business faster than the speed of sound," said Spike Aerospace president and CEO Vik Kachoria. Under the MOU, the companies will conduct an interior study, including engineering and design, to define the interior's possibilities, to develop photo-realistic renderings of the possible interiors.

Embraer has stood the concept of panoramic windows on its end, proposing in the Kyoto Airship, a custom interior for the Lineage 1000E, standard-width windows standing some three feet tall, providing an expansive exterior view. (The same size as Type III emergency exits: 20 x 36 inches.) Moreover, one or more standard-size windows can be placed at the same station, above or flanking the big window. The proposal was created for a Japanese client who wanted a sushi table so he could dine as he does at home, sitting on the floor, but still look out the window. Instead of lowering the window line, Jay Beever, Embraer's v-p of interior design, worked with engineers, who determined the window height could be extended without making major structural changes to the airframe. Embraer has since developed other interior concepts taking advantage of the drama of the larger window, like the Manhattan and Hollywood Airship, some created in tandem with noted designers like senior Disney Imagineer Edward Sotto, and yacht interior designer Patrick Knowles.

Ruag's Egg received lots of attention at EBACE in Geneva this spring. The egg-shaped vessel is a demonstrator for Ruag's SkyLife experience, an interior design concept for both large-cabin business jets and heavy-lift helicopters, aimed at super-wealthy people. It's about family, with the standard max 19-passenger cabins for both applications reduced to seating for six and five respectively, said Fabian Kölliker, manager of product management & innovation at Ruag. The interior is outfitted with little more than sparse seating and a ceiling contoured to illustrate the cabin heights of the respective aircraft types. Guests don virtual reality goggles to experience SkyLife in 360 degrees, and explore the cabin concepts for each. Hand motions activate various systems and allow the wearer to explore the cabins. Meanwhile, the theme of life, love and legacy weaves together the elements of the travel experience, including the cabin connectivity and active noise cancellation system for helicopters. Because these interiors require no structural modifications, the cost of the cabins would be on par with an OEM's completion, said Kölliker. Ruag is also using SkyLife to highlight the plight of the highly endangered Swiss Golden Eagle.

When Andrew Winch Design downsizes its offering to appeal to what it calls the "VLJ market," it's not referring to Very Light, but rather Very Large Jets. The firm, which designs bespoke interiors for clients' estates, yachts and private airliners, has launched a "VLJ concept aimed at a personalized market," said Jim Dixon, the firm's head of aviation. "Many of our clients operate multiple aircraft from several bases and for different flight plans. They want to have a consistency of design quality and elegance throughout their fleet, in their helicopter and business jet as well as their 787 for long haul." Two initial schemes developed in conjunction with the Hublot and Omega watch brands aim to appeal to "a younger client who uses the jet for business and leisure travel, but who doesn't want a typically 'vanilla' jet interior," Dixon said. ❑

Panoramic windows on Lineage

Kyoto Airship

at Greenpoint's facility in Moses Lake, Wash. The Triple 7 will begin its travel excursions later this year.

Aeria Luxury Interiors of Texas showcased at the NBAA Convention new concept interiors for a Boeing 777 and a BBJ, the former featuring what Aeria calls "a deco-esque retro space-age look" swathed in gold, creams and blues, with soaring, vaulted ceilings. The BBJ interior, in contrast, exudes a relaxed but stylish contemporary look rendered in light tones, accented with elegant chandeliers and ceiling lights that appear to open the cabin to the sky.

GDC Technics is performing completions on two BBJ787s, with delivery of a third green aircraft slated for September. General partner Muhammed Alzeer believes "customers right now are being selective. They like to be at centers that are innovating, that are developing and investing in new technology—not just building a beautiful cabin, which was always a requirement before, but one that is technologically advanced and brings a lot of value." GDC has responded in part by investing in developing STCs for JetWave high-speed broadband installations, and just performed the first on a BBJ787.

Another example of this innovation is the holographic display the company showcased at EBACE, a derivative of a transportable holographic tool the company is developing for its cabin design work. "One of the biggest challenges is trying to get aircraft owners to fully immerse themselves into the cabin while it's being designed," said Alzeer. "With this, you don't just see it, you're physically inside the cabin." GDC hopes to have the tool fully integrated into its design package "in the next few months."

Lufthansa Technik (LHT) performed identical completions on two BBJs for Abu Dhabi-based charter operator Royal Jet (only the color palettes differ). The interior of the 34-passenger jets, designed by New York's Edése Doret, has a bedroom, two full bathrooms, two lounge areas and a "starry sky" composed of some 15,000 points of fiber-optic light spanning the ceiling throughout the cabin. Carbon fiber is used extensively in the interior, one of the project's "biggest achievements," Edése Doret said. "You could use carbon fiber on other categories of aircraft, but it wasn't possible to use carbon fiber for a Part 21 [airliner-size] charter aircraft until [seat manufacturer] Pac and JCB Aero [the composites division of AMAC Aerospace] came up with a way to meet smoke, toxicity and heat-release certification."

The outfitting has carpeting from Tai Ping, leathers from Townsend, Ultraleather from Tapis and quartz and carbon-fiber flooring from F/List. The company performed the nine-month project at its Hamburg headquarters facility. LHT also builds all the interior and lining parts in house. Each completion required nine months, together involving some 280 technicians.

LHT also installed the interior in a new Airbus ACJ319 in cooperation with Parisian design house Hermès, for an undisclosed customer from the

Continues on next page

COMPLETIONS & REFURBISHMENTS


Duncan Aviation G550

"Greater China region." The cabin has a spacious dining and lounge area, master bedroom/office and master bathroom with a large shower. The 19-passenger jet's club seats and divans were designed and upholstered by Hermès craftsmen, and the aft cabin bulkhead and curtains are made of Hermès fabric.

At the MROs

Sabena Technics will refurbish an A310 for Saudi Arabia's Al Atheer Aviation. The aircraft's bedroom, bathroom, private office and lounge will undergo extensive soft furnishing replacement, including seat and divan upholstery, with a contemporary design incorporating Arabian motifs. The IFE system will be upgraded with an HD screen. Heavy maintenance C-checks will be performed simultaneously in what is expected to be a three-month project.

Al Atheer CEO Daif Alsolamy said, "The reduced downtime of the project is extremely important to meet with our specific operations," adding that the Paris-based MRO has "the right combination of maintenance and VIP cabin refurbishment skills." Sabena's vice president of VIP programs, Pascal Jallier, cited his company's "turnkey program with a single interface for design, materials and systems, as well as associated EASA STCs" for its ability to maintain quality while meeting the tight schedule.

Duncan Aviation recently refurbished a G550 with a new interior, CMS upgrade and exterior paint, all performed during scheduled maintenance on the 12-year-old jet, which Duncan had helped the owner purchase when new. "This serial number was a top performer in our client's fleet, so we gave it a facelift and kept it flying," said completions/modifications sales manager Nate Klenke. Duncan Aviation lead designer Rachael Weverka incorporated stylized design elements using the existing panels and structure to help meet the client's "conservative" budget. A client representative was on-site at Duncan's facility in Lincoln, Neb. throughout the three-month project, attending daily team meetings and having access to every Duncan Aviation team member who touched the aircraft. "We like to partner with our clients on these complex projects and be transparent throughout the entire process," said Klenke.

Flying Colours Global Express

Ruag reconfigured and

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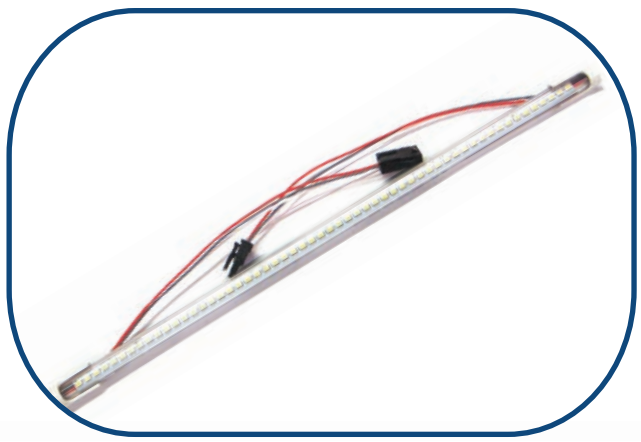


refurbished a new Indian-registered Global 5000 in consultation with Bombardier after the customer opted to restyle a variety of interior furnishings, such as replacing single seats with a divan, after consulting Ruag's cabin design showroom team. Additional changes include modifications to the existing window shades for improved cabin darkening, and upgraded IFE and connectivity systems, said Robin Freigang, director of the Swiss company's cabin interior services and design. Work was done at the company's Bombardier authorized service center in Munich under Ruag's EASA Part 21J design organization authorization (DOA).

West Star Aviation completed an extensive refurbishment of a Global Express, which included the MRO's first installation of a Rockwell Collins Venue CMS in this type. The refreshment installed a reconfigured floor plan, upgraded LED cabin lighting, belted divan usable for takeoff and landing, soft goods replacement, more wood accents and touchscreen control display units (CDUs) for the cabin. The Venue installation, supporting business, entertainment and conference calling in flight, underscores West Star's commitment "to strengthen our support of Globals," said Marty Rhine, director of sales for the East Alton, Ill.-based company.

Overall, customers are leaning toward darker woods like ebony paired with overall gray interiors, said Veta Traxler, paint and interior designer, adding that custom seat designs with quilted inserts "are hot this year." One such design was delivered in a Challenger and two more projects (a Legacy and Hawker) are under way, "with many more customers interested in incorporating the look into their design."

Other recent refurbs: "a G200 with a dark, bold veneer and purple- accented carpet" and "a Gulfstream with cream seats and navy welting, accompanied by a plaid over tuft khaki carpet," said Emilie Harbour, paint and interior design lead, describing the latter as "my Ralph Lauren-inspired airplane."

On a Global Express, **Flying Colours** performed the first cabin overhaul incorporating Inairvation's pre-engineered components. In addition to textured materials, designer fabrics, carbon-fiber veneers and handmade carpet, the interior features Inairvation's pre-engineered side ledges, which also house Lufthansa Technik's nice HD cabin management and inflight entertainment system. The project required five months. Pre-engineered retrofit components provide "a significant number of benefits to an aircraft owner," said Inairvation CEO Dr. Philipi von Schroeter, "as they minimize non-recurring engineering costs and reduce downtime."

West Star Aviation Global

Continues on next page

COMPLETIONS & REFURBISHMENTS

Execliner Interior Concepts

Airbus Corporate Jets (ACJ) has unveiled two cabin concepts for the forthcoming next-generation Neos. Together with Italian hypercar atelier Pagani Automobili, ACJ created Infinito for the ACJ319neo. Unveiled at EBACE this spring, Infinito features a sky ceiling that displays a facsimile of the sky above the aircraft or other images, creating an expanded feeling of airiness and space. Décor is reminiscent of Pagani hypercars, with natural soft-leather carpets and a wooden floor contrasting with carbon fiber furniture and wall-frames, meant to evoke the combination of art and science espoused by Leonardo da Vinci. Curves inspired by nature form a pathway through the cabin, which features shell-shaped valances and walls between zones, which can change from opaque to transparent at the touch of a button.

ACJ319 Infinito

Pagani's design team created the look and feel of the Infinito design and Airbus Corporate Jets' designers contributed their experience in aircraft design and compatibility. "Art and science can walk together hand in hand: this is the Pagani philosophy," said Horacio Pagani, founder and chief designer of Pagani Automobili. "Applying our Renaissance touch into the wider spaces of Airbus corporate jet cabins is the beginning of an exciting new venture for us." Airbus Corporate Jets managing director Benoit Defforge calls it "a fresh approach to cabin design."

At the NBAA Convention last year, ACJ introduced Melody for the ACJ320neo series. Done in white and light tones, the cabin concept features flowing lines and interior elements devoid of edges, providing a "soft," cosseted experience for passengers, according to ACJ. In keeping with the concept's name, the cabin has been acoustically tuned with the help of French audio engineering company Focal, incorporating rectangular-panel speakers blended into the ceiling, to provide striking sound from the entertainment system. The cabin has three curved, retractable 65-inch monitor screens, larger than any screen in an ACJ today.

Bizliner completion specialist Haeco Private Jet Solutions (HPJS) of Xiamen, China, debuted at MEBAA the Zen cabin concept, designed for the A320neo and showcased in a one-twentieth-scale mockup. Incorporating the colors, motifs and themes of four seasons, Zen is "minimalist, modern and stylish, a retreat from the busy hustle and bustle for a billionaire," said Henry Chan, the company's vice president commercial. "Central to our design is bringing the philosophy of Asian heritage and culture into what is otherwise a cold and mundane cabin." The four-seasons motif is carried throughout the interior, starting with the galley in front, with lotus patterns on the wall and carpet symbolizing summer. Cabin dividers incorporate large circular openings, giving the interior an expansive, open feel. The forward lounge area, done in light green tones with decorative cherry blossom patterns, symbolizes spring, while the dining area in mid cabin uses chrysanthemums, for autumn. The Tatami Room, aft of the dining area, is centered by a high-low table that can be lowered completely into the floor, "a refuge where the principal can really get away from it all."

Chan pointed out that most certification efforts today focus on meeting FAA and EASA regulations, but China's GAAC certification requirements are a growing factor in completions work, and "our group is the only one that can deliver all three." Said Chan, "We're in it for the long term, and we will continue to innovate, and showcase stylish and individualistic design." ❑

ACJ320 Melody

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Rockwell Collins

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ATC proposal

▶ Continued from page 1

silent on the concept of an independent ATC, remaining neutral on the topic last year. The Trump administration, however, has not only embraced the proposal but also used the concept to kick off its infrastructure campaign. On June 5, President Trump held an event in the White House to roll out his own independent ATC proposal, painting a bleak picture of the state of the ATC system.

"The FAA has been trying to upgrade our nation's ATC system for a long period of years. But after billions and billions of tax dollars spent, and the many years of delays, we're still stuck with an ancient, broken, antiquated, horrible system that doesn't work," Trump told an audience assembled in the East Room of the White House. "The previous administration spent $7 billion trying to upgrade the system and totally failed. Honestly, they didn't know what the hell they were doing—a total waste of money."

Trump offered broad descriptions of what that entity might look like. It would be a "self-financing, nonprofit organization" that would not require taxpayer funding. Proposed FAA reauthorization legislation would also maintain support for rural communities and small airports.

"For too many years our country has tolerated unacceptable delays at the airport, long wait times on the tarmac and a slowing of commerce and travel that costs us billions and billions of dollars in lost hours and sales," said Trump. "We will launch this air travel revolution by modernizing the outdated system of ATC. It's about time… Under this new plan the FAA will focus firmly on what it does best: safety."

Plan Principles

House Transportation & Infrastructure Committee chairman Bill Shuster (R-Pennsylvania), the chief architect of the independent ATC proposal that stalled in the House last year, joined Trump during last month's announcement. The White House credited Shuster's proposal as providing "a good foundation" for the concept and released a set of "Principles for Modernizing the U.S. Air Traffic Control System" that the administration says improves upon the concept.

The principles outline protections aimed at addressing general aviation, rural community, Department of Defense and security concerns. "All users, including the general aviation industry and emerging new entrants, must have open access to our nation's airspace…the new entity must maintain access and services to rural community and general aviation users." As for military access, the principles also discussed continued military access and ability to enforce temporary airspace restrictions.

At the same time the principles outlined a pay-for-access system, saying, "The new ATC entity would grant FAA-certified users access to the NAS, subject to their participation in the system's user fees, their being equipped as necessary to fly in controlled airspace and their compliance with other applicable rules and regulations."

The organization "must be fully and financially self-sufficient through the collection of user fees that cover both its costs of operations and recapitalization," according to the principles. "Users should have input in the fees and their structure…All users should pay their fair share." However, it does not specify whether certain segments of general aviation would be exempt as called for in past proposals.

Under the White House proposal, the fees could not be reviewed or approved by Congress. The only recourse would be review by the Secretary of Transportation and the determination of the secretary would be "final and not subject to judicial review."

The White House budget released last month would eliminate the airline ticket tax, but keep other excise taxes in place (at a rate to be determined), including fuel taxes and cargo fees, to fund the Airport Improvement Program and the rest of the FAA. The White House expects the general fund would cover the shortfall between those taxes and the costs. However, some estimates are that the proposal could result in a deficit of as much as $45 billion from Fiscal Year 2021 through Fiscal 2027.

The FAA could make safety reviews of route changes, but the principles add that such changes "would be subject to National Environmental Policy Act (NEPA) review only if the change exceeds the FAA-established noise threshold."

The proposal would seek to honor existing labor agreements and maintain the ban on controller strikes.

Plans call for a three-year transition period overseen by the DOT secretary. All

Continues on page 50 ▶

Global 7000 lighter wing

▶ Continued from page 1

Bombardier had remained quiet about the issues related to the rework of the wing until earlier this year, when Alain Bellemare, Bombardier Inc. president and CEO, confirmed that weight was a factor. He told analysts during the company's quarterly results call in February that "it's not a new wing…just a lighter wing…There's not much change to that."

Bellemare added that the design of the wing is largely completed. "We're in the final phase here of making sure that the 'lightweight wing' as we call it is being finalized," he said in February.

Since then, both Crowley and Bellemare have been upbeat about the progress of the program, with Triumph having delivered not only the wing for FTV4, but also the lightweight wing for FTV5, along with those for the first few production models.

Bombardier now has three test aircraft flying; the first took off Nov. 4, 2016, the second joined the program on March 4 and the third followed on May 10. The first aircraft has expanded the flight envelope, brushing up against supersonic flight, reaching a speed of Mach 0.995.

Flight-envelope Expansion

"Flight-testing on the all-new Global 7000 is going extremely well," Bellemare told analysts during release of the company's first-quarter results last month. "The aircraft continues to show a very high level of maturity. And we're quickly expanding the flight-test envelope and confirming the aircraft's outstanding performance."

The three flight-test vehicles in service "are meeting and exceeding performance and reliability expectations," added a Bombardier spokesman. They are testing the flight envelope and basic handling, engines and avionics/electrical systems. In addition to continued certification testing, FTVs 4 and 5 are scheduled for interior testing. Bombardier is calling the fifth FTV the "masterpiece… that will complete entry-into-service validations."

With the change in weight, though, one observer asked, "The questions that arise are many. Primary among these is when will Bombardier be able to fly an FTV with the new wing, and how much flight-testing from the earlier version will they be able to get ultimate credit for from the certification authorities?"

Bellemare reiterated that the aircraft will enter service late next year, saying the company and suppliers are ramping up quickly on the wing and "we don't see an issue on schedule." A company spokesman added that the first three FTVs "will account for the majority of certification requirements as they successfully progress through envelope expansion."

The company expects to update program milestones later this summer. To keep pace with this schedule, Bombardier has been investing in production hardware for the initial deliveries, Bellemare told analysts. ❑

The fifth flight-test Global 7000, currently on the production line, has already been outfitted with the new lighter, and final, version of the wing for the ultra-long-range jet.

Triumph Downplays Bankruptcy Prospects for Vought Aircraft

A few weeks after notifying regulators of possible involuntary insolvency of its Vought Aircraft division, Triumph president and CEO Daniel Crowley told analysts that is "highly unlikely." On May 5, Triumph filed an 8-K document with the Securities and Exchange Commission stating that it has renegotiated financial agreements with lenders, in part "to provide the Vought entities with greater financial flexibility to address their significant cash utilization relative to certain contracts."

The amended agreement provides Vought "with the option, if necessary, to commence voluntary insolvency proceedings within 90 days" of the effective date of the agreement, according to the filing. "Upon the commencement of such proceedings, the Vought entities would no longer be subsidiary co-borrowers under the credit agreement, and transactions between any of the Vought entities…will be restricted."

The filing would have come seven years after Triumph acquired Vought from the Carlyle Group in 2010 for $1.44 billion in cash and stock proceedings. But losses mounted for Vought, culminating in a $1.355 billion loss in Fiscal Year 2016.

Triumph pointed to slowing production of the 747-8 and G450/550, as well as to charges it incurred on the Global 7000/8000 wing program. The company took a pre-tax charge of $400 million "related to the impairment of previously incurred development costs associated with the Bombardier Global 7000/8000 program due to the higher level of spending and delays experienced to date."

But on May 24, Crowley downplayed the likelihood of insolvency as the company announced a settlement with Bombardier over a lawsuit regarding its wing work.

Clearly, the status quo across multiple contracts was untenable and required action," he said, adding that "We continue to work with our largest customers to resolve past claims and ensure that we have the liquidity needed to satisfy their needs."

Crowley noted that in addition to the settlement with Bombardier, Triumph also reached new contract settlements with Boeing, and said, "I look forward to achieving similar win-win outcomes with our other OEM customers in the months ahead."

For Fiscal Year 2017, Triumph's Aerospace Structures group (which includes Vought/Triumph Aerostructures) posted a $109 million loss, an improvement over the $1.355 billion loss reported a year earlier. —*K.L.*

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ViaSat

Intel makes inroads as commercial drones evolve

by Bill Carey

The headline speaker at the annual conference hosted by the Association of Unmanned Vehicle Systems International is a good indicator of who's on the rise in a small drone industry that is rapidly morphing from renegade to mainstream. Intel CEO Brian Krzanich gave the opening-day keynote at this year's Xponential conference in Dallas, not for the first time revealing the drone ambitions of the $59 billion corporation.

Krzanich, who also chairs the FAA's blue-ribbon Drone Advisory Committee, rolled to the stage on Intel's Loomo Segway-style robot. Borrowing from the playbook of a Silicon Valley developers conference, the keynote featured a drone light show and a simulated bridge inspection performed, respectively, by Intel's Shooting Star and Falcon 8+ machines.

"Data is the new oil," a commodity that will be delivered through automated, interconnected systems in the air and on the ground, said Krzanich, in evangelist mode. "By 2020 there's going to be incredible amounts of data that are going to be produced by all these connected things… For a single drone flight, the estimate is that about 50 gigabytes of data can be collected. Since drones can fly multiple flights per day, this translates into terabytes of data daily."

Intel's RealSense depth-perception cameras and Slam (simultaneous localization and mapping) technology provide drones and robots with a 2D "occupancy mapping" capability from 3D imagery, informing the machine on a grid which areas are occupied and which are open to support autonomous navigation and obstacle avoidance.

"We have systems out there today; we're continuing with a family of these. Each one is lighter, smaller, lower-power and has better distance capabilities," Krzanich said. "We're really trying to make this so that you as a developer don't have to worry about the depth sensing and the software capabilities. We're trying to provide you that output so you can really focus on your product and what you're trying to deliver to the marketplace with autonomous drones."

During the conference in early May, aerospace manufacturers Airbus and Boeing announced separate approaches to collect, shape and sell the wealth of data coming from drones, satellites and other vehicles. Airbus has created a new U.S. subsidiary based in Atlanta—Airbus Aerial—to provide drone and satellite imagery and data analytics services to the insurance, agriculture, oil-and-gas and utilities industries. Boeing's Insitu subsidiary unveiled Inexa Solutions a suite of remote-sensing platforms, data analytics and flight and training services drawing data "from seabed to space."

The Boeing offering builds on work Insitu Pacific has done with Royal Dutch Shell-owned QGC (formerly Queensland Gas Co) using the catapult-launched ScanEagle to inspect natural-gas wells, pipeline and other infrastructure in Australia. That effort was described last year as the most extensive commercial use of drones for beyond visual line-of-sight (BVLOS)operations to date.

