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Edited by William Garvey, Jessica A. Salerno and Molly McMillin

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COVER
Photo of the Falcon 8X courtesy of Dassault Falcon Jet

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Business & Commercial Aviation

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Seat Surrender

Having time **to do it right**

THIS FACT GAVE ME PAUSE: YEARS BEFORE HIS HANGING, WIL-liam Kidd, the 17th century Scots pirate, met and married a rich widow and for a time settled with her in New York. They bought a house at 119 Pearl Street in lower Manhattan along with a pew at the then-abuilding Trinity Anglican church. So, the buccaneer-turned-gentleman was briefly a respected burgher in the bustling American colonial seaport and was well connected to its political, religious and business leaders. Who knew?

Well, Robert C. Ritchie did. He's the fellow who authored "Captain Kidd and the War Against the Pirates," the well-documented book I was struggling to read in the dim light of my daughter's townhouse. My visit there and poor lighting were both the result of Hurricane Dorian, whose arrival had chased my bride and me from our low-country home and to our offspring's inland but abruptly power-less digs. I picked up the Kidd biography as a distraction from the howling deluge outside and mental images of the havoc Dorian might be wreaking upon my house.

When the rains eased, we motored along darkened, inundated streets lined with broken limbs and uprooted trees, the traffic lights all dead. Presently, we were much relieved to see our house had withstood the onslaught but had shed substantial amounts of siding and roof shingles in the Category 3 rampage.

Now not only did I have a mess to clear, but I'd also have to deal with the post-hurricane problems of the entire community since I'm a member of the homeowners' board. Meanwhile, the Coast Guard Auxiliary was calling for help — I'm a card-carrying member of Flotilla 12-06 — and my magazine deadlines were closing in. I was going to be busy.

In accepting To Do's, the best of intentions can lead to big trouble if the time available is constrained. When those conditions prevail, promised deliverables often aren't or the work is done poorly in haste or presented too late. Any of those outcomes can disappoint, even infuriate others and scuttle what had been a good reputation.

In reviewing my own list recently, I concluded that the reasonably expected was becoming out of balance with the hours they'd require. Something had to give. After considerable thought I decided, reluctantly, that my right choice was to resign from the National Business Aviation Association (NBAA) Safety Committee.

Committees, all filled by NBAA members, are the engines that give the association life, purpose, insight and direction. Their charges range from airport and airspace access and emerging technologies to domestic and international ops, security and maintenance, among the many. All are absolutely worthy and their work helps keep business aviation healthy, effective and secure. That stated — and here I'm unapologetically admitting total bias — I believe the Safety Committee's work is of foremost importance. After all, if business aviation is deemed unsafe, business aviation will cease to exist, thereby making all other considerations and concerns irrelevant.

Based upon my decade or so of participation, I can provide been-there assurance that the Safety Committee's members and leadership understand the weight of their responsibilities and the potential consequences of neglect. The record of actions taken attests to their good efforts to keep business aviators and their passengers out of harm's way.

> In accepting To Do's, the best of intentions can lead to big trouble **if the time available is constrained.**

Absent any enforcement power, the committee relies on its members' collective expertise, hard and shared data, imagination and media to identify risks and safety shortcomings, provide methods of mitigation and then promote the same. The results are familiar to many in the industry and include the NBAA's Top Safety Issues, the yearly Single-Pilot Safety Standdown along with training and ops guidelines, the National Safety Forum also held at the annual convention, and the NBAA Flying Safety and Dr. Tony Kern Professionalism awards, along with regional safety presentations. And all of that is supported with relevant information on the association's website.

While the impact of the committee's work is impossible to measure, it's not by chance that NBAA member companies consistently deliver a superb record of safe operations.

During my tenure, the committee was chaired by exceptional leaders, namely Rich Walsh, Eric Barfield, Steve Charbonneau, Dave Ryan and now Tom Hull, each of whom helped shape the group and provide it focus. Their varied experiences as fighter, line, charter, demo and general aviation pilots, department managers, data analysts and trainers enriched the committee's work. In exiting, I salute them all and hope someone with the time, talent and eagerness takes my seat.

Had I remained, I doubt I'd have the unfettered time to contribute as much as the position deserves and yet by staying might deny appointment of a capable successor. With Capt. Kidd's exploits and ending fresh in mind, mateys, that would equate to piracy by preoccupation. Aaaarrrggghhhh! **BCA**

Readers' Feedback

Alt Jet Fuel

Your "No Alternative" **(Viewpoint, July 2019, page 7)** is well-received. Keep me posted as you explore new communication opportunities for sustainable alternative jet fuel.

Keith R. Sawyer
Manager of Alternative Fuels
Avfuel Corp.
Ann Arbor, Michigan

MCAS Explained

Your **"Lessons From the MCAS Accidents"** article by Fred George (June 2019) is interesting, influential and provocative. We count on your accurate reporting to propel us forward armed with information clarified and distilled. I made this article a "Read and Initial" with my team!

And I'd also like to add that the feature **"Sidestepping Operational Complacency"** by James Albright (July 2019, page 28) was tremendous.

Marty Rollinger
Director of Flight Operations
LECO
South Bend, Indiana

Medical Nightmare

What a nightmare Fred George details in **"A Personal Medical Marathon"** (July 2019, page 52). It is amazing the stress from the ordeal did not give him high blood pressure or an ulcer. Thank you for sharing this experience. If this had happened to me, I do not think I would have had the resources and tenacity to get back my medical. It would have been a tremendous loss to the aviation community if we had lost Fred as a reviewer of aircraft. Great article.

Bill Reidy
Coeur d'Alene, Idaho

Author's response: It was our "Point of Law" columnist Kent Jackson of JetLaw who suggested I call Dr. Quay Snyder's team at Aviation Medicine Advisory Service. I doubt I would have been able to get my medical reinstated without their help. **Fred George**

From the Web

Comments regarding "All About Jet Blast" by Patrick Veillette, September *BCA*

A very good article and a clear warning of the effect of jet blast. When working at an airport we get used to the dangers


Are You Lucky or Safe?

Lessons From the MCAS Accidents

Deficiencies in training, airmanship and experience are all factors

but how often do we see a helicopter? We should not forget that jet blast comes from jet engines but downwash comes from the helicopter rotor and it can be just as dangerous but in slightly different ways. When Helicopters hover taxi they cause a very strong downwash that can pick up stones and hurl them like bullets. This can be extremely dangerous and is not generally appreciated by handlers who are not familiar with and have not experienced this danger. It is certainly worth adding to the jet blast danger.

gstephenson15@gmail.com

I saw the old pickup behind the B747 YouTube when I was in primary and it scared the hell out of me (to tell you how long ago that was, I saw it on 16 mm film).

The rule of thumb that I was given was to stay behind a turbofan (any type) by at least four taxiway lights (300 ft.). Even staying that far back I remember some situations where we were buffeted quite violently by a large heavy taxiing ahead of us