Evolving Industry

Keynoting the AUVSI conference may be a leading indicator, but it doesn't guarantee success in the still-evolving drone industry. Colin Guinn of 3D Robotics (3DR) kicked off the 2015 conference in Atlanta, but Guinn no longer works for 3DR and the company now focuses on providing analytics software to the construction industry instead of building drones. 3DR's course correction came after its first consumer drone offering—the Solo quadcopter—faltered in the marketplace. The Berkeley, Calif. company laid off 150 employees and burned through nearly $100 million in venture capital, Forbes reported last

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ICAO takes up UAS traffic management as international systems advance

ICAO is gathering information on organizing small drone traffic, affirming work that is well under way in several countries. The goal of these efforts is to establish in each place a low-altitude ecosystem to manage and support commercial operations of unmanned aircraft systems (UAS).

In May, ICAO announced the release of a request for information to industry, academia and member nations on developing a UAS traffic management (UTM) framework that would align regional efforts and support the use of drones across borders. An agency of the United Nations, ICAO promulgates "standards and recommended practices" for 191 member nations.

"ICAO is the natural agency to be gathering together the best and brightest from governments and industry to define the problem so that global solutions can be proposed, debated and agreed," stated Leslie Cary, ICAO's remotely piloted aircraft systems program manager, in an announcement at Xponential this year in Dallas.

The framework ICAO promises will provide an international standards foundation to UTM systems being developed in the U.S., Europe, Asia and the Middle East. The Global UTM Association, a nonprofit trade group based in Lausanne, Switzerland, reported representing air navigation service providers, UAS manufacturers and operators, UTM software developers and regulatory bodies in 15 countries as of January.

The NASA-led UTM development in the U.S., which also involves the FAA, other government agencies, industry and academia, has been under way since 2012. The space agency planned to conduct UTM Technology Capability Level 2 (TCL2) flight-testing from mid-May through June 9 at six FAA-designated UAS test sites across the country. The latest campaign, focused on flying small drones beyond the pilot's visual line-of-sight in sparsely populated areas, was the second in a series of four increasingly complex UTM demonstrations NASA plans.

NASA's next focus is TCL3 flight-testing over moderately populated areas, scheduled to start next January at the space agency's Crows Landing airport and test facility in north central California, south of Modesto. According to a presentation NASA gave during the Xponential conference, this testing phase will evaluate vehicle-to-vehicle (V2V) wireless technology the U.S. Department of Transportation has proposed for automobiles, in this case as a potential "equivalent" to having small drones signal their position by automatic dependent surveillance-broadcast (ADS-B).

Various projects are mastering beyond visual line of sight (BVLOS) control of small drones—the type of flight profile UTM systems would manage.

During the Xponential conference, the Nevada Institute for Autonomous Systems, which oversees the FAA-designated Nevada UAS test site, announced progress toward the goal of delivering packages by drone. On May 5, a team that included visual observer support from Embry-Riddle Aeronautical University flew a fixed-wing, hybrid quad-rotor Latitude HQ-40 unmanned aircraft 97 miles from a location in central Texas to Austin, using enhanced radios and cellular communications for command and control.

"This was the most challenging, logistically intensive and longest package delivery demonstration recorded to date using cellular technology in the National Airspace System," said Chris Walach, director of the Nevada UAS test site.

Avionics manufacturer Rockwell Collins and BNSF Railway, partners in an FAA Pathfinder project, said they have successfully demonstrated BVLOS drone flights for long linear operations such as inspecting railway tracks, pipelines and power lines. Unmanned aircraft fitted with the Rockwell Collins CNPC-1000 datalink radio were handed off between BNSF positive train control towers in a multi-node network covering 200 miles of track in the rail company's Clovis, N.M. operational subdivision.

Global Progress

The progress toward managing small drones reported at the Dallas conference complemented other such advancements around the world. On May 31, NTT Data, part of the Nippon Telegraph and Telephone Group of Japan, announced the launch of an "airpalette UTM" software package—which becomes available in October—consisting of a flight operations system function for commercial drone operators and a "UTM core" for airspace managers.

That development followed the announcement of a joint venture in March between Tokyo-based e-commerce company Rakuten and AirMap, of Santa Monica, Calif., developer of a drone airspace management system, to provide a UTM platform in Japan.

A venture capital investor in AirMap, Rakuten unveiled the "Sora Raku" delivery service in April last year, initially using a Tenku multicopter to deliver equipment, snacks and beverages to golfers at Camel Golf Resort in Chiba Prefecture.

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Latitude HQ-40 flew 97 miles as part of a package-delivery trial.

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Yuneec International unveiled the commercial-grade H520 hexacopter in January.

Drone evolution

▶ *Continued from page 36*

October; in April, 3DR announced that it had raised another $53 million in a fifth funding round, which it plans to invest in the Site Scan software application.

While Solos were made in China, 3DR for a time was considered the leading American rival to Shenzhen, China-based DJI, the undisputed market leader in small commercial and recreational drones. At least for underlying technology and applications, Intel will likely lead U.S. companies; it bought a presence on DJI drones last year after acquiring Movidius, a developer of computer vision technology.

Through other recent acquisitions, the semiconductor manufacturer has also become a drone maker in its own right. The Falcon 8+ rotary-wing drone Krzanich used to conduct a simulated bridge inspection during the Xponential conference was developed by Ascending Technologies of Krailing, Germany, which Intel acquired early last year.

At the Farnborough Airshow last July, the chipmaker and Airbus demonstrated the use of the V-frame Falcon 8 with RealSense collision avoidance technology and a 42-megapixel full-frame camera to visually inspect a widebody airliner.

"Now it's a manual system with people having to climb all over the airplane," Krzanich explained. "With Airbus we've developed a system that's capable of doing it both on the tarmac or in the hangar. Airbus has developed additional software that allows you to do an airplane inspection, identify and geolocate defects, understand their size and dimensions, then push out a data report that allows you to go back and do a repair." Airbus planned to implement drone inspections of the A350XWB this year.

Last November, Intel acquired MAVinci of Saint Leon-Rot, Germany, manufacturer of the MAVinci Sirius fixed-wing drone and software for aerial surveying and mapping. Intel's Shooting Star drone, a featherweight Styrofoam-and-plastic quadcopter fitted with LED lights, is advancing the state of drone swarming technology. Some 300 Shooting Stars performed in a pre-taped, choreographed light show that was televised during the Lady Gaga halftime performance at the Super Bowl in Houston in February. Intel says it has flown up to 500 at a time.

Intel Capital, the company's venture-capital division, has made equity investments in Chinese drone manufacturer Yuneec International; drone manufacturer and aerial data analytics and services company PrecisionHawk; commercial drone operating system start-up Airware; and e-volo of Germany, developer of the Volocopter passenger-carrying multicopter.

DJI'S Domination

While Intel has moved aggressively in the drone industry, drone and camera system manufacturer DJI has not stood still; rather, it continues to overpower competitors with rapid product releases and generational updates offered at lower prices than comparable models. The company that Hong Kong University of Science and Technology graduate Frank Wang started in 2006 collected $1.47 billion in revenue last year, *China Daily* reported, and has a market valuation estimated at $8 billion to $10 billion, according to various media reports.

Last year, Skylogic Research of Redwood City, Calif., determined that DJI controlled 50 percent of the North American market for commercial and recreational drones; for higher-end machines costing from $3,000 to $7,500 it had 67 percent of the market.

DJI produces the Spreading Wings series of multicopters resembling flying chandeliers for professional photographers and cinematographers. In November 2014, the company unveiled the Inspire 1 "prosumer" quadcopter with articulating rotor arms, and last year introduced the improved Inspire 2.

Also last year, DJI announced collaborations with Lufthansa Aerial Services to develop commercial drone applications such as aircraft, power line, road, railway and pipeline inspections and aerial monitoring of construction sites and crops; with automaker Ford to advance drone-to-vehicle software; with PrecisionHawk to integrate DataMapper flight and analytics software for crop monitoring; and with drone services company Measure to deploy drones in the farming, energy and media industries.

In February, DJI made a further foray into commercial drones by introducing the new Matrice 200 series of toughened quadcopters for critical infrastructure inspections, construction site mapping and public safety applications. The foldable, 13.5-pound mtow drone is fitted with DJI's FlightAutonomy sensor suite for collision avoidance and comes with the company's first upward-facing gimbal mount, opening the undersides of bridges, towers and other structures to inspection.

DJI planned to release the M200 series this month, but at press time had not made public a manufacturer's suggested retail price. Interested buyers were advised to contact its dealer network.

Rival manufacturer Yuneec International last year introduced the "semi-professional" Typhoon H hexacopter—the first drone with Intel's RealSense depth-sensing and collision avoidance technology. Besting DJI by

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ICAO takes up UTM

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The drone research and development company behind Tenku—Autonomous Control Systems Laboratory—completed the world's first autonomous flight and delivery by a rotary-wing drone over 10 km (6.2 miles), Rakuten announced in January. It delivered hot soup to waiting surfers on a beach in Minamisoma City, flying a pre-programmed 12 km route over the sea in the Fukushima Hama-Dori Robot Testing Zone.

Last November, Finnish telecommunications and technology company Nokia and the UAE General Civil Aviation Authority, based in Abu Dhabi, announced a partnership to develop an "end-to-end UAS ecosystem" in the emirates.

Nokia says its UTM system will be able to monitor the airspace and share data among UAS operators, air traffic controllers and drones fitted with its UTM modem, which combines an LTE modem, GPS transceiver and telemetry modules. The system will provide automated flight permissions and create no-fly zones that can be continually refreshed with the latest information.

The agreement with the UAE civil aviation authority complements Nokia's establishment last fall of a dedicated UAS traffic management test facility at Twente Airport in the Netherlands—the first such facility in Europe, according to the company.

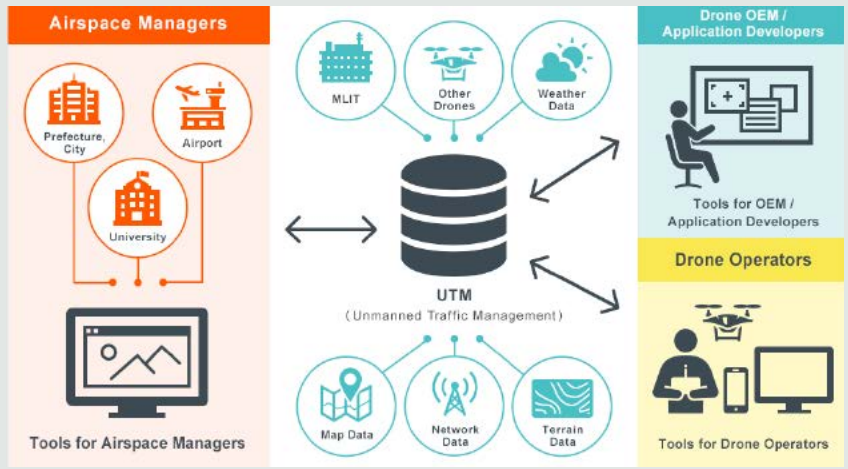
The European Commission last November announced the "U-Space" initiative to create a low-altitude airspace management system for drones comparable to the UTM model in the U.S. Plans call for widely introducing small commercial drones into Europe's airspace by 2019. Initial trial locations will be announced later this year, according to a presentation the Single European Sky ATM Research agency delivered during a U-Space workshop at the Unmanned Systems Expo in The Hague, Netherlands, in April.

At the World ATM Congress in Madrid in March, French avionics and air traffic management system provider Thales and Unifly, a Belgian developer of drone fleet management and UTM software, announced ECOsystem UTM, a drone flight-planning and management software platform. The system integrates Unifly's validation engine, which uses "geographically linked data" to determine the position of a drone, airspace and weather conditions, no-drone and geo-fenced areas, obstacles and other manned and unmanned traffic, the companies said.

Submissions to the ICAO request for information that are considered best at defining a common UTM framework will be presented at the Drone Enable UAS Industry Symposium the iorganization will host in September. That event will follow ICAO's Second Global Remotely Piloted Aircraft System Symposium.

Any common UTM framework must include three fundamental components: a registration system that supports remote identification and tracking of drones; a communications system that facilitates control, tracking and collision avoidance; and geo-fencing capability to restrict drones from sensitive sites and airports that can be updated on a 28-day aeronautical charting cycle, ICAO said.

"Multiple states and regions have expressed interest in developing UTM to provide services for UAS operations," the organization states in the information request. "A common agreement on the framework and core boundaries of UTM will facilitate harmonization between UTM systems globally and enable industry manufacturers, service providers and end users to grow safely and efficiently without disrupting the existing manned aviation system." ■



This image from Japanese e-commerce company Rakuten depicts the parties involved in a UTM system. 'MLIT' represents the Japan Ministry of Land, Infrastructure, Transport and Tourism.

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Court rejects FAA's attempt to register recreational drones

Commercial drone operators in the U.S. must meet the conditions of the FAA's Part 107 regulation for small unmanned aircraft systems, but they share the airspace with hobbyists who are unregulated. In May, the FAA's opening attempt to get its arms around hundreds of thousands of drone hobbyists by creating an online registry met with defeat when a federal appellate court ruled the agency had violated the law.

"This case is a big deal," said Jonathan Rupprecht, an aviation attorney based in West Palm Beach, Fla., who helped drone enthusiast John Taylor challenge the FAA registration rule. "In the FAA trying to do this regulatory land grab, it stepped on a land mine."

At issue was language Congress inserted in the FAA Modernization and Reform Act of 2012. Section 336 of the act—named the Special Rule for Model Aircraft—states that the FAA "may not promulgate any rule or regulation regarding a model aircraft" that is flown for recreational purposes, so long as it is operated in accordance with safety guidelines.

Faced with a rash of rogue drone sightings near major airports, the Department of Transportation under former secretary Anthony Foxx announced plans in October 2015 to establish a national registry of recreational drone users by the end of that year. Managed by the FAA, the registry would provide a means of tracing back a rogue drone to its owner, and thereby subjecting that person to civil or criminal penalties for unsafe or irresponsible flights.

The avenue the government chose to create the registry was to issue an "interim final rule," a provision that allows a federal agency, upon finding "good cause," to produce a regulation without following the usual notice-and-comment process. The final rule, containing a new Part 48 online registration process, became effective on Dec. 21, 2015; it required the owners of drones and model aircraft weighing a minimum of 250 grams—or about half a pound—to register online and pay a $5 fee. Two days later, Taylor, 56, filed suit in the U.S. District Court of Maryland, seeking an injunction to stop the registry before Christmas. Requiring hobbyists to register their names and affix an identification number to their aircraft, he believed, violated the protection from regulation that Congress provided hobbyists in Section 336 of the 2012 legislation.

Responding to Taylor's suit in Maryland, the FAA advised him to petition the U.S. Court of Appeals for the District of Columbia Circuit, which has jurisdiction over petitions for review of federal regulations. Taylor then contacted Rupprecht, who in a lengthy overnight call helped him draft the filing.

A collaboration of four lawyers—Rupprecht, Loretta Alkalay, Peter Sachs and Kathy Yodice—helped Taylor draft and edit court filings during the proceedings. The D.C. Area Drone Users Group raised $5,000 through a crowdfunding campaign to cover copying and filing fees.

In a decision dated May 19, a three-judge panel of the D.C. Circuit found in Taylor's favor and vacated the FAA's registration rule as it applies to model aircraft. "In short, the 2012 FAA Modernization and Reform Act provides that the FAA 'may not promulgate any rule or regulation regarding a model aircraft,' yet the FAA's 2015 registration rule is a 'rule or regulation regarding a model aircraft.' Statutory interpretation does not get much simpler," the court stated. "The registration rule is unlawful as applied to model aircraft."

Drone Registry Fate

The decision left the FAA's drone registry in limbo. As of the court's May 19 decision, 763,678 hobbyists had registered through the online system, paying $5 to obtain a single identification number for all of the small drones they operate. As an incentive, some hobbyists were refunded when the registry was launched, but had all paid the fee it would amount to $3.8 million. Registered separately were 66,111 non-hobbyist individual drones used for commercial or other purposes, plus drones weighing more than 55 pounds that owners must register under the Part 47 N-number system, the FAA reported.

The Association for Unmanned Vehicle Systems International, the Small UAV Coalition, the Commercial UAV Alliance, the Drone Manufacturers Alliance and Helicopter Association International (HAI) issued statements supporting the drone registry, in general saying that it promotes accountability and responsible use of the airspace system.

"The viability and growth of the UAS (unmanned aircraft systems) industry is contingent on the safe and responsible integration of UAS technology. This is only possible if all operators—commercial and recreational alike—understand their responsibilities and remain informed of the evolving standards around UAS technology," said the Small UAV Coalition, a group led by Airmap, Amazon Prime Air, Google [x], Intel, Kespry, PrecisionHawk and Verizon Ventures.

"The FAA must have appropriate authority to maintain reasonable oversight of UAS operations, including management of a national UAS registry, which is the first step to identifying UAS operating in the national airspace."

HAI strongly disagreed with the court's decision. "Helicopters routinely operate at the same low altitudes as drones, and we in the helicopter industry are deeply concerned about our ability to fly safely in airspace where pilots could encounter any unmanned aircraft,

BILL CAREY

Drone enthusiast and attorney John Taylor successfully challenged the FAA's national drone registry.

be it commercial or otherwise," the helicopter operators' association said. "One valuable component of the FAA's drone registration program is the opportunity to educate the general population about the hazards of careless drone operation, and we believe that the FAA's drone registration program serves to protect everyone in the air and on land."

The Muncie, Ind.-based Academy of Model Aeronautics (AMA), which was separately challenging the FAA's interpretation of Section 336 in the D.C. Circuit, applauded the decision. "We have repeatedly argued that federal registration for our community is duplicative and unnecessary, as our members already register their model aircraft with AMA," the academy said. "In addition, our 80-year history of safe and responsible flying demonstrates that we're not the problem. We shouldn't be burdened by overly broad regulations."

As of early last month, the FAA had not announced its next step. Among the options was to seek an en banc hearing before the full appellate court, but observers assumed the agency would seek a remedy from Congress through new legislation.

The D.C. Circuit itself suggested a legislative fix. "Aviation safety is obviously an important goal, and the Registration Rule may well help further that goal to some degree," the decision states. "But the Registration Rule is barred by the text of Section 336 of the Act…Congress is of course always free to repeal or amend its 2012 prohibition on FAA rules regarding model aircraft. Perhaps Congress should do so. Perhaps not."

Despite the FAA's legal setback, drone enthusiasts and commercial operators alike faced a thicket of state and local restrictions. The Center for the Study of the Drone at Bard College, in a study released in March, reported that 133 localities across 31 states had enacted local rules governing the use of drones.

The FAA planned to convene an aviation rulemaking committee this summer to study emerging technologies for remote identification and tracking of drones—prelude to a technological solution to controlling them. In late May, The New York Times reported that the Trump administration was asking Congress to authorize the federal government to track and if necessary disrupt or destroy drones that are deemed a security threat.

Taylor continued challenging the FAA's Part 101 regulation, which allows the agency to decide if a recreational drone is being flown in an unsafe manner—a suit that was consolidated with a legal challenge by the Electronic Privacy Information Center over the absence of privacy rules for small commercial drones.

The only way a registration system makes sense, Rupprecht argued, is for drones to be registered at the point-of-sale, not by an honor system such as the FAA attempted. He also recommended the agency should step up its prosecution of bad actors. —*B.C.*

Drone evolution

▶ *Continued from page 38*

one month, the dronemaker and electric aircraft developer based in Jiangsu Province, China, unveiled the H520 commercial grade hexacopter at the Consumer Electronics Show in Las Vegas in January. The H520 will be offered in a variety of configurations ranging in price from $2,499 to $4,499, Yuneec said.

French consumer electronics manufacturer Parrot announced in January that it would cut 290 of the 840 employees of its drone division after falling short of revenue targets. The company reported fourth-quarter 2016 revenue from drones of €60 million ($67 million), of which €49 million came from consumer drones and €11 million from commercial models. It planned to expand its commercial drone business.

At Xponential 2017, Parrot unveiled the Disco-Pro Ag fixed-wing drone system for remote-sensing of crop health, priced at $4,499, and two versions of the Bebop consumer quadcopter—Bebop-Pro Thermal and Pro 3D Modeling—for the construction and real-estate industries.

Among other new-drone announcements at the Xponential conference this year, AeroVironment, which has supplied thousands of hand-launched Raven, Puma and Wasp fixed-wing drones to the U.S. military, unveiled the five-ounce Snipe nano quadcopter, which has public safety and military applications. Pulse Aerospace, of Lawrence, Kansas, introduced the Vapor 15 and petroleum-powered Radius 65 small unmanned helicopters.

Sentera, a company based near Minneapolis-St. Paul International Airport, unveiled the Phoenix series of hand-launched, fixed-wing drones starting at $10,990 with payload for the precision agriculture, mapping and public-safety industries. ❑

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CIVIL SUPERSONIC

Concorde is a museum piece, but the allure of speed could spell success for one or more of these projects.

by Nigel Moll

Fourteen years have passed since British Airways and Air France retired their 13 Concordes, and for the first time in the history of human flight, air travelers have had to settle for flying more slowly than they used to. But now, more so than at any time since Concorde's thunderous Olympus afterburning turbojets fell silent, there are multiple indications of a supersonic revival, and the activity appears to be more advanced in the field of business jets than in the airliner sector.

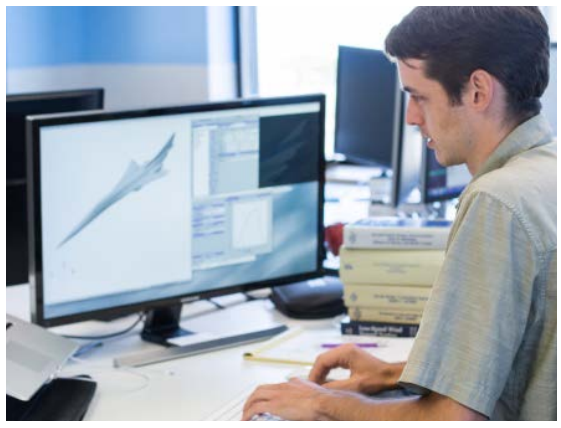
Aerion continues to be the most enduring player, and the company's AS2 design (*see image at top of page*) now has three engines (originally two), the involvement of Airbus and an agreement (loose and non-exclusive, but signed) with GE Aviation to explore the supply of those engines. Spike Aerospace expects to fly a subsonic scale model of the design for the S-512 Mach 1.5 business jet this summer, to explore low-speed handling, followed by a manned two-thirds-scale supersonic demonstrator "one-and-a-half to two years from now." Boom Technology is working on a 55-seat Mach 2.2 airliner that it plans also to offer as a private SSBJ. NASA and Lockheed Martin are encouraged by their research into reducing the severity of sonic booms on the surface of the planet.

Shaping the boom

The sonic boom produced by a supersonic aircraft has long shaped regulations that prohibit civil supersonic flight over land, presenting aircraft designers with no choice but to remain below Mach 1 over land and exceed the speed of sound (760 mph at sea level) only over water. But research over the past decade or so is bearing fruit toward revealing how to shape the aircraft to muffle the sonic boom.

"We call it sonic boom shaping because it shapes the acoustical signal of the shockwave that reaches the ground," says Peter Coen, project manager for the commercial supersonic technology project at NASA Langley. "All aircraft flying to date create what is called an N-wave sonic boom: if you plot the pressure distribution that you measure on the ground, it looks like the letter N. You get a large pressure impulse, a gradual decrease to below the local atmospheric pressure and then another impulse back to the atmospheric level. You hear bang-bang, and you don't hear the gradual pressure change in the center of the signal. The reason you have the two impulses is that the air doesn't know the airplane is coming, so the pressure changes instantly. Near the airplane there are shockwaves on the canopy, the wing, the nose, the engine nacelles and the tail, and they're all different strengths, randomly spaced along the airplane. Because they have different strengths they travel at slightly different speeds, so as that wave travels away from the airplane the energy coalesces into the two spikes; as that signal travels through the atmosphere it gets attenuated (the pressure gets lower) but it still maintains the N shape until the sonic boom reaches the ground.

"You want to shape the airplane so that the shockwaves formed near the airplane have a specific pattern in which they are relatively consistently spaced and of the same strength. If they're the same strength they travel at about the same speed and they tend not to coalesce. Or if they do they coalesce into a pattern that you want on the ground: instead of a spike, a series of small pressure changes. The atmosphere has worked on them and in effect rounded them a bit, so what we're aiming for is something that looks more like a sine wave than an N shape. With a gradual pressure change, your ear does not hear it and the disturbing crack or bang is gone. You'd hear it as a double thump."



Half a century ago, engineers designed Concorde with slide rules. Today, they have an arsenal of computing tools to solve the Anglo-French SST's shortcomings: boom noise, engine noise and fuel thirst.

Aircraft designers' predicament is not made any easier by the absence of hard numbers in the regs, which do not provide actual figures for decibels or strength of pressure wave that the FAA would deem acceptable for overland supersonic. This is what is driving NASA's low-boom flight demonstration program: it will produce measurable evidence of the reductions made possible by boom shaping.

In addition to shaping airframes, the researchers have also been studying how people respond to different impulsive sounds such as sonic booms, indoors and outdoors. "Using simulators, large rooms with large speakers attached to the walls, as well as flight-test work where we fly the airplane in a dive maneuver to produce in a very small area the signal we're looking for, we have an idea that at somewhere between 60 and 70 dBA the noise begins to fade into the background, which might be acceptable. The proof is when we leave the lab and take the dive test off range and see how the average person, going about their business on the average day, responds to this sound."

To test this theory, NASA and Lockheed Martin are designing a new airplane called the Quest,

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BAC-Aerospatiale Concorde	
Passengers (max)	100
Supersonic cruise	Mach 2.02/1,340 mph
Supersonic range	3,908 nm
Takeoff field length	11,800 feet
Max takeoff weight	408,000 lbs
Operating empty weight	173,500 lbs
Max fuel	210,000 lbs
Engines (four)	R-R/Snecma Olympus, 38,050 lbs each for t/o
Wingspan	84 feet
Length	202 feet 4 inches (+5.5 inches at Mach 2)

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CIVIL SUPERSONIC

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This page: NASA and Lockheed Martin are teamed on the design of the Quest, slated to fly in 2021. It will test theories about how the design of the airframe can shape and muffle the sonic boom as it is perceived on the ground.

for quiet supersonic technology. It's a single-seat Experimental airplane, some 100 feet long and with an mtow of 25,000 pounds, shaped to produce this low-boom signal. "For the dive testing we have been using an F/A-18, instrumented to repeat a dive profile precisely but not modified in any way to shape the boom," says Coen. "We start the dive subsonic at 50,000 feet and allow the airplane to achieve supersonic just briefly in a steep dive so that the signal comes off the top of the airplane at about 45,000 feet at a shallow angle and travels a long distance through the atmosphere before it reaches the ground.

"In a small area of the ground, you end up with a signal that is kind of rounded and has a low peak pressure, the sort of signal we're looking for with our low-boom design. The signal hits the ground about 30 miles from the aircraft. Right below the aircraft you get an intense, focused boom. This maneuver is effective as a research tool as long as you've got a big desert to fly over—we've done all this testing at NASA Armstrong [the former Edwards AFB] and the test community we've used is the base housing community—a small area surrounded by desert. The people we're exposing to this sound depend for their livelihood on aircraft that regularly make sonic booms. They're not anti-sonic boom—for them it's the sound of freedom. We don't really get true data that we could give to the FAA to prove that we've achieved the right level, but we can use it to test the procedures and fine-tune the surveys and how we record the noise in the community."

The low-boom flight demonstrator is slated to fly in 2021, at which time researchers can do tests in other, average communities anywhere in the U.S. Lockheed is doing the preliminary design of the aircraft for NASA, and that phase ends this summer. "We will then have a new competition for the actual detail design and development of the aircraft. It's a clean-sheet airframe that uses a lot of existing components, mostly from existing military aircraft. The Lockheed design uses F-16 landing gear and a GE F414 engine. The canopy and cockpit area is the aft cockpit of a T-38. To maintain the desired supersonic shape, you can't have a forward-vision window, so we're going to use a synthetic external vision display to give the pilot essentially VFR-equivalent vision."

Is Lockheed's end goal some sort of airliner? "I can't say for certain," ventures Coen. "My guess is they want to position themselves to be a technology provider. I don't see them getting back into the airliner business. They might partner with somebody to do an airliner design. Lockheed is not involved with Aerion or any other SSBJ project. A few years ago they were partnered with SAI [Supersonic Aerospace International] on the design of an SSBJ, but that design has languished. The NASA effort is focused on a longer-term goal of airliner-type transportation. But there is significant overlap in the technologies we're working for business jets too. We still have a no-funds-exchanged agreement with Gulfstream under which we share information about understanding the community response to low-noise supersonics."

A few years ago Gulfstream took out patents on a nose spike designed to mitigate the boom. "They haven't shown anything relative to that in a while," observes Coen. "The breakthrough that we came up with by shaping really just happened in 2009-2010. We tunnel-tested it in 2011. The mathematicians who started this research a long time ago proposed essentially two target ground signals to achieve a low boom. For the longest time, people were trying to produce a signal like that. The breakthrough came when we learned that we don't really care what the shape of the signal is on the ground as long as it produces the loudness level that we like. So Gulfstream was the first to exploit that with its quiet spike, but very rapidly NASA working with Lockheed and Boeing realized you could also do it with a more conventional nose shape, for less mechanical complication. Gulfstream has not shown any designs publicly, and I'm guessing they're also looking at other approaches." Coen notes that Aerion is not pursuing a low-boom design.

Gulfstream's only input for this article was this: "Unfortunately, we don't have anything new to report in terms of supersonic. We have a small team dedicated to researching sonic-boom mitigation and working with other organizations to remove the ban on flying supersonically over land. It's important to remember that we already offer an aircraft that can fly at nine-tenths the speed of sound!"

Even if, like Aerion, you choose to fly supersonic only over water, a supersonic aircraft still has to meet engine noise requirements for takeoff and landing. "Right now the NOx emissions requirement applies only to takeoff and landing," says Coen, "so a Concorde-type turbojet is not going to cut it. Our vision at NASA is a little farther out, but we are looking at engine cycle designs, nozzle and inlet configurations that meet at least the existing regs and, longer term, the proposed Chapter 14 stringency. That's an important area of our work that the business jet folks need to pay attention to. In conjunction with our subsonic research efforts, one of the big areas of focus is on the reduction of emissions and fuel consumption. We've developed some interesting concepts for the combustor, which should reduce emissions even at altitude to a point that is compatible with preserving the ozone layer in the upper atmosphere. This sort of technology should be available to the likes of GE and Rolls if they're providing the power for supersonic business jets. GE and Rolls do seem to be the two engine OEMs most involved in possibly powering an SSBJ today. Pratt & Whitney is out there as the biggest manufacturer of supersonic engines now, but it doesn't seem to be showing anything related to commercial aviation."

Is it still assumed at this stage that an SSBJ or SST will be powered by something burning jet or bio fuel? Is there any radically different engine technology at a stage now that would convince someone to design a supersonic airplane around it? Coen: "I would have to say no. Anything other than jet fuel that can offer the energy density required by a supersonic aircraft is a long way in the future. Some of the weirder hybrid things that have been proposed…They rely on some new physics. But I will give credit to the English hypersonic folks who would essentially use fuel to cool the inlet air. It looks a little weird, but they're making good progress on it. That's a hypersonic propulsion system, but it might be closer than you think. Considering the era in which it was designed, the Concorde engine inlet is really an amazing achievement. Not only did it work, but it did so with a great deal of efficiency." In cruise, the inlet was responsible for about two-thirds of the net thrust required by the aircraft.

Each of Concorde's four Rolls-Royce Snecma Olympus 593 turbojets breathed through its own 11-foot-long inlet equipped with a complex system of ramps, actuators, valves and spill doors that with precise manipulation were able to slow the intake air to Mach 0.5 from Mach 2. "If you slow down from Mach 2, to 1.7 or 1.8," notes Coen, "you can design a pitot-type fixed-geometry inlet that has a normal shock that stands off a little way in front of it for what we call an external compression inlet that rivals the efficiency of Concorde's engines but without any moving component."

Supersonic Shove

GE Aviation has been working with Aerion "for some time now and doing studies around different configurations and options," according to Shawn O'Day, marketing general manager for GE Aviation business and general aviation and integrated systems. The agreement with Aerion (announced at EBACE this spring) "involves working together to define a configuration that makes sense for the program." At this stage scant detail about the agreement has been released. "We don't have a timeline drawn out. We've been talking for years, and this is the next step. Talks will get more serious about what the next stage is. It's tough to paint a picture here because a lot of what we face now is diving in to see what these next steps are. Those are going to be determined over the summer and beyond."

Does the agreement provide exclusivity to GE? Is there anything to prevent Rolls or Pratt jumping in? O'Day: "Aerion and GE are working together now; let's just leave it at that. Ask Aerion if there is any exclusivity to GE." Aerion chose not to elaborate on this and other questions, among them whether any money has changed hands yet and to what extent GE would be expected to be a risk-sharing partner putting skin in the game: "We expect to have more to say as we progress with the engine development process. Engineering teams at Aerion and GE currently are working jointly in an engine definition phase."

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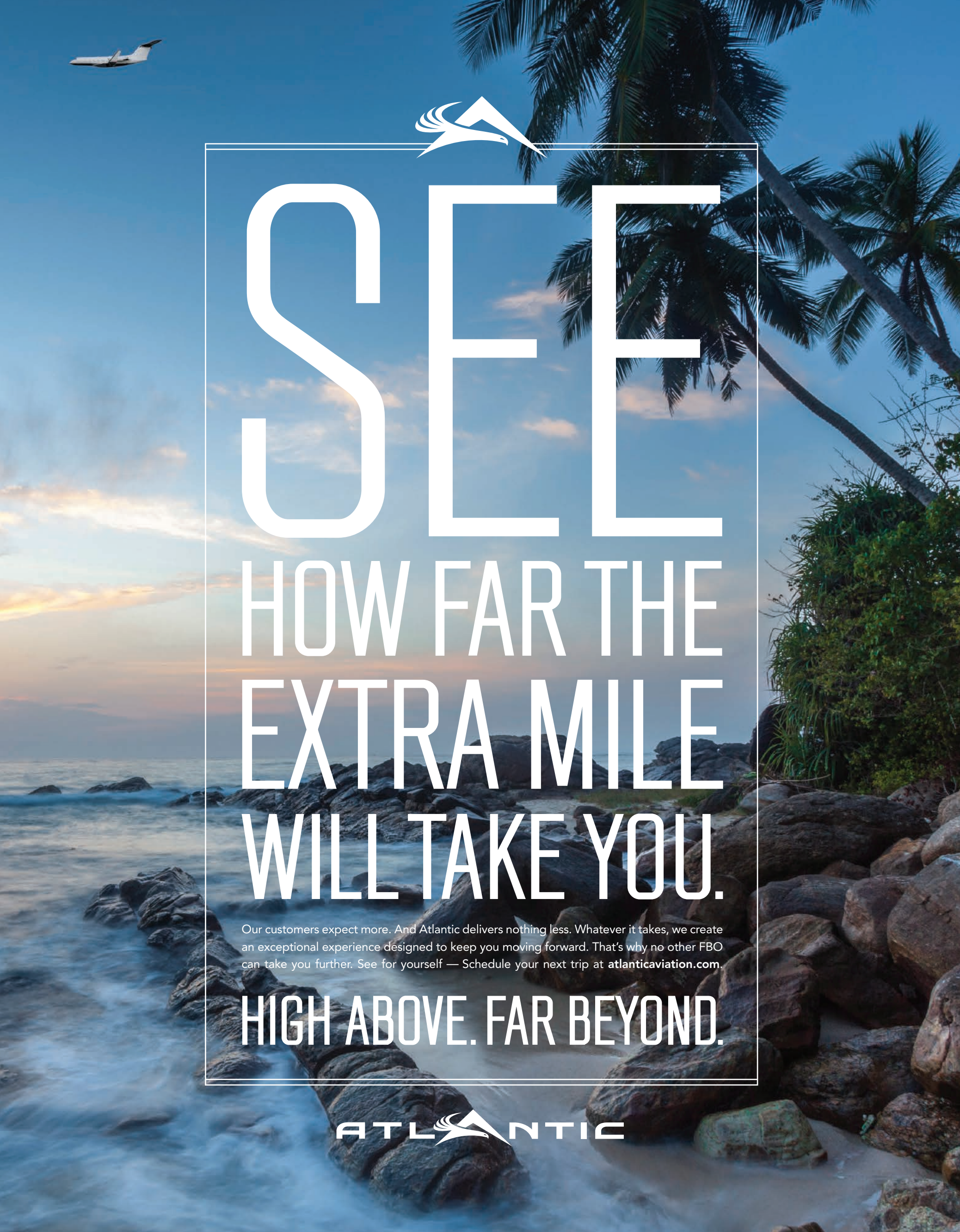
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CIVIL SUPERSONIC

Continued from page 44

Spike S-512	
Passengers (max)	18
Supersonic cruise	Mach 1.6
Supersonic range	5,580 nm
Subsonic cruise	Mach 0.95
Subsonic range	4,050 nm
Takeoff field length	6,000 feet
Max takeoff weight	115,000 lbs
Operating empty weight	47,250 lbs
Max fuel	56,000 lbs
Engines (two)	20,000 lbs each for t/o
Wingspan	58 feet
Length	122 feet

Has any particular GE engine, such as the Passport, caught Aerion's attention as a strong candidate to serve as the core of a supersonic engine? O'Day: "We're not disclosing that at this point. We're using existing capability and technology to address the need. Aerion requires somewhere in the region of 17,000 pounds from each engine for takeoff, but really what you're designing for is high-altitude thrust. Unlike a traditional airplane, the thrust levers on an SSBJ go forward for cruise at altitude. The engine is actually operating at a higher power at altitude, and it needs a lot of air flowing through the core. Bypass ratio is lower than on a traditional business jet engine, so the core has a lower-bypass fan attached to it and is bigger than what you'd normally have. Technically it's still a turbofan rather than a turbojet." Aerion did confirm to **AIN** that the AS2 will have fixed engine inlets, but "we need more engine data before we finalize the design. Concorde had variable inlets, but the challenges are fewer at Mach 1.5."

Will military engine people and expertise be formally assigned to this project? "We have people with both military and civil program experience," said O'Day, "so we will be drawing on them. But we have to be careful not to get into materials, technology and know-how that fall under export control laws. It has to be a commercial engine."

The other engine manufacturer publicly interested in getting on board the next generation of supersonic civil aircraft is Rolls-Royce, which can claim to have civil supersonic propulsion experience equaled only by Olympus 593 partner Snecma (Safran). The British company is looking into supersonic concepts and following supersonic business aircraft development programs. Dr. Dean Roberts, market analysis executive for business aviation at Rolls-Royce, said "We have supersonic civil aircraft experience, and can draw on our fighter experience as well." He noted that until regulatory hurdles can be overcome to allow supersonic flight over land, the "halfway house" will be a hybrid SSBJ.

The company has done detailed analysis, Roberts said, that showed the hybrid approach is "quite an attractive proposition—looking at the routes you could fly there are very clear benefits." On the economic side, R-R's analysis suggests "the greater the distance you can go, the more people will pay for speed. What we think is that if you radically increase speed, you will get an exponential not a straight-line relationship so you can substantially raise the price," a prerequisite to make such programs viable. Thus "it will not destroy the subsonic world" as the number of aircraft would be small, tying in with the growing number of billionaires.

Spike, Boom, Pow, Zap

Spike founder Vik Kachoria has put his own money into the S-512 SSBJ program but he also has investors, "all U.S. individuals and commercial entities so far, but we have also talked with investors in the Middle East and Asia."

The all-composite S-512 is being designed to cruise at Mach 1.6, which Kachoria defines as "a sweet spot for boom, airframe temperature and range." His background is in physics and math and he has worked at NASA and GE Aircraft Engines, "and our chief engineer was at NASA for 20 years and at Boeing for 20 years, specifically working on supersonic and hypersonic vehicle design."

Kachoria is playing his cards close to his chest at this stage and reveals little detail about the S-512 beyond what is on the website. He does say, however, that "we have talked with two of the three engine manufacturers." GE is already under an agreement with Aerion but the partnership appears to be loose on ties; maybe the two are Rolls and Pratt, maybe not. "Our engines will not be afterburning—too much noise, too much fuel burn—and boom shaping is the number-one priority for our program. We're talking with NASA and Lockheed Martin."

Boom is working on the design of a small supersonic airliner, and the company says the design "can also be configured as ultra-VIP personal or business aircraft." Declaring that "a major problem with Concorde was that it had more seats than could be filled at the required prices," Boom says its aircraft will have just 55 seats, similar to the number of seats in the premium cabin of a typical widebody airliner: "Final ticket prices will be set by airlines, but we are designing the aircraft so that airlines can operate profitably while charging the same fares as today's business class."

While designing its airliner to have a boom 30 times quieter than Concorde's and takeoff noise quieter than required by Stage IV, Boom rails against the ban on overland supersonic operations in the U.S.: "This ban should be reversed and replaced with a commonsense noise standard, set to promote efficient, affordable supersonic flight while disallowing nuisance. In the meantime, Boom will focus on routes that are primarily overwater—such as New York to London or San Francisco to Tokyo, flying subsonically when over land. More than 500 routes benefit immediately and significantly from supersonic speeds."

Boom plans to fly the XB-1, a supersonic two-seat concept demonstrator under construction at Denver Centennial Airport, next year. It will be powered by three GE J85 turbojets. The airliner is intended to cruise at Mach 2.2, at which the nose and leading edges of the carbon-fiber structure will reach as much as 345 degrees F (174 degrees C.) on a hot day. Concorde's speed limit of Mach 2.02 was defined by its aluminum structure: at that speed at 60,000 feet, the nose was 260 degrees F. (127 degrees C.) and the wing leading edges were 210 degrees F. (99 degrees C.), and sustained forays into temperatures above those harm the molecular structure of aluminum. Boom emphasizes that modern composites are a more suitable material for building a high-speed airplane.

The Allure of Speed

I think back to one of my seven rides in Concorde for a case study in the allure of speed. One of the passengers was about as close as humanly possible to Mr. Creosote, the impossibly portly restaurant patron in the Monty Python movie, *The Meaning of Life*, who, after consuming every item on the menu and washing them down with two jeroboams of wine and a crate of ale, exploded. This passenger's decidedly non-aerodynamic frame was blistering through the dwindling atmosphere at the muzzle velocity of a .22 rifle bullet, wedged cattawampus in one of the SST's modest chairs with a seatbelt extender. He had a choice and would have been way more comfortable spending seven hours in a 747's first-class throne, but the allure of extreme speed for three hours of discomfort was more powerful. I had only admiration for his enduring such contortions to log the ride of his life.

This anecdote perhaps partially addresses a question raised by some about the ultimate market size for an SSBJ. They question whether spending fewer hours in a relatively small cabin will trump spending more hours in the sumptuous, connected surroundings of a modern subsonic large business jet or private airliner, literally a home and office in the sky, complete with multiple different zones, among them a bedroom with en suite marble/granite bathroom with shower.

Bob Witwer, vice president of advanced technology at Honeywell Aerospace, has some thoughts on this: "Aerion's cabin is nice, it's pretty, but it's not that roomy. It's about like a super-midsize. [The AS2's cabin is 30 feet long from the cockpit divider to the rear of the lavatory. For good fuselage shaping, cabin width varies: about 66 inches immediately aft of the cockpit divider in the forward lav/galley area; 87 inches in the forward seating area; 90 inches in the aft seating area; and 96

Aerion AS2	
Passengers (max)	Nine
Top-speed cruise	Mach 1.5
Top-speed range	4,000 nm
Long-range cruise	Mach 1.4
Long-range range	4,750 nm
'Boomless' cruise	Mach 1.2
'Boomless' range	3,750 nm
Transonic cruise	Mach 0.95
Transonic range	5,300 nm
Takeoff field length	7,500 feet
Max takeoff weight	121,000 lbs
Basic operating weight	57,801 lbs
Max fuel	Approx. 61,000 lbs*
Engines (three)	15-17,000 lbs each for t/o
Wingspan	61 feet
Length	170 feet

*With approx. 2,000 pounds for eight passengers and bags

inches in the aft lav. By contrast, a Challenger 350 super-midsize cabin is 25 feet 2 inches long and 84 inches wide.]

"The laws of aerodynamics and the cost of making and operating such an aircraft mean that you want to keep it as narrow as possible. Think about the choice between that airplane, which gets you there a couple of hours earlier and then you get stuck in traffic at the destination, and a bigger cabin with connectivity as seamless as being on the ground. Setting air transport aside for a second, there's been a push in the bizjet market forever to try to make the aircraft a flying office, with all its comforts and amenities, to the point that the transition is transparent to the executives flying. If we go down the path of providing much greater bandwidth for connectivity in the air, using satellites for oceanic flights, such as with Honeywell's GX Aviation, and it keeps growing in bandwidth just like it has on the ground, then how much bigger a deal is it to go from NY to Johannesburg and save three hours of flight time?"

Witwer also shared his thoughts on some avionics-related nuts and bolts facing SSBJ developers: "I'm sure there are going to be subtleties as we dig into a supersonic aircraft. Flight controls become more complicated, especially when you remain in the transonic region (Aerion is supersonic but not high Mach [and is being designed to cruise efficiently at Mach 0.99]), and that introduces some design complications. When they're done right they'll be transparent to the pilot—that's just the nature of bridging the gap from subsonic to supersonic. As far as other avionics and systems go, such as FMS, I don't know that there would be a need to intrinsically change the design. FMSes do efficiency calculations, so modeling for those would change, and to a greater degree than they do today when we go from one subsonic aircraft to another. We collaborated with NASA Langley on a pilot-friendly intuitive cockpit presentation for an SSBJ to show the effective sonic boom from a geographic point of view in relation to where the airplane was. If the NASA and Lockheed work in mitigating the boom pays off, we'd have to revisit depicting the boom; NASA did all the algorithmic work there. I don't know if Aerion has chosen an avionics supplier but they haven't talked with us."

Laura Smith-Velasquez, a sonic-boom display researcher at Rockwell Collins, does see a place for certain new capabilities in an SSBJ's avionics suite: "You can develop a low-boom aircraft but you can't develop a no-boom aircraft. There will always be a sonic boom if you are traveling faster than the speed of sound. The resulting sonic boom is managed (dependent on atmospheric conditions, which are highly dynamic) via the flight plan/profile an aircraft will fly. A sonic boom footprint display is necessary to predict (based on atmospheric conditions) where the footprint will reach the ground and allow pilots to modify their flight plan and mitigate the sonic boom, keeping it at either an 'acceptable level' or flying at a Mach cut-off airspeed and altitude so it does not reach the ground. Since sonic boom propagation depends on the area of atmosphere from the aircraft to the ground through which the pressure wave travels, it will greatly depend on the weather you are flying through and above. Currently we have forecast data we can use to characterize the atmosphere the pressure wave is traveling through. This is highly dynamic and can change in flight. The sonic boom display system will need to monitor these changes for negative impacts and alert the pilots to resolve any issues by modifying the flight plan." ❑

Boom Mach 2.2 airliner	
Passengers (max)	55
Supersonic cruise	Mach 2.2/1,451 mph
Supersonic range	4,500 nm
Subsonic cruise	Mach 0.95
Subsonic range	Not announced
Takeoff field length	8,500 feet
Max takeoff weight	Not announced
Operating empty weight	Not announced
Max fuel	Not announced
Engines (three)	Not announced
Wingspan	60 feet
Length	170 feet

Boom XB-1 demonstrator	
Crew	2
Supersonic cruise	Mach 2.2/1,451 mph
Supersonic range	1,000+ nm
Takeoff field length	8,500 feet
Max takeoff weight	13,500 lbs
Operating empty weight	Not announced
Max fuel	Not announced
Engines (three)	GE J85-21 turbojets
Wingspan	17 feet
Length	68 feet

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DAVID McINTOSH

Paris Air Show Report

Sweltering skies didn't dampen the ardor of attendees, although it did result in crowded exhibit halls and a new Paris pastime, chalet hopping to take advantage of cold air-con between dashes to the static display. The biennial aerial extravaganza certainly lived up to its billing and the show delivered on every front, from fantastic aerial displays to 130 fascinating aircraft and halls full of aerospace goodies.

Debutantes take bow at Paris salon

As the aviation industry convened in Paris last month for the city's biennial Salon du Bourget, aircraft manufacturers and integrators pulled out all the stops to show their newest flying machines to visitors from all over the world. They also hoped to solidify some sales, or at least pave the way for future transactions. There were 130 aircraft at this year's show (36 of them participating in the flying display), more than enough to satisfy the curiosity of the most avid aviation geek, or fit the needs of any type of buyer.

The debutantes were wide-ranging this year. Representing the airliner sector were Mitsubishi's MRJ-90; the split-winglet Airbus A380plus and the A321neo and A350-1000; and from Boeing the 787-10 Dreamliner and 737 Max 9. Embraer's beautifully painted E192-E2 "Profit Hunter" made its first show appearance, as did Antonov's re-engined An-132D.

Flying the bizav flag, Gulfstream brought the soon-to-be-certified G500 fly-by-wire business jet, equipped with a production interior. Not to be outdone by the heavy metal at Paris was Cirrus Aircraft's recently certified single-engine Vision Jet.

Two other small aircraft made their first appearance at the show: L3's Longsword and the LASA T-Bird from Bulgaria, both adapted from agricultural airplanes for military applications. Embraer's KC-390 multimission military transport flew during the daily demonstrations, as did Lockheed Martin's F-35A fighter. Also joining this year's military parade was Lockheed Martin's LM-100J, the civilian cargo version of the C-130J Hercules; the Kawasaki Aerospace P-1, which features the world's first application of a fly-by-light flight control system; and the Wing Loong II UAV, making its first appearance outside China. —*M.T.*


DAVID McINTOSH

Lockheed Martin and the U.S. Air Force brought two F-35A stealth fighters to Paris. This marked the international debut for the conventional takeoff and landing version of the Lightning II. The airshow display was flown by company test pilot Billie Flynn, and demonstrated a considerably extended envelope, compared to the F-35B routine at Farnborough last year.

Boom unveils completed design, announces orders

As of the middle of last month's Paris Air Show, aspiring supersonic airliner manufacturer Boom held purchase commitments from five airlines for 76 aircraft, slated to enter service by 2024. The company unveiled the completed design of a sub-scale prototype at the Salon. *(See also Civil Supersonic, page 42.)*

"The airlines that are placing reservations are putting real money against them," said Blake Scholl, Boom founder and CEO. "These aren't letters of intent."

In an update during the show, Scholl confirmed that the one-third-scale demonstrator unveiled in November, dubbed the XB-1 or Baby Boom, has completed preliminary design review (PDR) and is scheduled to fly next year.

Scholl confirmed to **AIN** that Boom is exchanging information with the FAA about certification. So far, he said, there are no show-stoppers. "There are challenges, but no blockers," Scholl told **AIN**. "The feedback from regulators is there are some things that will be special [conditions] on the airplane, but no blockers. We're deliberately choosing technologies that have a certification roadmap."

Boom also used the Le Bourget backdrop to unveil a second cabin configuration with 45 seats, 10 of them first class. This, Scholl said, appeals to longer-range flights such as transpacific routes, where a lie-flat seat might be desirable. The standard Boom configuration of 55 business-class seats with about 75 inches of pitch, ideal for transatlantic routes that take three to four hours, doesn't need the lie-flat seats found in today's premium cabins because the flights aren't long enough, he said.

The addition of the second cabin configuration suggests that Boom is gaining interest—and possibly undisclosed orders—from operators in the Middle East and Asia, which operate many lucrative, ultra-long-haul, overwater routes. Scholl would not disclose any additional customers, noting only that the Boom "is more than a transatlantic aircraft." The lone identified customer is Virgin Atlantic.

A Boom passenger aircraft carries a list price of $200 million. Scholl said that the ability to fly more cycles in less time than current subsonic long-range aircraft means operators will make money selling 45 to 55 tickets on intercontinental routes. The initial target round-trip ticket prices are comparable to those for today's business-class seats, or about $5,000 for London-New York. Scholl believes technology will help reduce operating costs even further, making cheaper tickets possible.

Seeking to pick up—and go beyond—where Concorde left off, Boom believes technological advancements in the last 50 years make its vision not just possible but achievable, even with current supersonic overland restrictions. Composite materials mean the highly complex fuselage shape, featuring a chine and a refined delta wing with swept trailing edge, can be built without bending any metal. Using composites also eliminates several other technical challenges that supersonic flight brings, such as selecting a metal with enough heat resistance to withstand speeds above Mach 2, Concorde's long-range cruise speed. Boom will be designed for Mach 2.2 cruise and a range of about 4,400 nm.

Baby Boom will be powered by three non-afterburning General Electric J85-21 turbojets with variable-geometry intake and exhaust. The company has not yet selected an engine for the airliner. The demonstrator will fly with Honeywell avionics, and the airframe is being made from Tencate carbon-fiber prepreg, with 3D-printed components from Stratasys.

Boom has $41 million in funding, which Scholl says should be enough to take the company through Baby Boom's first flight "with some margin." The 76 aircraft on order are sufficient to launch the aircraft, he added.

Scholl reiterated that Boom's focus is on the passenger-transport market, noting that he believes there is plenty of room for a supersonic business jet—several of which are in development.

"We look at those folks as fellow travelers on the road to a faster future," Scholl said. "Our focus is on something that's for a wider audience." Boom calculates that its aircraft is economically viable on 500 routes, and that assumes current regulations banning supersonic flight—and the sonic booms they produce—over land don't change. "We'd love to see that reversed," he said. "I think when people find they can get from San Francisco to Tokyo faster than they can get from San Francisco to D.C., they will think, 'This needs to change.'" —*S.B.*

Boeing launches Max 10 on fat order book

Boeing officially launched the 737 Max 10 at the Paris Air Show last month, in an answer to Airbus's hot-selling A321neo. Boeing already has orders for 240 copies from 10 customers; the new derivative incorporates a pair of fuselage plugs to extend the Max 9's length by 66 inches. Among the other changes are a levered main landing gear, minor wing changes to accommodate the 777-style

landing gear and a four-inches-wider mid-exit door to allow for the extra 12 passengers, bringing maximum capacity to 230.

Speaking at a pre-show briefing at Boeing Commercial Airplanes headquarters in Seattle, BCA head of product development Mike Delaney said the company started offering the airplane in its current form last October, after originally considering more powerful engines. Powered by the same CFM Leap-1Bs found on the rest of the Max line, the Max 10 might have come with Leap-1As or Leap-1Cs if Boeing had stuck with its original plan.

"What [airlines] really wanted was seats and economics," said Delaney. "Remember the A320 series is carrying 25 percent more thrust than we are. We're fundamentally a 28k engine, they're fundamentally a 34k engine. That's a huge difference in airplane and weight, and you can't put that kind of stuff on a 737 or A321 and not degrade the economics. So the customers came back and said, 'No, what we really want is the economic horizon of the 737.' And then they came in and [asked], 'How many seats can you put in it?' So we went back to them, and this is the airplane we have."

Designed to hold 188 seats in a two-class configuration, the Max 10 carries the same passenger capacity as the A321neo under those rules, while in a single-class arrangement the Boeing aircraft holds slightly fewer. However, Boeing promises a 5 percent lower fuel burn per seat and more range in the Max 10, creating what Delaney characterized as a winning competitive formula. Airbus specifies a range of 4,256 nm for an A321neo equipped with Sharklet wingtips.

Orders for the newly launched Boeing Max 10 announced at the show include a 10-aircraft MOU from China's BOC Aviation worth $1.25 billion and a conversion of a Gecas order for 20 Max 9s to the same number of Max 10s. Gecas holds orders for 170 Maxes, the most of any leasing company. Dublin-based CDB Aviation Lease Finance added to the total by another 10 Max 10s, in an MOU also covering 42 Max 8s and eight 787-9s.

Appearing at a briefing with Boeing Commercial Airplanes president Kevin McAllister, CDB Aviation CEO Peter Chang promised big plans for the now 100 Boeing airplanes in its portfolio. "Our new vision is to propel CDB Aviation into a formidable global aviation leasing platform," he said. "The 737 Max and 787 Dreamliner will play a key role in bolstering our fleet and advancing our global market presence to fulfill the vision." Yet another leasing company order came from Tibet Financial Leasing, which signed an MOU for 20 Max jets, including Max 10s and Max 8s, worth $2.5 billion at list prices. —*G.P.*

Airbus unveils A380plus concept

Airbus announced the A380plus concept, featuring split winglets and other enhancements adding an estimated cost-per-seat benefit of 13 percent, according to Airbus.

Airbus revealed a development study for an enhanced A380 called the A380plus that features new split winglets, measuring 4.7 meters in height, and a so-called "downlet" that measures 1.2 meters. The new winglet appeared on the fourth A380 test aircraft, on display at the show. Airbus expects the winglets and other aerodynamic improvements to result in fuel burn savings of 4 percent.

The study also involves an "optimized" A380 maintenance program and new cabin features first shown at Aircraft Interiors Expo (AIX) in Hamburg last April. Overall, Airbus estimates the cost-per-seat benefit to total 13 percent.

"The A380plus is an efficient way to offer even better economics and improved operational performance at the same time," said Airbus COO for customers John Leahy. "It is a new step for our iconic aircraft to best serve worldwide fast-growing traffic and the evolving needs of the A380 customers."

The new cabin layout, based on the "cabin enablers" presented at AIX, allows up to 80 more seats through the use of redesigned stairs, a combined crew-rest compartment, sidewall stowage removal, a new nine-abreast seat configuration in premium economy and 11-abreast in economy. The A380plus will have a higher maximum take-off weight of 578 metric tons, stretching range by 300 nm or allowing for the carriage of the extra passengers over today's range of 8,200 nm.

The revised A380 would also introduce longer maintenance check intervals, less downtime for the six-year check and systems improvements designed to cut maintenance costs and improve aircraft availability. —*G.P.*

ATC proposal

▶ *Continued from page 34*

the assets owned by the FAA would be transferred at no charge. Under the White House vision, the organization would be managed by a professional board of directors that have a "a fiduciary responsibility solely to the new ATC entity." The organization should represent all users and "no group should have even the appearance of influence over the board of directors." The Transportation Secretary would select members from candidates supplied by "nominating groups" representing a spectrum of stakeholders.

Transportation Secretary Elaine Chao said the proposed reforms will accelerate the deployment of new technology and usher in a new era of enhanced safety and ATC system performance. But she made a point of complimenting the FAA's controller workforce, most of which is unionized.

Chao, who subsequently testified in consecutive days on Capitol Hill before the House Transportation and Infrastructure (T&I) Committee and Senate Commerce Committee, recognized fears surrounding general aviation and rural community access. She said she has worked with business and general aviation groups and added she wants to "partner with them to address some of the issues."

She further dismissed concerns that the system would be run by the airlines, saying it would be run by an independent board with only a couple of seats appointed by the airlines. "The board will not be dominated by airlines," she emphasized.

However, Chao also acknowledged that "in broad terms," a private air traffic board would have an incentive to prioritize operations of larger airports, but said "we are open to working with Congress" on the details to preserve access. "Rural America overall is an important aspect. We are open to discussion about that."

In the House T&I Committee, the Trump proposal received a mixed reception, with many of the Republicans referring to a need for change and emphasizing "the status quo is unacceptable," while Democrats questioned the capitalization of the new organization, long-term labor outlook and prospects for environmental reviews for future changes.

Rep. Rick Larsen (D-Washington), noting that comprehensive reauthorization encompasses a spectrum of issues, expressed concern that the controversy surrounding the ATC reform could lead Congress to another short-term bill rather than a long-term bill. He asked if Chao would support moving forward with reauthorization without addressing the ATC reform issues.

Chao responded that the administration's preference is that "liberation" of the ATC organization would be considered and passed. But she added, "We want to work with the committee and the Congress."

"There is consensus about the need for a long-term FAA bill that reforms the FAA's certification processes, integrates unmanned aircraft and improves safety," Larsen said. "That's the bill we should be talking about today. That's the bill we must enact with no further delay. Absolutely no science experiments, just bipartisan provisions that have broad stakeholder support and should have already been enacted."

Larsen has teamed with Rep. Pete DeFazio (R-Oregon), the ranking Democrat on the T&I Committee, to offer an alternative proposal that would instead call for a series of personnel and procurement reforms and the removal of the Airport and Airway Trust Fund from the constraints of the congressional appropriation process. The lawmakers said they have the co-sponsorship of every Democrat on the panel and would be reaching out to other Democrats and Republicans.

Shuster said that the Democrats' proposal is an acknowledgement that the current system is broken. "However, we disagree on how to fix the problem," Shuster said. "[The Democrats' alternative] rehashes years and years of ineffective congressional reforms aimed at allowing the FAA to act like a business and modernize the ATC system. If government is clearly the problem, and if exempting ATC service from virtually every government system, process and procedure is the offered solution, why keep it in the government at all?"

In addition to the House Democrat opposition, Chao faced a skeptical Senate Commerce Committee, where she heard further concerns about rural community and contract tower protections from several members of the committee on both sides of the aisle, among them chairman John Thune (R-South Dakota).

Sen. Bill Nelson (D-Florida) also reiterated, "I am opposed to ATC privatization, no matter what form it might take. We currently have the safest ATC system in the world. Why risk that by handing the whole thing over to an untested, unproven entity?"

Industry Response

While protections were outlined to preserve general aviation access, GA groups were unswayed in their opposition. The groups sent a joint letter to the Trump Administration expressing their concerns.

"It's difficult to see how one 'Makes America Great Again' by emulating foreign ATC systems that are smaller and demonstrably less safe than our own," said National Air Transportation Association president Martin Hiller. "The Trump proposal introduces significant uncertainty to the world's largest, most complex and safest ATC system, offering a radical solution to issues easily addressed within the FAA's current framework."

NBAA president and CEO Ed Bolen remained wary of the underlying objectives of ATC reform and long-term ramifications. "Unfortunately, the recent discussion about privatization is really about the airlines' push to gain more control over our ATC system, so that they can run it for their own benefit, and is a sideshow to a serious and constructive discussion about building on the progress currently under way on NextGen," Bolen said. "We are concerned that those left behind under ATC privatization would be the citizens, companies and communities that rely on general aviation for all manner of services."

Meanwhile, the Aircraft Owners and Pilots Association took aim at the prospect of user fees. "We have consistently said we will not support policies that impose user fees on general aviation," noted AOPA president and CEO Mark Baker. "As the air traffic debate continues, we are also concerned about the impact of these proposed reforms on general aviation based on what we have seen in other countries."

While the National Air Traffic Controllers Association (Natca) had backed the independent ATC concept as unveiled last year, the association was more measured in its response to the Trump proposal. "Natca shares the Administration's commitments to infrastructure modernization and providing the National Airspace System with a stable, predictable funding stream," said Natca president Paul Rinaldi. "We look forward to reviewing the specifics of the ATC reform legislation so we can evaluate whether it satisfies our union's principles, including protecting the rights and benefits of the ATC workforce." ❑

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NTSB celebrates 50 years of safety

by Kerry Lynch

The crash of a Platinum Jet Challenger operating under Part 135 at Teterboro in February 2005 was the result of the pilots' failure to ensure the airplane was loaded within weight-and-balance limits and their attempt to take off with the center of gravity well ahead of the forward takeoff limit. But it was the contributing factors that sent ripples through the industry: Platinum Jet's operation without proper FAA certification, failure to maintain operational control by Darby Aviation and a tacit approval by the FAA of the arrangement between Darby and Platinum Jet. The findings spurred one of the most comprehensive looks throughout the industry of the meaning of operational control.

Doug Carr, v-p for regulatory and international affairs for NBAA, called the accident and the subsequent NTSB findings an "industry-changing event," saying it resulted in a wholesale change regarding the understanding and application of operational control. "Those changes are still something operators pay close attention to today," Carr said.

The NTSB's findings in this accident, as well as numerous others, such as the May 2014 crash of a Gulfstream IV in Bedford, Mass.; the 2004 Challenger crash in Montrose, Colo.; or the 2005 crash of a Circuit City Citation 560 in Pueblo, Colo. led to industry soul-searching and action on issues such as professionalism, compliance, de-icing practices and missed approaches, to name a few.

Those investigations are among the 132,000 aviation accidents the NTSB has engaged in since its founding in 1967. Since that time the agency has issued 14,500 safety recommendations throughout all modes to 2,500 recipients. Considering the agency has no regulatory authority, it has had remarkable success: 80 percent of those recommendations have been adopted.

The agency is celebrating its 50-year heritage this year, built on the thousands of investigations it has completed across aviation, highways, marine, pipeline and railroads and thousands of lives saved.

"The NTSB's work throughout our 50-year history is responsible for the transformational improvements that make transportation safer for all of us today," said acting chairman Robert Sumwalt. "The transportation industry is focused on a future with zero accidents."

The roots of the NTSB trace back much earlier than 1967. Congress granted the first authority for aircraft accident investigation as early as 1926 under the Air Commerce Act. That investigation authority was strengthened to allow procedures such as public hearings after public interest heightened following crashes that killed Knute Rockne in 1931 and Will Rogers and Wiley Post in 1935, along with the crash of the *Hindenberg* in 1937, according to a historical accounting by the Rand research institute. Those crashes also led to the handing over of the responsibility of accident investigation to the new Department of Commerce agency, the Civil Aeronautics Board (CAB), in 1940. The CAB held that responsibility for many years.

The NTSB Training Center is home to a reconstruction from the wreckage of TWA 800, a reminder of the detective work the Board undertakes, sometimes under extreme weather, geographic and political conditions.

But the number of accidents swelled as the aviation industry began to take off, and after a TWA Constellation collided with a United Airlines DC-7 over the Grand Canyon, Congress passed the Federal Aviation Act in 1958, laying out a framework that would ultimately be incorporated into the modern NTSB.

In 1967 Congress created a new U.S. Department of Transportation to house all the various transportation agencies. As part of that move, a quasi-independent NTSB was established, led by a board of five presidential appointees. In creating the new agency, President Lyndon B. Johnson said the NTSB's sole function "will be the safety of our travelers."

Seven years later, Congress moved the agency outside the department, believing that "No federal agency can properly perform such (investigatory) functions unless it is totally separate and independent from any other…agency of the U.S."

Since that time the NTSB's role has expanded and evolved. In 1992, Congress passed a law to transfer the adjudication of enforcement actions to the NTSB from the FAA. This role, Carr said, improved notably nearly a decade later after the NTSB released a recommendation that gave more transparency into enforcement actions against certificate holders, Carr said.

As a result of the 1988 Pan Am 103 bombing over Scotland, the 1996 explosion of TWA 800 in New York and the 1996 crash of ValuJet 592 in the Florida Everglades, the NTSB was given the responsibility of coordinating assistance for victims' families.

The agency also has taken on more outreach and educational duties, establishing the NTSB Academy in 2000. The academy not only provided technical training for the agency's own employees, it opened its expertise to the community. The Board opened a facility to house the academy—now called the NTSB Training Center at the George Washington University Virginia campus in Ashburn, Va.—in August 2003. That facility has since hosted hundreds, if not thousands, of seminars and classes surrounding transportation safety.

It is also home to a haunting display: a reconstruction from the wreckage of TWA 800. Thousands of pieces of the shattered 747 were patched together, providing a chilling glimpse into the difficulty of the agency's work and the detailed detective work that it undertakes, sometimes under extreme weather, geographic and/or political conditions.

In the case of TWA 800, perhaps the agency's most extensive, controversial and expensive accident investigation, most of the pieces of the airliner were excavated from the ocean floor and gathered into a warehouse on Long Island.

After painstaking re-creations and testing, the NTSB pointed to ignition of the flammable fuel/air mixture in the center wing fuel tank. The findings and associated recommendations spurred rules for transport category aircraft from fuel-tank design to mandatory wiring inspections.

Focus on Business Aviation

NTSB investigations weren't limited to large-aircraft accidents. The investigation into the crash of the Cessna Citation 560 that was owned by Circuit City Stores and operated by charter/management firm Martinair led to a recommendation regarding procedures for the use of de-icing boots. The business aviation industry pushed back on that recommendation, Carr recalled, noting the procedures the Board recommended were not viewed as the safest route for operators.

The Safety Board also came under fire by some pundits for its probable-cause finding in the Gulfstream IV crash in Bedford, Mass. The NTSB cited as the probable cause of the accident "the flight crewmembers' failure to perform the flight-control check before takeoff, their attempt to take off with the gust lock system engaged, and their delayed execution of a rejected takeoff after they became aware that the controls were locked."

The agency further cited "habitual noncompliance" with checklists, and said "the flight crew's omission of a flight-control check before the accident takeoff indicates intentional, habitual noncompliance with standard operating procedures."

Some pundits believed the NTSB should have faulted the gust lock system rather than the pilots. While the NTSB did recommend incorporation of a modified system, it also called on the business aviation industry itself to look at metrics to determine the extent of noncompliance and issued a safety alert to underscore the importance of following checklist procedures.

Industry Partnerships

The sharpened focus on business aviation professionalism and intentional non-compliance in the aftermath of the Bedford investigation remains a top issue today.

That accident produced one of nearly a dozen recommendations aimed directly at NBAA over the years.

Another association, the Air Charter Safety Foundation (ACSF), traces its beginnings to the investigations of a spate of high-profile accidents involving air charters in the 2000s, the Challenger crashes in Teterboro and Montrose among them, said ACSF president Bryan Burns. Those crashes not only raised the question of operational control, but shone a spotlight on charter brokering practices.

These investigations spurred the FAA to bring its concerns to the National Air Transportation Association (NATA), Burns said. NATA responded by creating the ACSF in 2007. It also led to the creation of the association's industry audit standard.

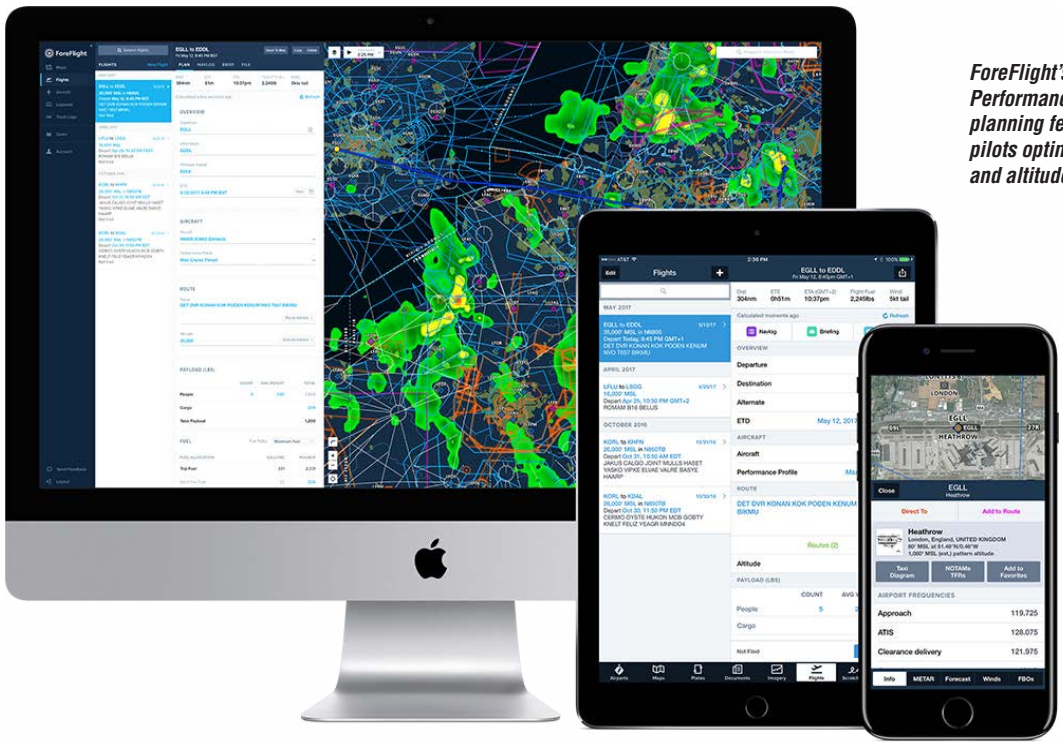
The NTSB is an integral partner for the ACSF. Every year the NTSB Academy hosts the ACSF's safety symposium, and frequently an NTSB member is among the speakers at the event. Burns noted that over the years, the ACSF began scrutinizing the agency's "Most Wanted" list of safety improvements for topics that could be addressed at the symposium. This has led to key discussions in areas such as runway excursions, loss of control, procedural noncompliance and distraction, Burns said.

In addition to shaping safety discussions, NTSB recommendations have effected numerous regulations, from mandatory installation of ground proximity warning systems to flight data recording requirements and actions regarding icing.

Carr cited the strong track record of acceptance of the NTSB safety recommendations. "The fact that 80 percent of the NTSB's 14,522 safety recommendations since 1967 have been acted upon favorably is testament to the work of NTSB employees," the Safety Board said in celebrating its anniversary.

"The NTSB was established to ask 'why?' when an accident happened, and to ask 'why not?'" Sumwalt said. "Why not improve regulations, training or a certain aspect of the vehicle or the environment?"

The NTSB now has a staff of 430, and each year it investigates an average of 1,600 aviation accidents and incidents and issues 280 safety recommendations. ❑



ForeFlight's new Performance Plus flight-planning features help pilots optimize routing and altitudes.

ForeFlight updates app with performance planning

by Matt Thurber

Following its purchase of Denmark-based flight-planning engine developer AviationCloud in 2015, ForeFlight has released its performance flight-planning service, which provides flight planning for high-performance aircraft from piston-powered singles through jets. The new Performance Plus service adds a third tier to ForeFlight's subscription plans, and it costs $299.99 per year for individual users. For multi-pilot flight departments, the new features are part of the Business Performance package, which costs $300 per seat per year.

Thanks to AviationCloud, ForeFlight Performance Plus lets users plan flights anywhere in the world. AviationCloud was founded by Kim Lantz and employs a team of doctorate-level programmers to provide flight-planning services to trip-support and flight-planning companies. AviationCloud still provides these services to third-party companies while also creating the foundation for ForeFlight's new capabilities.

Also included in the new Performance Plus/Business Performance service level is integration with JetFuelX contract fuel prices. ForeFlight purchased JetFuelX early last year.

With the full integration of AviationCloud flight planning, the ForeFlight procedure advisor will now work worldwide, although some functionality is waiting on the planned integration with Jeppesen charts, which could happen as early as this month. ForeFlight also recently announced integration of Jeppesen global high-resolution terrain and obstacle data in all ForeFlight service levels. This means that ForeFlight's synthetic vision view is supported worldwide by Jeppesen data.

Complex Airspace Requirements

Adding AviationCloud capability in ForeFlight was necessary because of the complexity of airspace outside the U.S., especially in Europe. According to Andy Maag, ForeFlight executive vice president of product, Eurocontrol publishes 20,000 constraints in European airspace four times a day, and flight-planning software must take all of these constraints into account.

When planning a flight in Europe, a pilot can use a Eurocontrol-proposed route, or select the most efficient route, and ForeFlight can plot that route according to those constraints, based on the performance of the aircraft.

The new version of ForeFlight includes hundreds of performance profiles for a variety of airplanes, incorporating aircraft manufacturer climb, cruise and descent performance. On top of that, the performance models also consider various altitudes, weights and temperatures so that the pilot can choose from a list of possible altitudes to find the most efficient in terms of speed and fuel burn. Users can also customize the profiles and add or modify weight and fuel data.

ForeFlight has simplified the app's interface, consolidating the former File & Brief view into a single-form view called Flights. This now includes route information, payload calculations, and fuel planning. The payload calculator provides a quick view of structural weight limits to help pilots see if there will be an issue with an overweight takeoff and landing.

To help pilots assess fuel requirements, the new Performance Plus provides multiple fuel policies to suit the mission. These include minimum fuel required, extra fuel (user's discretion), maximum fuel (to max ramp weight), landing fuel (user-defined amount) and manual fuel (completely user-defined).

Within the Flights view, Route Advisor and Altitude Advisor can help the pilot decide on the optimum route or altitude, based on wind-optimized routing from AviationCloud calculations. The top choice is the AviationCloud autoroute, which is the most efficient, but the user can select from a list of options, including recently cleared ATC routes. All of this planning can also be done offline.

Another new feature in the Flights interface is a detailed navlog, which can be printed. In addition to all of the typical waypoint information, the navlog includes a range of bracketed altitudes based on the forecast weather as well as a summary of fuel and weights and a section for notes on flight times and other information.

ForeFlight's weather briefing tool is available in the Flights section, as is a button to file the flight plan directly into the Aeronautical Fixed Telecommunication Network.

ForeFlight users can access the new Performance Plus features on Apple iPads, iPhones, and iPod Touches. Annual subscriptions include a license for a single user for the app on one iPad, one iPhone, one iPod Touch, and one backup iPad. All of the new features are also integrated with ForeFlight's web-based flight planning system. ❑

NEWS UPDATE

Send Solutions To Add STCs Via AML

Send Solutions's Airtext unit is working with Wichita-based 3S Engineering to create a broad approved model list (AML) for installation of the Airtext SMS messaging system on a range of Part 23 and Part 25 aircraft. Airtext and Sierra Nevada's 3S subsidiary reached an agreement to transfer an initial Airtext STC for Airtext's Iridium-based SMS messaging and voice calling system on the Citation X. Introduced in 2014, Airtext is a lightweight (1.2-pound), low-cost satcom that enables up to 16 users to send and receive messages simultaneously, using their own mobile devices. Target date for the Part 23 AML STC is mid-August, with a Part 25 AML STC to follow. Airtext costs $9,750, not including the Iridium antenna, and Airtext offers an annual membership for $300 that includes 1,000 messages. Airtext also offers Airtext+, with a bigger modem, for $14,950.

Flying Node Network Marks First Flight Test

Airborne Wireless Network has achieved the first flight test of its high-speed broadband airborne connectivity network, using a temporary mobile mast system to emulate a ground station and two Boeing 767s carrying airborne equipment. The plan for the network is to put aircraft to work as airborne repeaters or routers, eventually creating a flying network or, as the company calls it, "a digital superhighway in the sky." The company believes that its airborne network will allow users all over the world—including those living in rural areas and island nations, and those on ships, oil platforms and aircraft—to tap into the network.

Baron API Offers Wx Cross-section

Weather information provider Baron is offering an application programming interface (API) for aviation, allowing application developers to add Baron's information to their programs. In addition to providing quality-controlled weather information, Baron distributes it via a network of data centers "with built-in scalability designed to handle large usage demands," according to the company. Typical devices that run programs using Baron information are smartphones, tables, desktop computers, installed multifunction displays, electronic flight bags and boat chartplotters. More recently, Baron added the flight cross section to its services. This "provides customers with detailed weather information for every altitude between takeoff and landing," so developers can create vertical profile displays with temperature, winds, turbulence and icing along the planned route.

New Virb Adds 360-degree Capture

Garmin's new Virb 360 action camera can record immersive videos that are stitched together to create a 360-degree view. The camera also produces stitched-together 15-megapixel spherical photos, and it captures video at up to 5.7K at 30 fps and has four microphones for multi-directional audio recording. Spherical stabilization ensures a smooth result. The $799 camera has a built-in GPS receiver and Garmin's G-Metrix data overlays. The Virb 360 offers voice control for starting and stopping recording, taking photos and other functions. Livestream capability is built in, for posting live video to YouTube or Facebook Live when interfaced with a compatible mobile device.—*Matt Thurber*

NEWS UPDATE

Russian Helicopters on the March

Russian Helicopters has obtained financing from Russia's state-owned Vnesheconombank (VEB) to develop a new light multipurpose helicopter. VEB will finance also other areas of Russian Helicopters' business.

Separately, Russian Helicopters announced at HeliRussia that the Mi-171A2 will be certified in August and that it is working on an offshore variant with Gazprom.

More than a year after it performed its first hover on April 28, 2016, Russian Helicopters' Kamov Ka-62 medium twin made something akin to a test flight, flying a 15-minute orbit on May 25 at speeds up to 60 knots from the Progress test facility at Arsenyev. The Ka-62 is expected to cost in the region of $10 million, seat 12 to 15 and be aimed primarily at the offshore energy and search-and-rescue markets.

Cabri Fleet Advances

Helicoptères Guimbal has delivered the 200th Cabri G2 light two-place helicopter. The aircraft was delivered to the UK's HeliGroup at Heli UK Expo at Wycombe Air Park. This particular G2 was the first to be equipped with the 160-hp engine upgrade. The delivery brings the UK G2 fleet to 28.

Belgian Helo Makes U.S. Debut

The first Dynali Helicopter H3 EasyFlyer shipped to the U.S. last month. The Belgian manufacturer recently delivered the 50th two-place H3 to a French flight school. The version being imported into the U.S. by Dynali's authorized distributor, Cincinnati-based Hangar 36, will retail for $129,700; it is powered by the Rotax 914 four-cylinder turbocharged engine and comes with lights but no radio, transponder or GPS. The H3 will be sold as a kit under the Experimental category in the U.S. Hangar 36 is providing a builder-assistance program and a five-hour check-out in the H3.

Enstrom Reports Progress

The second Enstrom TH-180 has joined the certification test program, the company announced last month. The two-seat piston helicopter is slated to earn concurrent FAA and EASA certification by year-end. One helicopter is in flight-test while the other is engaged in 100 hours of ground-testing drive system and controls. The TH-180 is powered by a 210-hp Lycoming HIO-390-A1A piston engine and will initially be certified with Garmin avionics. Target price is less than $400,000.

India Flies Indigenous Model

India's HAL has flown the second prototype of the Light Utility Helicopter (LUH-PT2). The indigenous three-ton LUH is equipped with a glass cockpit and is powered by HAL's native-designed single turboshaft engine. The helicopter first flew on September 16 last year. HAL aims to have the configuration frozen by year-end.

Fly-through Weddings

Las Vegas-based Sundance Helicopters aims to break the Guinness Book record for the most helicopter weddings in the air on July 7 using 12 helicopters for a "Lucky in Love" discount airborne wedding promotion. Couples can roll the dice on matrimonial bliss at 800 feet agl in the back of an Airbus EC130 at prices starting at $777. *—Mark Huber*

Italian agency reveals causes of AW609 crash

by Mark Huber

The fatal crash of the second AgustaWestland (Leonardo Helicopters) civil tiltrotor prototype (AC2), N609AG, on Oct. 30, 2015 at Tronzano Vercellese, Italy, is ascribable basically to the "combination of three factors": the development of latero-directional oscillations; the inability of the fly-by-wire flight control system (FCS) control laws to maintain controlled flight; and the failure of the engineering flight simulator (SIMRX) to "foresee the event in any way," according to the final report from Italy's National Agency for Flight Safety (ANSV—Agenzia Nazionale per la Sicurrezza del Volo). The accident aircraft had accumulated 567 hours since first flying in 2006. It took off from the company's production facility at Cascina Costa and crashed at 10:42 a.m. local time while executing a third planned high-speed descent as part of test flight T664. During the descent the aircraft entered uncontrolled flight in a series of lateral-directional oscillations and broke up and caught fire in flight before striking the ground, killing both test pilots.

Difficulty of Recovery

The ANSV said that a combination of ground debris mapping and telemetry data led it to "hypothesize with reasonable certainty" that the aircraft broke up in flight as a result of multiple prop-rotor strikes from excessive blade flapping on the wings as a consequence of excessive yaw angles reached during the fatal dive. This damaged the hydraulic and fuel lines that are positioned along the wing leading edges, precipitating the in-flight fire. The aircraft was equipped with flapping stops, but they were not designed to "contain the effects of the extreme aerodynamic forces generated during the event." Because of the aerodynamic characteristics of the aircraft and the specific conditions created by the dive, the flying pilot's attempt to counteract the oscillations with a roll-tracking maneuver to level the wings was ineffective, partly because the FCS was designed to "couple" on more axes than the command inputs given on the single axis by the pilot.

Specifically, "Total lateral control resulting from the summation of pilot input and automatic FCS input has an effect on the yaw axis through aerodynamic coupling and feedforward and feedback turn coordination automatically provided by the FCS. Consequently, giving a command in counterphase on the roll axis to dampen the relative oscillations creates an effect on the yaw axis that can be in phase with the yaw oscillations. This occurred during the accident: the correction of the roll oscillation induced, by the control laws of the FCS, a manuever in phase with the oscillations of the yaw axis, generating a divergence of the oscillations." The ANSV said that the "low frequency and low amplitude nature of the oscillations" made them difficult for the pilots or ground crew to perceive until the roll and yaw "reached excessive levels only a few seconds before loss of control."

The pilot flying also made rudder-pedal inputs. As explained above, the inputs exacerbated the situation, taking sideslip to maximum values. The tiltrotor entered a dive at the 293-knot design dive speed. AC2 was fitted with a new tapered rear fuselage and redesigned vertical fin with less surface area. During the dive, the aircraft reached 306 knots.

Investigators attempted to recreate the accident flight in the AW609 SIMRX in Philadelphia using the same software and flight conditions but could not; they came close by inserting algorithms that changed the aerodynamic configuration of the aircraft, but even

Continues on page 56 ▶

Flight-testing of the AW609 has resumed, and FAA certification is expected next year.

BILL BERNSTEIN

BELL 525 TO FLY AGAIN SOON

Nearly a year after the fatal crash of a Bell 525 during a test flight, the program remains grounded. In early June, Bell Helicopter CEO Mitch Snyder said the 525 would be "back up to flight in the near future."

"We continue to work on non-flight activities and the program is continuing to progress there," Snyder said. "We continue to work closely with the NTSB and the FAA. We're preparing for flight. We expect to be in the air in the near term. That's pretty much what we can say right now. The aircraft are being built up in preparation. We have one aircraft that we are bringing back up on line and then the second one will follow shortly after that."

Snyder said that neither of the remaining two test aircraft had engaged in ground runs during the standdown and that two more test aircraft are being built at Bell's plant in Amarillo, Texas. One of those new aircraft would fly this year and the other early next year. "The current plan, assuming that we will be flying here pretty quick, is that we will get type certification by the end of next year and begin deliveries in early 2019," Snyder said. *—M.H.*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SureFly solves eVTOL battery capacity problem

by Mark Huber

Ohio-based electric vehicle manufacturer Workhorse Group unveiled the SureFly hybrid gas-electric helicopter concept at the Paris Air Show last month and plans to fly it later this year. The vehicle displayed at Paris was an actual assembled prototype, not a mock-up. The all-carbon-fiber, two-passenger SureFly is designed to compete in the newly created eVTOL market with a maximum payload of 400 pounds, a range of 70 miles, a cruising speed of 70 mph and a service ceiling of 4,000 feet. The aircraft is powered by a 200-hp BMW 600cc twin-cylinder engine linked to a pair of generators and parallel lithium battery packs offering redundant power and eliminating the need for long battery recharging between flights. The electrical system powers eight electric motors mounted on four folding propeller arms, each with two contra-rotating carbon-fiber propellers. The folding arms make the SureFly easier to ship and store. The lithium batteries can power the motors in the event of generator failure. The airframe also has a ballistic parachute.

The eVTOL SureFly electric helicopter offers redundant electrical supply thanks to an onboard generator.

A company spokesman said the aircraft has undergone ground runs on a test stand and that the goal is to fly it in three or four months. He said Workhorse has set a target price for SureFly of less than $200,000. The aircraft has an estimated empty weight of 1,100 pounds and a maximum takeoff weight of 1,500 pounds. The cabin is configured for one passenger and one pilot or can be converted to one pilot plus cargo. He emphasized that the SureFly has a simple design with fixed-pitch propellers. "It's designed for simplicity and safety." He said the company has yet to make a final decision on an avionics supplier. "This is a personal helicopter. We are building it to be affordable and easy and safe to fly."

Workhorse said it intends to earn FAA certification in late 2019. The company has developed a variety of hybrid-electric vehicles such as step vans and pickup trucks. In February, UPS successfully tested Workhorse's HorseFly UAV for home package delivery service from atop a delivery package car. ❑

BELL 505 GAINS FAA CERTIFICATION

Bell Helicopter's $1.07 million 505 Jet Ranger X light single received FAA type certification early last month, and EASA certification should follow "shortly." The 505 received its initial type certification from Transport Canada on December 21. That certification was validated by Australia's Civil Aviation Safety Authority on March 2. The first customer aircraft was handed over on March 7.

The Texas-based manufacturer says it holds letters of intent for four hundred 505s, but on June 5 company CEO Mitch Snyder declined to reveal how many of those LOIs have been converted to firm orders. Snyder also declined to estimate what the 505's production run would be this year in an apparent change from the estimate of 50 he gave during a press conference in December. Bell continues certification work on options for the 505, among them kits for law enforcement and electronic newsgathering. —*M.H.*

The FAA granted type certification for the Bell 505 on June 8.

The first new-production K-Max made its first flight in May.

Kaman hands over K-Max, plans production through 2019

by Mark Huber

The first new-production Kaman K-1200 K-Max heavy-lift helicopter made its first flight on May 12. It is the first of two helicopters slated for delivery to China's Lectern Aviation this month for firefighting missions. New-production K-Maxes have been ordered by customers in China, North America and Europe. In April Kaman announced an additional order for two K-Maxes from Rotak Helicopter Services of Anchorage, Alaska, for delivery next year. Through the beginning of last month, the order book for new-production K-Maxes stood at eight. Citing greater customer interest, Kaman said on June 14 that it intends to keep the new K-Max production line open through at least 2019.

Kaman announced its intention to relaunch production in 2015. The relaunch customers placing orders that year were Rotex Helicopter of Switzerland and Helicopter Express of Chamblee, Ga. The Rotex helicopter is slated for delivery this month. The fourth new airframe arrived at Kaman's Connecticut plant for assembly on June 8. Kaman plans to build 10 K-Maxes in the initial production restart run. "We're moving right along," said Terry Fogarty, Kaman's director of business development. "People are interested in the aircraft."

The K-Max was certified in 1994 and the production line was shuttered in 2003 after 38 had been built. A dozen have been written off in accidents. The helicopter can lift up to 6,000 pounds externally and is powered by a single Honeywell T53-17 turboshaft flat rated to 1,500 shp for takeoff. The single-seat K-Max features a pair of counter-rotating intermeshing main rotors and is designed specifically for external load operations.

The U.S. Marine Corps operates two unmanned K-Maxes developed with Lockheed Martin. These aircraft successfully supported the U.S. Marine Corps in Afghanistan from 2011-2014, carrying 4.5 million pounds of cargo. More unmanned firefighting and humanitarian missions for the K-Max are being developed and tested. During a demonstration in 2014, an unmanned K-Max lifted and dropped 24,000 pounds of water onto a target fire in an hour. ❑

AW609 crash report

▶ *Continued from page 54*

then the lateral-directional oscillations developed were in a different phase. They did, however, use the exercise to verify the "great difficulty" of recovery to controlled flight under the conditions. The ANSV found the inability to replicate the accident flight in the simulator unremarkable given "the lack of experimental data obtained previously in the wind tunnel and in-flight evaluations with those speed conditions and relating to the recent modified geometry of the tail fin; this last change was considered conservatively by entering a reduction in the tail fin area into the database and then implementing the computational fluid dynamics."

The ANSV made several safety recommendations after the accident: more high-speed and complex flight condition modeling, verification and wind tunnel testing as part of the AW609 certification process; and verification of the flight control laws in extreme flight conditions, in particular reviewing their effectiveness with regard to pilot inputs and uncommanded coupling effects.

AW609 flight-testing resumed in August last year. AC3 is flying from the company's Philadelphia facility and recently completed testing for flight into known icing. AC4 is under assembly in Philadelphia and is expected to fly next year. AC1 is in Italy undergoing modifications before return to the flight-test program. Leonardo Helicopters expects FAA certification next year. ❑

The Irkut MC-21 takes off for the first time outside the Siberian city of Irkutsk.

MC-21's May first flight signals Russia's airliner challenge to the West

by Gregory Polek

Russia's Irkut MC-21-300 single-aisle airliner flew for the first time on May 28, a milestone that parent company United Aircraft (UAC) hopes will set it on a path to mounting a serious challenge to the global dominance of U.S. and European airframers. Lasting only 30 minutes, the flight from the Irkutsk Aviation Plant airfield in Siberia took the 163- to 211-seat airliner to an altitude of 3,280 feet and a speed of 162 knots. The crew checked aerodynamic stability and controllability as well as engine controls, and they performed a simulated landing approach, followed by a pass over the runway and climbing and turning maneuvers.

"This is not just the first flight of a new aircraft, but rather an advance of the product that will determine the shape of the Russian civilian aviation industry for the next fifty years," commented UAC president Yury Slyusar.

The first flight came only two weeks after Irkut had announced the beginning of taxi trials at its Irkutsk airfield and nearly a year after the airplane's rollout in the Siberian city on June 8 last year. At the time, officials eyed Russian certification in 2018, although earlier plans to fly the airplane by the end of last year appeared dashed. During the rollout ceremony Russian Prime Minister Dmitry Medvedev made reference to plans for first flight "within a year," and UAC officials acknowledged that the previously quoted target might prove too optimistic. A UAC spokesman told **AIN** that February 2017 appeared more realistic, but since then virtually all had gone quiet at Irkut until taxi tests in May.

Powered by Pratt & Whitney PW1400G geared turbofans, the MC-21 offers the widest fuselage of any single-aisle airliner on the market, promising cabin comfort for full-service airlines and cost advantages for low-fare carriers, according to UAC and Irkut. The MC-21's list price of $91 million suggests a 15-percent lower acquisition cost than that of the current Airbus A320.

Irkut claims that either the PW1400G or a Russian engine alternative—namely, the Aviadvigatel PD14 now undergoing a second round of testing aboard an Ilyushin Il-76 flying testbed—will produce a 12- to 15-percent operating cost

UAC president Yury Slyusar

advantage over the current A320. Apart from the engines, the MC-21's most radical advance is its carbon-fiber wings, which take the airplane's composite content to 30 percent. AeroComposit in Ulyanovsk, Russia, builds the wings using an out-of-autoclave resin transfer infusion process never before tried on a commercial aircraft. Both Airbus and Boeing use a more expensive process that requires an autoclave to cure the composite wings on the A350 and 787, respectively. Both of the MC-21's chief competitors—the 737 Max and A320—use metal wings.

While UAC's definitive plans call for that innovation to extend to the smaller, 150-seat MC-21-200, Slyusar suggested it has seriously revisited prospects for a larger version in the form of the MC-21-400. At the time of the rollout, Slyusar said discussions about the larger variant could start this year, but that any decision would depend on what competition ultimately exists in the segment of the market the MC-21 would occupy, or the so-called "Middle of the Market (MOM)."

"We should take into consideration the plans of our colleagues; that's why we [plan to] make a decision rationally," he said.

In terms of production capacity, Irkut claims it could build as many as 72 aircraft a year in the newly refurbished and modernized final assembly hall in Irkutsk. While the company's need—or ability—to deliver six airplanes per month won't likely materialize for several years, the production plan satisfies the company's projected demand for 1,060 MC-21s over the next two decades. Slyusar, meanwhile, expressed satisfaction with the early level of commercial interest in the product: so far Irkut has firm orders for 175 MC-21s.

Although Irkut and UAC claim they have received payments on all sales contracts signed so far, some of the intended customers have said they would firm their "preliminary orders" after the first flight or when the airplane demonstrates advertised performance during flight-testing.

Sergei Chemezov, general

Continues on next page ▶

NEWS UPDATE

Comac, UAC Formalize Widebody Joint Venture

China's Comac and Russia's United Aircraft officially established their joint venture to develop a long-range widebody during a ceremony in Shanghai in May. Dubbed China-Russia Commercial Aircraft International Company (Craic), the entity established what UAC calls an "equivalence principle," under which each side takes a 50-percent share in the program—known as the C929 by the Chinese. It remains unclear whether the sides have agreed on a name, however, given that the Russian partner believes it implies a Comac designation. In fact, the agreement calls for final assembly in Shanghai.

The new widebody would seat 280 passengers and fly 6,500 nm, placing it roughly in the category of the Airbus A330-900. The companies revealed preliminary operating specifications during Airshow China in Zhuhai last November. Schedules call for the aircraft to fly in 2023 and enter service in 2026.

Comac and its Avic subsidiary will be responsible for final assembly and the majority of parts manufacturing, using existing factories around Shanghai and other Chinese cities, among them those now being used for the ARJ21 and C919 airliners. The Russian partner will perform mainly design and development work. UAC's newly built 463,000-sq-ft engineering center at Zhukovsky, near Moscow, will house Chinese and Russian engineers working on the program.

Airbus Establishes Legal Review Panel Amid Bribery Probe

Airbus has established an independent panel composed of external consultants from Germany, France and the UK to review its compliance with anti-bribery laws, the company announced last month. The move comes as authorities from the three countries continue their investigations into allegations of fraud, bribery and corruption at Airbus's civil aviation business. Those probes effectively cut off Airbus's access to export credit finance until they close.

The UK Serious Fraud Office (SFO) launched the criminal investigation last August, four months after it began looking into the manufacturer's failure to reveal the identity of some intermediaries in applications for export credit financing for certain airline customers. France's Parquet National Financier joined the investigation in March.

China To Raise Pilot Retirement Age

The Civil Aviation Administration of China (CAAC) plans to raise the mandatory retirement age for pilots from the current 60 as part of a strategy to ease the shortage faced by Chinese airlines. The agency has yet to arrive at a decision on the exact age, but it plans to implement the change in two or three years.

Official estimates forecast a need for 2,800 to 3,000 pilots annually over the next three years. The 12 flying schools across China can produce only 1,250 to 1,300 a year. Local airlines increasingly send their cadet pilots to the U.S., Europe or Australia for training. Cadets must undergo a minimum 80-hour English course before they start training.

Chinese carriers attract experienced foreign pilots with retention bonuses and big salary packages ranging from $240,000 to $310,000 a year for a captain.—*Gregory Polek*

Bombardier keeps faith in 'backloaded' C Series schedule

by Gregory Polek

By the end of May Bombardier had delivered 12 C Series jets.

Swiss International Airlines' acceptance of its first Bombardier CS300 on May 26 marked the 12th C Series delivery in total and the fifth this year for the Canadian airframer, clearly suggesting a so-called backloaded schedule that calls for a total of 30 to 35 airplanes by year-end. Happily for Bombardier, the plan to solve the fan-blade supply problems that plagued the Pratt & Whitney PW1500G early in the program appears settled, giving Bombardier Commercial Aircraft president Fred Cromer confidence in the delivery guidance the company continues to cite.

"[Pratt & Whitney has] ramped up the supply chain, they have people monitoring the situation and we're obviously staying pretty close to them to make sure they aren't pacing the line any more than they already have, so I think they have that issue pretty much under control," said Cromer. "The engines ramp up in the back half of this year, so I think that's really the test. But from what we see now we think Pratt is going to meet its delivery commitments."

Bombardier has managed to soften the financial blow resulting from the delays somewhat by adjusting its own production pace to match the delivery rate from Pratt. "We're continuing down our production plan so that we're not having airframes sitting there waiting for engines, but typically in our production schedule the engines come at the very end anyway because we don't want to sit on expensive inventory," explained Cromer.

For its part, Pratt & Whitney expects to triple production of the hybrid metallic fan blades in question after opening two new assembly facilities this year, allowing it to deliver what it quotes as 350 to 400 engines from the PW1000G series by year-end.

'Mature Engine Program'

However, one of a set of broader technical "issues" that have plagued the geared turbofan series—particularly in the PW1100G for the Airbus A320neo—continues to affect the C Series, namely deficient durability of the engines' combustors. As a result, Bombardier will need to replace the engines on all the airplanes it has already delivered with powerplants outfitted with newly upgraded combustors. Cromer didn't know exactly when Pratt & Whitney would begin delivering engines equipped with the new combustors and could offer only an estimate of "the back half of this year."

Although Bombardier hadn't received an engine with the new combustor by the end of May, Cromer said that the engines for the C Series have performed in revenue operations "much better" than those for the A320neo. "We have a different aircraft and systems configuration because [of the] clean-sheet design," he explained. "In designing the airplane from the ground up...versus a re-engined aircraft where you are installing a new engine on an existing airframe… you don't have integration choices per se," he added.

"We have what I would describe as a more mature engine going into service," said Cromer, attributing that maturity to testing the company has conducted from the beginning.

Engineering trade-offs Bombardier made early in the program included a change in the design of the pylon to allow the attachment point with the engine to move forward to accommodate the large size and weight of the fan. So rather than attach the pylon near the middle of the engine, designers attached it to the fan case, thereby reducing stress on the powerplant. "What that has done is minimize this issue that the Airbus is dealing with, this bowed rotor issue; we do not have that issue and we think it's largely because of the pylon design."

The so-called rotor bow issue forced Airbus to extend the start-up times for the PW1100G on the A320neo to ensure that temperature variation along the shaft does not affect its alignment.

Although Cromer said not enough C Series airplanes have entered service to quote a meaningful dispatch rate, early indications point to a better than acceptable level of operational reliability for Swiss and Air Baltic, the only two airlines to have taken deliveries so far. "Both airlines have expressed high levels of satisfaction with how we're doing with entry into service," he said. Next, the company plans to deliver the first of 10 CS300s to Korean Air "in the back half" of the year, followed by Delta Air Lines' first CS100 in the spring. Delta holds a firm order for 75 CS100s and options on another 50, and may convert a portion of its order to positions for CS300s.

Steep Approach Approval

Swiss plans soon to operate out of London City Airport, following the airplane's Transport Canada and EASA certification in the spring for takeoff and approach on the field's 5.5-degree glideslope. Calling the CS100 the only commercial airplane specifically designed for operation out of such challenging airports, Bombardier estimates the airplane doubles the range of revenue flights it considers viable out of LCY.

In late March Bombardier flew a CS100 with a representative payload nonstop from London City to New York JFK Airport following the completion of its demonstration flights for the steep-approach, short-landing requirements at LCY.

Although the steep takeoff and approach requirements at London City call for a 5.5-degree glideslope, Bombardier had to test and validate the C Series to 8.5 degrees to qualify to operate there. In its full 108-seat cabin layout, the CS100 can fly 2,350 nm into and out of London City. It can reach New York from LCY in a 42-passenger configuration. British Airways' Airbus A318 flies 36 passengers on that route with a stop in Shannon, Ireland, for refueling. Late last summer it cut the frequency on the route from twice to once a day.

Cromer noted that Bombardier has spoken to "a few" potential customers interested in flying the LCY-New York route, but he said he knows of no firm plans to do so yet.

One major customer whose plans for its airplanes still remain unclear is Russia's Ilyushin Finance, which last year claimed that a politically motivated decision by Export Development Canada (EDC) to refuse low-interest financing played a key role in its decision to reduce its order for CS300s to 20 from 32. Cromer characterized the uncertainty surrounding IFC as one exacerbated by a "challenging" market environment. "We've worked with them to structure the deal in a way that probably makes more sense and we have a good relationship with them so we're staying close to that group," said Cromer. "When we see opportunities and their markets firm up, that's the nature of the conversations that we're having with them. But they're still a valued customer in our C Series program and when the time is right we'll be working with them to get them some airplanes in service."

Addressing reports that Chinese investors have expressed interest in investing in the C Series program, Cromer characterized them as nothing more than speculation. Some three years ago Bombardier and China's Comac signed what they called a definitive agreement covering four distinct projects as part of the second phase of the parties' long-term collaboration on common parts, systems and design aspects between the C Series and C919 narrowbody.

The deal followed an agreement signed on March 21, 2012, covering program commonalities between the C919 and C Series and the letter of intent signed on Nov. 13, 2012, signaling the beginning of Phase II of a collaboration first announced in March 2011. Under the 2013 deal, Comac and Bombardier said they would collaborate on C Series flight-test activities pertaining to non-flying tasks, implementing and maintaining the common items achieved as part of Phase I, sales and marketing and certain areas of customer services related to training, technical publications and parts distribution.

However, according to Cromer, "each program got focused on its own issues," eventually prompting the sides to dissolve the agreement. ❑

MC-21 first flight

▶ Continued from preceding page

manager of state-owned Rostec, expressed optimism about the export potential of the new jetliner, most notably in the developing markets of Southeast Asia, Latin America, India and the Middle East. Rostec has long projected a presence in those regions selling weapons and now wants to expand its footprint through civilian projects. "We are ready to render complete support to United Aircraft promoting the MC-21 to these markets," said Chemezov.

Aeroflot expects to receive its first MC-21 from Rostec-controlled lessor AviaCapitalService in 2019. Other lessors and financial institutions committed to the project are Ilyushin Finance, VEB and Savings Bank of Russia, while only two Russian airlines signed direct contracts with the manufacturer: Nordwind for five jets and IrAero for 10. Holding a commitment for six MC-21-300s, Egypt's Cairo Aviation stands as the only confirmed non-Russian customer for the airplane. Malaysia's Crecom Burj Resources placed a tentative order for 25 airplanes at Farnborough 2010 that has yet to become firm. Other carriers that have indicated interest are Russia's Red Wings, Azerbaijan Airlines and Air Tanzania.

Meanwhile, UAC and China's Comac established a joint venture last month to develop a 280-seat, 6,500-nm widebody, dubbed China-Russia Commercial Aircraft International Company (Craic; *see News Update, page 57*). The new widebody would cost between $13 billion and $20 billion to develop. Initially, the 75,000-pound-thrust-class engines for the new widebody would likely come from Rolls-Royce and/or GE Aviation, "which already have suitable models with the required thrust of 35 metric tons," according to Slyusar. Later propulsion options could include a larger version of the Aviadvigatel PD14 now undergoing testing by the Russian design house in Perm called the PD35. The Chinese side has also expressed a desire to develop a turbofan of its own to power the airplane and last year consolidated several state-owned companies to establish the new Aero Engine Corporation of China (AECC). ❑

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Maintenance News

AVIATION MX JOB VACANCIES COULD COST INDUSTRY $2B

The shortage of skilled aviation maintenance technicians could cost the industry as much as $1.95 billion in unrealized revenues, according to statistics released by the Aeronautical Repair Station Association (ARSA). Total economic loss was derived from multiplying the number of open positions—as reported by members in a survey—by $170,000, the average annual revenue generated per employee. Projected across the entire population of FAA-certified repair stations in the U.S., the number of vacant positions could reach 11,000, which equates to nearly $2 billion in lost economic activity, if left unfilled. That shortage has become a deep concern for maintenance providers, who identified difficulty finding and retaining technical talent as one of their "most pressing risks to company business outlook" in the survey.

Finding and retaining maintenance technicians is expected to be a concern for the next several years.

U.S. BIZJET FLEET NOT KEEPING PACE WITH ADS-B COMPLIANCE

The business aviation industry is still behind the curve when it comes to meeting the Jan. 1, 2020 ADS-B equipage mandate, according to recent analysis by Duncan Aviation. Using data from its customer database, the FAA and other sources, the Nebraska-based MRO provider determined that as of the end of March, 73 percent of U.S.-registered business jets, meaning 10,000 aircraft, have not yet complied with the mandate.

"At the current rate of ADS-B adoption, 4,760 aircraft will still need ADS-B when the mandate goes into effect," said Mark Cote, the company's vice president of parts sales, avionics and satellites. "Those aircraft, for all intents and purposes, will be grounded."

He added that for the entire fleet to be ADS-B compliant, 320 aircraft would need to be updated every month from now until the midnight Dec. 31, 2019 deadline, twice the number currently being upgraded each month.

EUROPEAN GROUP PREDICTS BOOM IN CHINA'S MRO NEEDS

Deliveries of new business aircraft to China have peaked, and the emphasis for the industry now is shifting toward providing maintenance, repair and overhaul support for the fleet based there, according to service provider Jet Maintenance Solutions (Jet MS). The Lithuania-based company reported that there are 480 business jets based in mainland China, Hong Kong, Macau and Taiwan. The boom in new aircraft deliveries occurred between 2010 and 2014, with the fleet growth rate then "stabilizing" at 7 percent annually between 2014 and 2016. Last year was the first for some time in which pre-owned aircraft transactions surpassed new-aircraft deliveries.

According to Jet MS, many of the aircraft operating in China have come to the end of their warranty period or are about to do so. The company predicts that most of these aircraft will remain in China, or be sold to other Asia-Pacific operators.

ONTIC EXPANDS P&WC PARTS PRODUCTION

BBA Aviation's Ontic Engineering & Manufacturing continues to expand its Pratt & Whitney Canada (P&WC) offerings with a third acquisition of manufacturing rights for JT15D engine components. The third batch involves 80 additional parts, bringing to 300 the number of parts for the JT15D that Ontic supports.

"Beginning with our first engagement with P&WC in 2015, we had the intent to expand [our] component offering for the JT15D," said Gareth Hall, president and managing director of Ontic. "The JT15D engine aligns with Ontic's commitment to support legacy products, and this further acquisition is a logical progression and expansion of our current services to our OEM partners."

The additional parts will be manufactured and sold at Ontic's facility in Chatsworth, Calif. Aviall Services will continue to distribute the parts.

ADVENT RECEIVES EASA NOD ON eABS BRAKING SYSTEM

Oklahoma-based Advent Aircraft Systems has received EASA certification for its eABS anti-skid braking system for the Pilatus PC-12/PC-12NG and the Beechcraft King Air B300. The Tulsa manufacturer has also launched certification processes for the system on the same aircraft with Transport Canada and Australia's CAA. Australian Pilatus dealer Premiair Aviation Maintenance, in anticipation of the approval, has ordered an initial three eABS kits for the PC-12, while Canadian Pilatus dealer and King Air service provider Lavaero Aviation has placed an order for one of the PC-12 kits as well.

Advent expected to add FAA, EASA and TC certification for the King Air B200 by the end of last month, and it has already received its first European order for the next-generation braking system from a Norwegian customer for a B250.

Advent recently received certification for the eABS braking system on the King Air B300. The company also offers the system on the Eclipse and Pilatus PC-12.

"Owners and operators understand the benefits of anti-skid braking, both from a safety perspective and to the bottom line," said Tom Grunbeck, the company's vice president of sales and marketing. "With eABS, there is a viable, effective and simple anti-skid system for a variety of aircraft that didn't have the option previously."

BLACKHAWK NEARING STC ON SPEEDY KING AIR UPGRADE

Blackhawk Modifications' XP67A engine upgrade for the King Air 350 is nearing certification. The mod provides speeds that the company says will make it comparable to jets. The company has completed flight-testing and at press time anticipated FAA approval last month. Work on EASA certification is slated to begin after FAA approval. The company has begun to take pre-certification orders on the package, which consists of two Pratt & Whitney Canada PT6A-67As and new MT five-blade composite propellers and spinners. The upgrade boosts the maximum cruise speed of the aircraft to 332 knots at 28,000 feet (from 312 knots) and allows the aircraft to climb from sea level to 35,000 feet in 18 minutes.

Blackhawk says its XP67A upgrade will give the King Air 350 jet speeds.

WEST STAR OPENS LANDING GEAR SHOP IN COLORADO

West Star Aviation has opened a new dedicated landing-gear facility in Grand Junction, Colo., and received FAA Part 145 certification for the satellite location at Denver Centennial Airport. The company opened the landing gear shop on May 26. West Star acquired the newly redesigned, 20,000-sq-ft Grand Junction facility in February. It supports Challenger, Hawker and Phenom landing gear.

West Star opened the Centennial satellite facility in 2014 to provide support in the Denver region. The facility has offered avionics repairs, maintenance troubleshooting and other services. For more extensive work, West Star will obtain ferry permits to provide support at the Grand Junction facility or at the other full-service MROs in East Alton, Ill., and Chattanooga, Tenn.

TEXTRON AVIATION PORTAL SIMPLIFIES MX CUSTOMER SUPPORT

Textron Aviation's new web-based customer portal is rolling out in phases this year for all customers, enabling them to monitor progress and manage maintenance on their aircraft during visits to the OEM's 19 factory-owned service centers. So far, 500 operators have signed up for the portal since it went live a few months ago.

Owners, operators and directors of maintenance can access the customer portal via web browsers running on any computer or mobile device. The portal allows them to initiate a service request, track maintenance events, order parts, review and approve maintenance tasks, view invoice history and pay for services, without having to contact a customer-service representative.

EMBRAER EXECUTIVE JETS EXPANDS SERVICE IN RUSSIA

Embraer Executive Jets appointed JF Service its new authorized service center for Legacy 450s and 500s in Russia. The Moscow-based company will support operators of the midsize jets with local and EASA registrations.

This partnership follows the growth of Embraer's business jet fleet in the region. Embraer recently delivered the first Legacy 500 to a Russian customer.

The company also reported that Embraer Executive Jet Services at Paris Le Bourget holds FAA approval as a Part 145 repair station. The facility can service Embraer business jets registered in the U.S. Embraer's Le Bourget facility holds 15 certifications from aviation authorities. ❑

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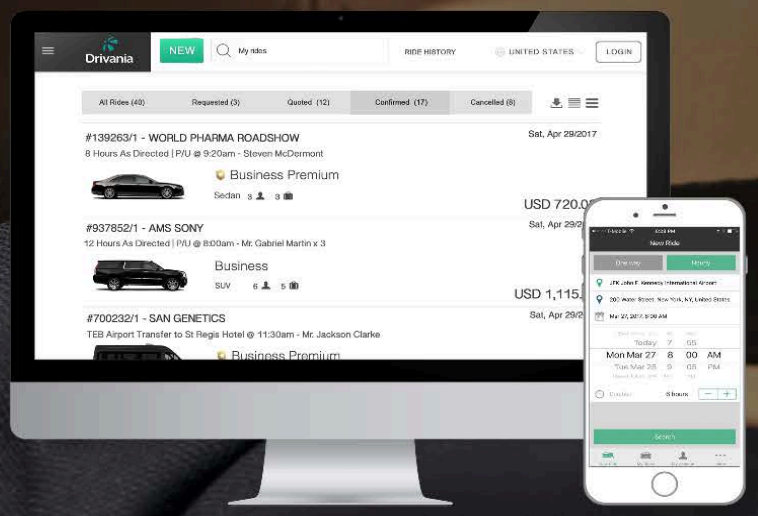

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Touching Bases by Curt Epstein

FBO and Airport News

When the project is complete, the Avflight FBO at Pennsylvania's state capital Harrisburg International Airport will feature a 5,000-sq-ft executive terminal and a 25,000-sq-ft hangar.

FBO UPGRADES AT PENNSYLVANIA AIRPORT

Avflight broke ground last month on a major upgrade of its FBO at Pennsylvania's Harrisburg International Airport (MDT), where it is the sole aviation service provider. The first stage of the multimillion-dollar project, which is expected to be completed by the end of January next year, consists of the building of a new 5,000 sq ft contemporary-styled private aviation terminal next to the commercial terminal. Amenities include a conference room, kitchen, pilots' lounge, three snooze rooms, a catering kitchen and office space. The building will be across the street from a new hotel now under construction. A second phase of the upgrade will add a 25,000-sq-ft hangar to accommodate big business jets.

JET AVIATION OPENS RENOVATED FACILITY AT BEDFORD

The Jet Aviation Boston/Bedford FBO at Hanscom Field held grand opening festivities last month for new hangar and ramp facilities, a major part of the company's first comprehensive expansion since it began operations at the airport in 1984. Among the upgrade are a 40,000-sq-ft hangar capable of handling the G650 and Global 7000; 16,000 sq ft of office and shop space; a refurbished ramp and apron upgrade; new entrance roadway, parking and landscaping; and soon a new two-story terminal with 13,000 sq ft, which is expected to be completed within several weeks.

Jet Aviation president Rob Smith said expansion projects are in the works for current facilities in Palm Beach, Teterboro and Van Nuys, as the Zurich-based company celebrates its 50th anniversary this year.

UK'S RIGBY GROUP ADDS THIRD FBO

UK-based Rigby Group has added to its XLR Executive Jet Centre brand with the acquisition of the Marshall Aerospace and Defense Group's corporate aviation facilities at Birmingham Airport.

In 2015, Marshall Aviation Services was awarded a 20-year lease to operate the former Euro Jet FBO, a glass-fronted 44,000-sq-ft facility that offers 27,000 sq ft of heated hangar space for based and transient aircraft up to a Global and multiple spacious parking ramps.

XLR, part of Rigby's aviation division, which owns Exeter and Coventry Airports and operates FBOs at both locations, announced its intentions to expand its UK operations rapidly earlier this year.

JET AVIATION MOVING AT DWC

Jet Aviation is relocating its FBO at Dubai's Al Maktoum International Airport, which it operates in partnership with the Al Mulla Business Group. Established in 2013 in the airport's main terminal building, the new facility will be one of the service providers sharing the world's largest purpose-built VIP terminal at Dubai South next to the Dubai Airshow Hall. The facility will be open for the Dubai Airshow in November.

At 6,460 sq ft, Jet Aviation's new FBO is six times larger than the previous location. It will feature a trio of 430 sq ft customer lounges, a conference room, crew lounge, two prayer rooms, showers and a separate waiting room for chauffeurs. The terminal also houses a large duty-free shop.

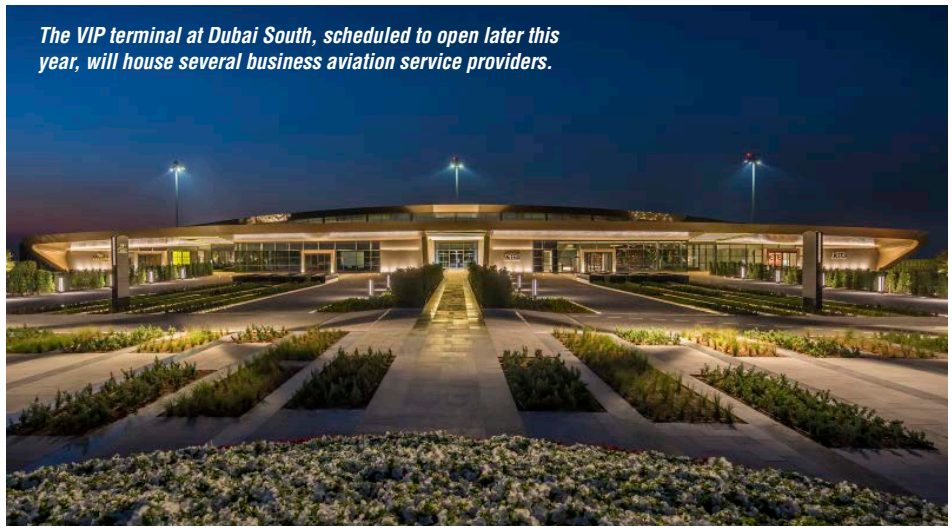
Given the current lack of hangar availability at Dubai South, Jet Aviation will provide base maintenance through its MRO location at Dubai International Airport, while developing line maintenance capabilities at the Al Maktoum FBO.

JETEX EXPANDS IN EUROPE

Jetex Flight Support has expanded its FBO network in Europe with the announcement of 20 new ground handling locations in France, Spain and Italy. On June 1, the company began providing FBO services and ground-handling support for 15 locations in the Edeis Airports network in France. The locations provide Jetex services such as global trip planning, fueling and concierge services.

In Spain the company made its debut with three new bases, at Barcelona-El Prat, Adolfo Suárez Madrid-Barajas and Málaga-Costa del Sol Airports. Operating from the general aviation terminal in each instance, the company is providing 24/7 fueling, ground handling, parking and ramp services. Customs and immigration facilities and hangar space are also available at all three locations, as are executive and crew lounges and meeting rooms, concierge service and private car parking.

The Dubai-based company is also entering Italy, having won a tender to provide FBO services at Rome's Ciampino–G. B. Pastine International Airport, the city's main hub for general aviation. Based at the 19,375-sq-ft terminal, the FBO, which is scheduled to begin operations in the second half of the year, will provide a range of ground support services. Ground transfer, flight support and concierge services will also be available at the location or via the company's operations centers in Dubai, Miami and Beijing.



The VIP terminal at Dubai South, scheduled to open later this year, will house several business aviation service providers.

SKY VALET STARTS IS-BAH STAGE II VALIDATIONS

Sky Valet's FBO at Cannes Mandelieu Airport was the first to achieve stage II registration under IBAC's International Standard for Business Aviation Handling (IS-BAH), the company announced. The voluntary set of industry best practices was launched at EBACE in 2014, and the Sky Service location was the first European handler to be recognized with Stage I approval the following year. The company plans to implement IS-BAH approval throughout the network as part of a development strategy.

"Our level I IS-BAH [registration] validated an organizational principle based on the mastery of safety of our ground handling expertise as a whole," noted Joseph Azzaz, who heads the company's ground handling department. "IS-BAH level II confirms and guarantees the daily implementation of our safety management system. This means that we have integrated it into each of our actions and that it is now part of our DNA, but also that of our partners because the [registration] is the result of true teamwork involving the employees of Cannes Mandelieu Airport, suppliers and subcontractors."

Sky Valet operates 22 FBOs in France, Spain and Portugal.

SHELTAIR OPENS ORLANDO FACILITY

Sheltair has opened a hangar at Orlando Executive Airport (ORL), as Phase I of the aviation development company's plan to build hangars that serve the needs of the Florida general aviation community. "This milestone represents the first phase of expansion plans for our Orlando location, allowing us to open two hangars totaling 22,600 sq ft with 3,600 sq ft of office space," said Todd Anderson, Sheltair's senior v-p for real estate and development.

Phase II, which will see construction of an $8 million executive terminal at ORL, is expected to start by July 1 and end within a year. Sheltair's new terminal, which is expected to be four stories, will include office space and a restaurant for passengers, crew and the public.

"Our $13.5 million of new capital investment is a strong and visionary recognition that Orlando Executive Airport will continue to expand, handle more operations and play a vital role within the corporate general aviation sector as a result of its location only three miles from the business and financial center of central Florida," Anderson said. Sheltair's current facility

CHARTER NEWS NOTES

- **ExcelAire's newest addition, a G450**, is based at company headquarters in Islip, N.Y., but is **flying out of West Palm Beach, Fla., and Van Nuys, Calif**. In partnership with Custom Jet Charters, the G450 is available for international charter.
- **A Citation X has joined Silver Air's charter/management fleet** and will fly from McClellan-Palomar Airport in Carlsbad, Calif. Silver Air also added a G200, Challenger 300 and Astra SPX recently.
- **Executive AirShare's new Embark membership** provides buyers of jet lift access the company's fleet for as few as 10 days a year, the company said, "with no long-term commitment." Travelers can use their Embark membership to fly in the U.S. and into the Caribbean, Mexico, Latin America and Canada.
- **Jet Access Aviation** of West Palm Beach, Fla., **has added five aircraft to its charter fleet:** the Challenger 604, Falcon 2000, Learjet 60, Hawker 800XP and G550 will join the floating fleet.
- **TAG Aviation Europe has added a Challenger 350 to its Europe-based charter fleet.** The new jet is based in Geneva.
- Germany's **MHS Aviation now has a Falcon 2000LX available for charter**, and the company is adding a 7X to its management fleet in October. ■

in Orlando offers customer service, ground support, cabin cleaning, catering, passenger shuttle services, concierge services, crew cars, a pilots' lounge and a flight-planning room.

GENAV TERMINAL RENOVATED AT ROME CIAMPINO AIRPORT

ADR, the company that manages Rome's two airports, along with the Italian Civil Aviation Authority (ENAC), earlier this year completed a major one-year renovation project on the general aviation terminal at the "Eternal City's" Ciampino-G.B. Pastine International Airport. The structure underwent a $3.37 million (€3 million) refit inside and out, featuring natural materials such as steel, wood, ceramic and glass, inspired by Italian and Roman themes.

On the inside, the ground floor layout called for the six FBOs—Jetex, Universal Aviation, Sky Services, Signature Flight Support, Argos/Deer Jet and Aviapartner—to be grouped around a large central passenger lounge and two shared meeting rooms, along with commercial space. The three larger FBO spaces incorporate their own private passenger lounges, and the second floor of the facility now houses four crew snooze rooms.

The refurbished facility is designed to incorporate energy-saving features, and authorities expect it to achieve U.S. Leadership in Energy and Environmental Design (Leed) Gold certification.

Visitors to Rome Ciampino Airport can expect a refreshed passenger lounge, among other improvements.

HARRODS TAPPED TO MANAGE CRANFIELD FBO

Harrods Aviation, which operates FBOs at London Luton and Stansted airports, has signed an agreement with Cranfield Airport to rebrand the FBO there as a Harrods location. Owned by Cranfield University, the airport, an hour's drive from London, describes itself as "the best kept secret in business aviation for the London area." The dedicated GA airport has a 5,900-foot main runway, and for flights originating outside the UK, slot-free Cranfield benefits from remote customs and immigration arrangements. A private passenger lounge is also available with sofas, refreshment facilities, Wi-Fi and TV.

The location offers a recently refurbished 23,680-sq-ft hangar, large enough to accommodate a Global. Airside access for passenger vehicles is available and all business customers, based operators and aircrew have free access to the FBO's secure car parking lot.

STOBART EXECUTIVE JET CENTER OPENS AT LONDON SOUTHEND

London Southend Airport is adding a new FBO, Stobart Executive Jet Center, along with accommodations for a central London helicopter transfer. The upgraded Stobart facility will provide FBO services and have access to immigration and customs pre-clearance. Under a partnership with Apollo Air Services, the FBO is offering helicopter transfers from London Southend to Canary Wharf or Battersea Heliport aboard AW109 GrandNews. Car services and boat transfers are also offered. The transfer service enables passengers to reach central London in 10 minutes from London Southend.

The FBO facilities provide 24-hour surveillance and security, private security clearance, large meeting room with video conference facilities, passenger lounge, complimentary refreshments and Wi-Fi, catering and shuttle service. The FBO also offers line and handling services and hangarage.

The additional services are part of an effort by the airport to expand and attract operations in the London area. The airport notes it has no slot restrictions and offers better departure routes outside London airspace, trimming flight times.

GROUP SEEKS PROPOSALS FOR THIRD FBO AT ADDISON AIRPORT

The Business Aviation Group is seeking proposals from "qualified" FBO candidates to bid on a 15.5-acre business aviation services development project at Addison Airport in north Dallas. BA Group already has a lease agreement for the acreage at the southeast quadrant of the airport. According to BA Group, "Addison Jet Center" will be built in two phases and, when complete, will have 120,000 sq ft of hangar, office and shop space, 6.9 acres of ramp space and a 22,000-sq-ft FBO terminal. This would be the third FBO at the airport, competing with Atlantic Aviation and Million Air.

Iver Retrum, co-founder and partner of BA Group, said this will be the largest development project ever undertaken at Addison. "It comes at a time when hangar space [at Addison] is at capacity and the nearby northern corridor of the Dallas Metroplex is exploding with growth," he noted. The first phase will span 11 acres and will likely include two 40,000-sq-ft corporate aircraft hangars; a two-story FBO terminal with a rooftop observation deck and office suites; and a 4.6-acre ramp. The company also envisions indoor secured car parking with lifts and valet and auto spa services.

Phase two would add a 40,000-sq-ft hangar and 4,800 sq ft of office and shop space, while the ramp area would be expanded by 2.3 acres. ❑

FBO PROFILE: Atlantic Aviation TEB

THE FACILITY IS ONE OF SIX AT BUSY NEW JERSEY AIRPORT

New Jersey's Teterboro Airport, in addition to being the nation's busiest business aviation airport, is the oldest operating airport in the metro New York area, and for most of its existence it has been home to an Atlantic Aviation FBO. Though the terminal has been rebuilt several times during its long existence, the company has occupied the same spot on the west side of the airport since the 1930s, and today it has the largest single leasehold on the dedicated GA airport at 32 acres.

Atlantic Aviation has occupied the same location at New Jersey's Teterboro Airport since the 1930s. Today, the facility has one of the largest leaseholds at the dedicated general aviation airport and is home to 42 jets.

The two-story terminal received its most recent renovation two years ago, $5 million project that installed an elevator and a flybridge that spans the atrium lobby and connects the two halves of the building's upstairs offices. The project also entailed an expanded business center, pilots' lounge with recliners and a quiet lounge, as well as a 14-seat A/V-equipped conference room. The rampside wall of the atrium was replaced with glass, offering panoramic views of the aircraft parked outside, and the Manhattan skyline in the background.

"Atlantic Teterboro is fortunate in our parent company, which reinvests in our infrastructure and invests in our employees, giving us the resources to be able to provide the services and facilities we have today," noted general manager Joe Fazio.

While the passenger area of the terminal is 6,500 sq ft, offices take up another 34,000 sq ft in the building. The company keeps close tabs on what its customers require in terms of amenities. "We found that pilots don't normally stay in the facility," said Barbara Briccola, Atlantic's regional sales manager, adding that some underutilized features such as a gym were repurposed during the recent renovation to align more closely with client needs. "People coming into Teterboro are normally coming in for business, and they are time sensitive. They appreciate us just getting them in and out."

The location has 125,000 sq ft of heated hangar space, capable of storing the latest big jets. It has 42 based aircraft, ranging from a Beechjet to a G650, which are serviced by a quartet of 5,000-gallon jet-A tankers that draw from a 190,000-gallon World Fuel Services-supplied tank farm that Atlantic shares with neighbor Meridian. Last year the FBO, one of six at Teterboro, pumped 11 million gallons of fuel.

While the FBO used to have peak seasons, Briccola describes business these days as busy and busier, year round. "It seems now that every month is just as busy as the next," she told **AIN**, adding that the location, which has a staff of 65 and is open 24/7, handles 14,000 operations a year.

To help alleviate ground handling congestion at the airport, administrators instituted a gridlock avoidance program last year that requires aircraft arriving during periods of peak demand to come to a stop in the operations area after landing and confirm if their chosen FBO can indeed handle them. If not, the tower advises which FBO can accommodate them. The Atlantic ramp has never been gridlocked, Briccola reported.

The facility offers the full range of FBO services, with fueling handled by an in-house trained line service staff, aircraft washing, type I and IV de-icing, crew cars, concierge service to handle reservations and ground transportation, and on-site car rental. Fresh baked cookies and fruit are always available, as are seasonal beverages.

U.S. Customs at the airport is handled at the northernmost ramp, and all arriving international flights must first stop there for clearance. Atlantic has the contract to support the customs operation, providing aircraft marshaling and baggage assistance for all arriving aircraft. The company is also permitted to dispose of international trash. —*C.E.*

PRELIMINARY REPORTS

WING STRIKE ON LANDING IN GUSTY WIND

Bombardier Global Express, March 8, 2017, Hamilton, Ontario, Canada—The right wingtip of a Jetport Global Express contacted the runway while the aircraft was landing at John C. Munro Hamilton International Airport in Ontario, damaging the aileron, winglet, slat tip and outboard flap canoe. The wind at the time of the landing on Runway 24 was reported as 240 degrees at 41 knots, gusting to 55 knots. No one was injured in the accident. The Transport Safety Board of Canada is investigating.

AIR AMBULANCE CRASHES IN COW PASTURE

Pilatus PC-12, April 28, 2017, Amarillo, Texas—A Part 135 air ambulance flight by a PC-12 ended soon after takeoff from Amarillo Airport (KAMA, elevation 3,605 feet msl), killing the three people on board. The IFR flight, operated by Rico Aviation, was dispatched to transport a patient from Clovis, N.M., to Lubbock, Texas. On board were the 57-year-old ATP-certified pilot, who reported 5,800 hours total flight time and 80 hours in the last six months on his most recent second-class medical application, and two medical flight crew.

The flight departed without issue, but three minutes into the flight, at 6,000 feet msl, the pilot failed to respond to an ATC transmission regarding an inoperative transponder. The controller made three more transmissions to the pilot without response. Shortly thereafter the airport tower controller saw a fireball and reported a crash. Surveillance video from a nearby business recorded the airplane in a steep descent at high speed followed by an explosion.

The airplane created a burned trench in a pasture adjacent to several stationary train cars one mile south of KAMA. The debris path was generally oriented southwest. All major structural components of the airplane were located within the wreckage.

The KAMA automated weather observation recorded wind from 360 degrees at 21 knots gusting to 28 knots, 10 statute miles visibility, broken clouds at 700 feet agl, overcast cloud layer at 1,200 feet agl, temperature 45 degrees F, dew point 45 degrees F, altimeter 29.78 inches, with peak wind from 360 degrees at 32 knots, lightning distant west, variable ceiling from 500 to 900 feet agl. A preliminary review of the weather data revealed wind shear beginning at about 6,000 feet msl, along with a temperature inversion at the same altitude.

The NTSB has retained the wreckage for further examination.

NORWEGIAN SUPER PUMA LOSES MAIN ROTOR HEAD AND MAST

Airbus Helicopters H225, April 29, 2017, Turøy, Norway—An Airbus Helicopters H225 (registration LN-OJF) operated by CHC Helikopter Service with two crew and 11 passengers aboard was flying from Gullfaks B (ENQG) to Bergen Airport Flesland (ENBR) at 2,000 feet when the main rotor head (MRH) and mast detached. The helicopter fell onto a small island and caught fire. Wreckage was found scattered in the water at a depth of one to nine meters. The accident was not survivable.

The UK Air Accidents Investigation Branch (AAIB) is working with the Norwegian Accident Investigation Board (AIBN) and Airbus Helicopters to determine the cause of the accident. The recordings on the CVFDR showed that everything appeared to be normal until a sudden catastrophic failure developed in one to two seconds. The CVFDR recordings ended abruptly at the same time. There are no indications that pilot actions were a factor in the accident. Investigators have conducted a spectral analysis of the CVR data. There was no obvious indication of an abnormality before the sudden detachment of the rotor head.

The wreckage was moved to the AIBN premises in Lillestrøm for more detailed inspections/examinations. The health and usage monitoring system (Hums/PCMCIA) card was retrieved and examined. Key pieces of wreckage were sent to selected laboratories, one of them at Airbus Helicopters, for detailed examination, which continues to focus on the MRH suspension bar assembly, the main gearbox and the main rotor head. Other wreckage parts and components are also being examined in parallel. Important components are still missing, however, among them the epicyclical second-stage planet gear carrier and parts of the forward suspension bar. AIBN and AAIB investigators continue to search for these components.

CESSNA CARAVAN HITS HIGH TERRAIN IN ALASKA

Cessna 208B, May 1, 2017, Chignik Lake, Alaska—A Cessna 208B Caravan operated by Grant Air under Part 135 hit rising terrain surrounded by steep, mountainous terrain eight miles south of Chignik Lake Airport, Chignik Lake, Alaska, killing the ATP-rated pilot. The wreckage came to rest in deep snow at about 2,993 feet on the west face of a treeless, steep mountain in the Alaska Peninsula National Wildlife Refuge of the Aleutian Range, 500 feet from the top of the mountain ridge and partially submerged in the snow on its left side with the nose section under the snow pack. Weather at the time of the accident at the aircraft's departure point, Port Heiden Airport, Alaska, was VFR. At 12:39 p.m., an aviation special weather report from Chignik Airport (the closest weather reporting facility) reported, in part: wind variable at 4 knots; visibility 10 statute miles, light rain; sky condition, overcast at 1,700 feet. The aircraft was destined for Perryville Airport, Perryville, Alaska.

POSSIBLE TAIL-ROTOR AND GEARBOX FAILURE

Bell 407, May 2, 2017, Grand Bay, La.—A Bell 407, N457PH, registered to and operated by PHI Helicopters of Lafayette, La., on a VFR Part 135 flight with four passengers made a precautionary landing at Grand Bay receiving station, an oil platform in the Gulf of Mexico near Boothville, La., after the pilot noticed vibration. As the pilot shut down the engine the vibration worsened and required the rotor brake to bring the dynamic system to a swift halt. Post-accident inspection revealed tip cap separation from one of the tail-rotor blades and cracks on the tail-rotor gearbox, mounting hardware and tailboom—substantial damage, according to the NTSB preliminary report. The pilot and four passengers on board were not injured. The flight was en route to Main Pass 311A in the Gulf of Mexico.

ASTAR DOWN IN BERGEN HARBOR

Airbus Helicopters AS350B3, May 10, 2017, Bergen, Norway—A UK-registered AStar with three people on board hit the water after missing the landing pad on the pleasure yacht *Bacarella* in the fjord outside Bergen harbor, seriously injuring one passenger; two others suffered minor injuries. The helicopter, which was equipped with an emergency flotation system, came to rest upside down in the water.

Video clips of the accident were captured from different positions, one of them a CCTV camera on the helicopter deck of the yacht. As the AStar was coming in for landing, the yacht camera shows a cover for the fuel depot at the helipad being lifted up in the air by the main rotor downdraft. It subsequently flew through the arc of the main rotor disc. The pilot saw the cover moving and climbed away, but the cover hit the main rotor and the helicopter rotated around its vertical axis while moving backwards, hitting the water tail first. The pilot activated the flotation system, preventing the helicopter from sinking. The Norwegian Society for Sea Rescue arrived immediately after the accident and rescued the three people from the helicopter. The UK Air Accidents Investigation Branch has secured all data recording devices from the helicopter wreckage and the investigation is continuing. ❑

FINAL REPORT

HELICOPTER CRASHED ON MAINTENANCE FLIGHT AFTER INADEQUATE PRE-FLIGHT

Airbus Helicopters EC155B1, April 2, 2015, Carapicuíba, São Paulo, Brazil—An EC155 departed on a post-maintenance flight from Carapicuíba, São Paulo, Brazil, that covered just 1.27 nm before it descended into a large residential compound, killing all five people on board. One of the victims was the youngest son of the governor of São Paulo. A helicopter pilot, he had run into a colleague at a gas station, who invited him along for the test flight and he was in the left-hand seat. The Center for Research and Prevention of Aeronautical Accidents (Cenipa) determined that the cause of the accident was that the helicopter's controls were never completely reconnected after maintenance. All such connections are typically inspected by the pilot-in-command before flight and always inspected by the mechanics before releasing a helicopter as safe for flight. Investigators called out organizational factors at the maintenance facility; the mechanic balancing the rotor blades was called away for another task, and the maintenance inspector completed the balancing.

Accident inspectors found in the wreckage that the right-hand roll ball-type flexible control was disconnected from the right-hand roll bellcrank; the right-hand roll ball-type flexible control and right-hand roll bellcrank connection screw was found housed in the right-hand roll bellcrank, with its washer and with the "pointed" nut on some threads (nut partially threaded on the bolt). Research showed the helicopter underwent maintenance that included compliance with "Inspection Criteria—Main Rotor Flexible Ball Controls." In that task the mechanic must disconnect the flexible controls from their respective bellcranks and reconnect the components at the end of the service; however, there was no record of a completion sign-off by the inspector, which would have indicated that he had inspected the components for integrity at the completion of the task.

The helicopter's manufacturer, Airbus, specified, performed and tracked repairs on the five blades, and painted them, each on a different date. The shop performing that maintenance ran out of paint thinner, putting the helicopter's maintenance behind schedule. When the thinner arrived all the blades were painted and sent to Helibras's maintenance facility immediately, disregarding the maintenance manual requirement for seven days of paint curing before installation. Airbus said in the investigation that since the paint was not air-dried but kiln-cured at 60 degrees C, it did not require seven days of curing and that the blades were immediately ready for installation and dynamic balancing. Cenipa's report pointed out that such a procedure is not in the helicopter or blade maintenance manual. Airbus maintained that the blade paint was not to blame for the accident.

At the end of last year the police delegate presiding over the accident indicted three people for five wrongful killings; one for procedural fraud; and one for false witness. The indictments were later dismissed. A criminal investigation is under way, however, by the public prosecutor's office in Carapicuíba.

In its recommendations, Cenipa urged the operator to ensure that an effective mechanism is in place to control the updating of aircraft maintenance logs; it is working to ensure the adoption of operational procedures within that company that prevent flights if there is no record of the pre-flight inspection being carried out in the logbook; it is helping the operator adopt procedures prohibiting passengers on operational check flights, which is in accordance with current legislation; and it is working with the maintenance facility on better control of mechanics' and inspectors' records. Finally, it is working with Airbus to specify in appropriate documentation the necessary conditions and cure time for completion of the polymerization process of the blades. ■

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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Mitsubishi inspires students to embrace Stem

How do you inspire high-school students to pursue careers in science, technology, engineering and mathematics (Stem)? That's the question Mitsubishi Aircraft America is trying to answer. On May 16, the company held the Reach for the Stars with Stem program for 550 Moses Lake High School ninth graders in Washington State. The one-day event, held with Big Bend Community College, featured students meeting with individuals in the aviation community, hearing from speakers such as astronaut Wendy Lawrence and contemplating the possibility of pursuing a career in Stem fields.

"This Stem event was a way for Mitsubishi Aircraft America to give back and benefit the community," Hitoshi "Hank" Iwasa, head of Mitsubishi's flight-test center, told **AIN**. "Since being in Washington State, we've seen how important Stem education is and we want to continue to promote it throughout the region."

To start the day, the students visited the Port of Moses Lake at Grant County International Airport, home of Mitsubishi's flight-test center. It is also where the first MRJ flight-test aircraft landed in the U.S. While the company had a few aircraft, such as the regional jet, on display, the weather restricted most of the students from touring the aircraft. However, some were able to tour the aircraft and speak with pilots and other members of the regional jet program.

The MRJ was among several aircraft on display at Mitsubishi's Stem event for ninth graders.

Speakers such as astronaut Wendy Lawrence and the NTSB's Dennis Hogenson shared their Stem experiences with the students later in the day. Video messages from Sen. Patty Murray (D), Sen. Maria Cantwell (D) and Governor Jay Inslee (D) also played at the event. All of the speakers have some connection to Washington State and Stem.

The Reach for the Stars with Stem event also made sure that women and minorities were represented with participants such as Reina Endo, manager of Mitsubishi's Moses Lake flight-test center. She originally moved to Washington at the age of seven because of her father's business. She did not speak English and did not have the luxury of the Internet to teach herself the language. However, Endo attended school in Snohomish County, where Boeing had donated some computers. Over time, computers became a basic language for her to communicate with other students.

"In Japan, mathematics and science are really advanced, so I was able to teach my friends because I was more advanced even though I didn't speak the language," Endo told **AIN**. "It really helped me to gain confidence as well as connect with other students and make friends. For me, that's how the Stem area helped me advance personally and academically. That led me to think that for a company like Mitsubishi it would really be meaningful for the local students if they were able to access Stem through seeing airplanes and talking to the pilots and others in the aviation industry."

Target Audience

Representatives from Mitsubishi Aircraft America worked with the Moses Lake school district and state educators to determine that the group of students to benefit from this program the most was ninth graders. The beginning of high school is an important time for exploring paths for higher education and careers.

"I think it's really cool that you as ninth graders have a chance to start your careers right now," Inslee said in a video message. "You might be building autonomous vehicles that can drive themselves. You'll be driving new carbon-fiber jets with whole new electrical systems. You can be the next governor or president and understand the science of climate change."

At the end of the day a reception was held where 40 attendees from the local, state and federal levels discussed Stem-related issues affecting Washington State. Representatives from government and educational offices came together to discuss how to encourage students' interests in Stem and aviation careers while also discussing how to better promote Stem events with Mitsubishi's flight-test center.

"We received a positive reaction from the school and community," Iwasa said. "We are now planning to have another event probably next spring. It depends on the discussions with the community and school, but since this year's event was so successful, we might do the same thing next spring." —*S. C.*

THE WORLD CHANGES >> SEPTEMBER 5-6

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Rule Proposal Addresses Helicopter Gearboxes

Comments are due by the end of this month on a European Aviation Safety Agency (EASA) notice of proposed amendment (NPA) to reduce the level of risk associated with loss of lubrication of rotorcraft gearboxes on transport-size Category A multiengine helicopters (EASA CS-29). The objective of this NPA is to ensure continuation of safe flight for an extended time after loss of oil from a gearbox that relies on a pressurized lubrication system to provide lubrication and cooling of rotating components.

Aug. 12, 2017

Proposed Rules Published to Regulate Drones in Europe

The European Aviation Safety Agency (EASA) has proposed rulemaking to regulate the operation of small drones in Europe. Comments are due by August 12 this year. The proposed rule would require a system that ensures drones do not enter a prohibited zone. It addresses pilot qualifications and requires pilots to register before they operate drones heavier than nine ounces. The proposal provides alleviations for people flying model aircraft. At the end of this year, the EASA will submit a final recommendation to the European Commission.

Aug. 15, 2017

New EASA CS-23 Goes Into Effect

A rewrite of the European Aviation Safety Agency's CS-23 small airplane certification regulations goes into effect just 15 days before the FAA's own comprehensive overhaul of Part 23 small airplane certification rules. Similar to the FAA's rewrite, the new CS-23 lays the foundations for a performance-based, flexible approach to certifying small aircraft. According to EASA officials, the rules will "remove design limitations for manufacturers, opening the way for innovation."

Aug. 30, 2017

FAR Part 23 Rewrite Effective Date

The FAA's rewrite of Part 23 small airplane certification rules goes into effect on August 30 this year. The revised airworthiness standards will apply to airplanes in the normal, utility, acrobatic and commuter categories, and replace current "prescriptive design requirements with performance-based" airworthiness standards. These standards replace the current weight and propulsion divisions with "performance- and risk-based divisions of airplanes with a maximum seating capacity of 19 passengers or less and a mtow of 19,000 pounds or less." The new rules enact additional airworthiness standards to address certification for flight in icing conditions, enhanced stall characteristics and minimum control speeds for multiengine airplanes. Additionally, revised rules will apply to Part 91, 121 and 135 operations to correspond with the new airworthiness standards.

Within 12 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.

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."

Beyond 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.

Nov. 8, 2018

ICAO Adopts 15-min. Position Reporting

The International Civil Aviation Organization Council adopted a tracking standard for certain international flights that requires crews to report their aircraft's position at least every 15 minutes. It will become applicable on November 8 next year. The new requirement will be made formal as Amendment 39 to Annex 6—*Operation of Aircraft*, Part I. The new standard is the outcome of recommendations stemming from the disappearance of the 777 operating Malaysia Airlines Flight MH370 while en route from Kuala Lumpur to Beijing, China, on March 8, 2014. The search for the 777 was called off in January this year.

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. ❑

Rudy Toering, president and CEO of the *Canadian Business Aviation Association*, plans to retire in February next year. Toering, who has 40 years of industry experience, has led the association since 2013, and before that held roles with FlightPath International, CAE, FlightSafety International, Air Canada and Innotech Aviation. CBAA has launched the search for a successor.

Bruce Byerly has returned as an owner of *Byerly Aviation,* the longtime Commander service center founded by his grandfather, Millard Byerly. **Scott Welch**, who acquired Byerly Aviation in 2010 from Aviation Facilities, will retain 50-percent ownership and will stay on as CEO to oversee day-to-day management. Byerly will focus on sales and new-business development.

SR Technics named **Jean-Marc Lenz** chief operating officer and accountable manager and **Michael Sattler** chief commercial officer. Lenz succeeds Frank Walschot, who has joined HNA Group. Lenz has 30 years of aviation experience, beginning as an aircraft maintenance technician and holding roles with SR Technics as head of line maintenance, head of aircraft services and most recently head of engine services. Sattler joined SR Technics in 2015 and has 25 years of aircraft maintenance and repair experience with Ruag Aviation and Jet Aviation.

Premium Jet appointed **Daniel Kunz** managing partner and director of aircraft sales. Kunz was most recently with Indigo Lyon Switzerland.

Lufthansa Technik named **Kai-Stefan Roepke** and **Thomas Decher** to lead its VIP and special-mission aircraft services operations. They take over from Walter Heerdt, who recently retired. Roepke is vice president commercial and Decher vice president operations.

Nordam named **Raegen Siegfried** vice president of HushWorks, the company's advanced-development projects effort. Siegfried had held the position of director of the program since 2015 and before that had served with Goodrich, United Technologies and Nordam in Singapore.

Global Jet Capital appointed **Andrew Farrant** chief marketing officer. Farrant wasmost recently v-p of marketing, strategy and communications for Sequa and Chromalloy.

FlightSafety International chairman, president and CEO **Bruce Whitman** was elected to a three-year term as chairman of the board of directors for the *USO of Metropolitan New York*. Whitman, who has been a director of the USO since 2010 and most recently was vice chairman, has served with FlightSafety since 1961 and took on the role of CEO in 2003.

Cutter Aviation promoted **Tara Creel-Cesena** to general manager of the FBO at Phoenix Deer Valley Airport. Creel-Cesena joined Cutter Aviation in 2011 as a customer service representative after spending five years with Mesa Airlines as a buyer of heavy maintenance. Cutter named **Sylvia Graebe** as charter sales and aircraft acquisitions manager for its charter and flight management department in Phoenix. Previously Graebe was COO of Eascor, and she has also served with World Jet and America West Airlines. Cutter also appointed Bob Boudreau regional sales manager based at Phoenix Sky Harbor Airport. Boudreau joins Cutter Aviation from Phoenix Aircraft, where he provided pilot services, aircraft brokerage and aircraft management.

Comair Flight Services appointed **Kerry Searle** client services director. Searle joined CFS in 2011 and most recently was client services manager.

ACASS hired **Trisha Lakatos** as sales director, Eastern U.S. and Canada. Lakatos joins ACASS from Gulfstream Aerospace, where she was a sales development manager.

Carlos Ordonez joined *C&L Aerospace* as director of business development for Latin America. Ordonez formerly was v-p of sales for Aeronautical Investments.

Eastern Aviation Fuels named **Rhonda Bernthal** director of marketing. Bernthal has a 15-year background in marketing strategies, branding and resource development.

Andrew Pearce was appointed international sales manager for *Innotech Aviation*. Pearce will be responsible for sales in all of Europe.

Keystone Aviation promoted **Charlie Chamberlain** to managed aircraft sales director based in Salt Lake City and hired **R.D. Wooten** as sales director of Piper aircraft for Arizona, Nevada and New Mexico. Chamberlain previously was an aircraft charter sales representative. Wooten has 30 years of aviation industry sales experience and began his career flying Piper aircraft.

FlightSafety International promoted **Rachel Runner** to assistant manager of the company's Cessna learning center in Wichita. Runner joined FlightSafety in 2008 as assistant to the director of quality management systems for Cessna training programs and since has served as operations support and compliance coordinator and director of quality management systems for Cessna programs.

Western Aircraft hired two former employees to key sales positions. **Walt Marcy,** who served with Western Aircraft from 2012 to 2014, rejoined the company as avionics sales manager. Most recently Marcy was with StandardAero. **Lee Miles**, who worked at Western Aircraft from 1999 to 2016, rejoins the company as a regional sales manager for jet aircraft. He was most recently regional sales manager with Dassault Aircraft Services.

Jody Fischer was promoted to director of flight operations for *Weather Modification International* (WMI). Fischer has served with WMI for 17 years, most recently as chief pilot.

Flightstar appointed **Robert Dorsey** quality control manager. Dorsey has a 35-year background in the aviation industry, holding positions such as quality control manager, FAA accountable manager, assistant project manager, chief inspector and quality control auditor.

Acropolis Aviation named **Tina Ross** as a charter sales executive based at Farnborough Airport in the UK.

Elit'Avia named **Wynton Fauré** sales director for the UK, Europe and Africa. Fauré has held sales positions with TAG Aviation and VistaJet.

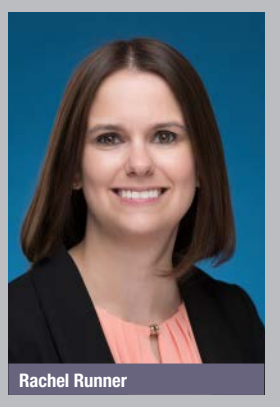
Francis Aviation hired **Kevin Wickstrom** to serve as a charter pilot. Wickstrom brings 26 years of flight and maintenance experience to his new role, including flying Apache helicopters for the U.S. Army and numerous airplanes and helicopters for U.S. Customs and Border Protection. ❑


Bruce Byerly


Jean-Marc Lenz


Raegen Siegfried


Carlos Ordonez


Rachel Runner

Awards & Honors

The National Air Transportation Association (NATA) has named L.J. Aviation co-founder **Edward Kilkeary, Sr.**, this year's recipient of the William A. "Bill" Ong Memorial Award, and selected Duncan Aviation chairman David Todd Duncan to receive the NATA Distinguished Service Award. The awards, considered to be the association's highest honors, were presented on June 7 at a luncheon held during the 2017 NATA Aviation Business Conference in Washington. The Ong award, named after the association's co-founder and first president, recognizes "extraordinary achievement and extended meritorious service to the general aviation industry." Kilkeary, a business owner, pilot and former NATA board member, will be honored for an aviation career that spans 40 years. A Vietnam War veteran, Kilkeary co-founded L.J. Aviation in 1980 with his wife, Mary Ann. The company, which has a charter and management firm and an FBO at Arnold Palmer Airport in Latrobe, Penn., operates 30 aircraft. His company was among the early adopters of the NATA Safety 1st Professional Line Service Training and Air Charter Safety Foundation Industry Audit Standard.

The NATA Distinguished Service Award recognizes "outstanding service and ongoing contributions to the general aviation industry." Duncan leads the FBO and MRO organization founded by his grandfather, David Duncan, in 1956. Todd Duncan joined the family business 30 years ago, beginning in aircraft sales and component services and working his way up to chairman in 2007. Following in the footsteps of his father, Robert, Todd Duncan chaired the NATA board of directors in 2011 and was a founding board member of the Air Charter Safety Foundation. He remains a member of the Presidents Council of NATA.

EBAA honored two supporters of business aviation with its 2017 European Business Aviation Awards presented during EBACE in May. The honors went to **Marian-Jean Marinescu**, member of the European Parliament from Romania, and **Carlo des Dorides**, executive director of the European Global Navigation Satellite Systems Agency (GSA). Marinescu was recognized for his contributions in "promoting the interests of business aviation in the European Parliament," said EBAA CEO Brandon Mitchener, adding, "Mr. Marinescu helped to make the EBAA's 'Meet your MEP' campaign a reality by hosting an insightful discussion with some of our Romanian members in his hometown of Craiova." Marinescu is a member of the European Parliament's Transport Committee. Des Dorides was honored as a strong supporter of EBAA in its talks with the European commission, contributing key input to EBAA's position paper on Egnos. Mitchener said, "As executive director of the GSA, Mr. des Dorides sets the vision of the agency and ensures Europe's satellite navigation systems are effectively operated, well maintained and secure." He has three decades of experience managing space-service-focused teams. ■

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YSSY	Hawker Pacific	Sydney	Australia
ZGHA	Deer Jet	Changsha	China
ZGKL	Deer Jet	Guilin	China
ZGNN	Deer Jet - Guangxi	Nanning	China
ZGSZ	Deer Jet	Shenzhen	China
ZJHK	Deer Jet	Haikou	China
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AIN Calendar

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

DAVID McINTOSH

NBAA 2016

JULY

ASA ANNUAL CONFERENCE…July 9-11, Hyatt Regency, Reston, VA. Info: www.aviationsuppliers.org/annual-conference.

INTERNATIONAL CONFERENCE ON ADVANCES IN DESIGN, MATERIALS, MANUFACTURING AND SURFACE ENGINEERING FOR MOBILITY… July 19, Crescent University, Chennai, India. Info: www.bsauniv.ac.in/admms2k17

FLIGHT SAFETY FOUNDATION NETWORKING DINNER AND SILENT AUCTION…July 20, National Press Club, Washington, D.C. Info: waddell@flightsafety.org; https://flightsafety.org/event/5th-annual-networking-dinner-and-silent-auction/.

▲ **EAA AIRVENTURE**…July 24-30, Oshkosh, WI. Info: www.eaa.org/en/airventure.

AUGUST

NATA ADVANCED LINE SERVICE REGIONAL WORKSHOP…August 1-2, Alliance Aviation Services, Fort Worth. Info: safety1st@nata.aero; http://nata.aero/2017-Advanced-Line-Service-Workshops/ALS-Workshop-Ft-Worth-TX.aspx.

LATIN AMERICAN BUSINESS AVIATION CONFERENCE & EXHIBITION…August 15-17, Congonhas-São Paulo Airport, São Paulo, Brazil. Info: www.abag.org.br/labace2017.

22ND ANNUAL INTERNATIONAL AVIATION FORECAST SUMMIT…August 26-29, The Wynn Resort, Las Vegas, Nevada. Info: Sonia@AviationPlanning.com; http://aviationforecastsummit.com/.

SEPTEMBER

EASA AIRCREW TRAINING CONFERENCE… September 6, EASA Headquarters, Cologne, Germany. Info: olga.rando@easa.europa.eu; www.easa.europa.eu/newsroom-and-events/events/aircrew-training-conference-advanced-approach-pilot-training

REGIONAL FORUM…September 7, Morristown Airport, Morristown, NJ. Info: www.nbaa.org/events/forums/2017MMU/.

JETEXPO MOSCOW 2017…September 7-9, Vnukovo-3 Business Aviation Center, Moscow, Russia. Info: info@jetexpo.ru; http://2017.jetexpo.ru/en/.

DAVID McINTOSH

DUBAI 2015

AOPA FLY-IN…September 8-9, University of Oklahoma Westheimer Airport, Norman, OK. Info: www.aopa.org/community/events/aopa-fly-ins/2017-aopa-fly-ins.

ENGINE LEASING SEMINAR…September 12, Holiday Inn Kensington Forum, London, England. Info: events@everestevents.co.uk; www.everestevents.co.uk/event/engine-leasing-seminar-2017/.

NATA ADVANCED LINE SERVICE WORKSHOP…September 12-13, Duncan Aviation, Lincoln, NE. Info: safety1st@nata.aero; http://nata.aero/2017-Advanced-Line-Service-Workshops/ALS-Workshop-Lincoln-NE.aspx.

AIRCRAFT ASSET MANAGEMENT SEMINAR… September 13, Holiday Inn Kensington Forum, London, England. Info: events@everest events.co.uk; www.everestevents.co.uk/event/aircraft-asset-management-seminar-2017-2/.

MBAA 6TH ANNUAL SCHOLARSHIP GOLF TOURNAMENT…September 14, The International, Bolton, MA. Info: massbizav@gmail.com; www.massbizav.org/events/mbaa-6th-annual-scholarship-golf-tournament/.

GAMA GENERAL AVIATION AIR SAFETY INVESTIGATORS WORKSHOP… September 26-27, Union Station, Dallas, Texas. Info: info@gama.aero; https://gama.aero/civicrm/?page=CiviCRM&q=civicrm/event/info&reset=1&id=40.

SAE 2017 AEROTECH CONGRESS & EXHIBITION…September 26-28, Fort Worth Convention Center, Fort Worth, TX. Info: CustomerService@sae.org; www.sae.org/events/atc/.

WAI CONNECT DAYTON…September 29-30, Marriott at the University of Dayton, Dayton, OH. Info: mmartin@wai.org; www.wai.org/wai-connect-dayton.

OCTOBER

DRONE WORLD EXPO…October 3-4, San Jose Convention Center, San Jose, CA. Info: info@jdevents.com; www.droneworldexpo.com.

AOPA FLY-IN…October 6-7, Groton–New London Airport, Groton, CT. Info: www.aopa.org/community/events/aopa-fly-ins/2017-aopa-fly-ins/.

▲●◆ **NBAA BUSINESS AVIATION CONVENTION & EXHIBITION**…October 10-12, Las Vegas Convention Center, Las Vegas, NV. Info: (202) 783-9000; www.nbaa.org.

GENERAL AVIATION STRUCTURES WORKSHOP…October 16-17, EASA Headquarters, Cologne, Germany. Info: Structures.Workshop@easa.europa.eu; www.easa.europa.eu/newsroom-and-events/events/general-aviation-structures-workshop.

ENGINE LEASING SEMINAR…October 17, Crowne Plaza, Fort Lauderdale, Florida. Info: events@everestevents.co.uk; www.everestevents.co.uk/event/engine-leasing-seminar-2016/.

INTERNATIONAL AIR SAFETY SUMMIT… October 23-25, Clayton Hotel, Burlington Road, Dublin, Ireland. Info: events@flightsafety.org; https://flightsafety.org/event/iass2017/.

AOPA FLY-IN…October 27-28, Peter O. Knight Airport, Tampa, FL. Info: www.aopa.org/community/events/aopa-fly-ins/2017-aopa-fly-ins.

BOMBARDIER SAFETY STANDDOWN… October 31-November 2, Hyatt Regency Hotel, Wichita, KS. Info: (316) 946-7876; www.safetystanddown.com/.

NOVEMBER

▲●◆ **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 Operation at Page Field, Fort Myers, FL. Info: safety1st@nata.aero; http://nata.aero/2017-Advanced-Line-Service-Workshops/ALS-Workshop-Ft-Myers-FL.aspx.

EASA GLOBAL MANUFACTURING MEETING FOR INDUSTRY PRODUCTION AND MANUFACTURING STAKEHOLDERS…November 17, EASA Headquarters, Cologne, Germany. Info: GMC2017@easa.europa.eu; www.easa.europa.eu/webshop/gmc2017.

NBAA TAX, REGULATORY & RISK MANAGEMENT CONFERENCE…October 8-9, Las Vegas Convention Center, Las Vegas, NV. Info: sobrien@nbaa.org; www.nbaa.org/events/taxes/2017/.

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/.

DECEMBER

AIRCRAFT ACQUISITION PLANNING SEMINAR…December 5-6, Scottsdale Plaza Resort, 7200 Scottsdale Rd., Scottsdale, AZ. Info: 800-832.2025; http://www.conklindd.com.

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/.

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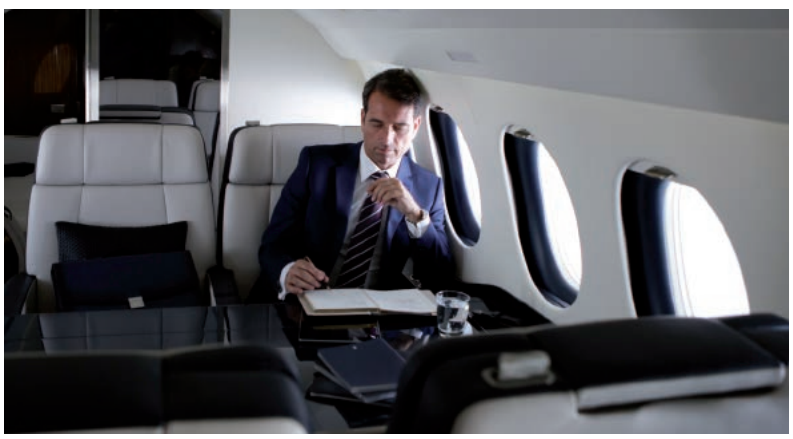

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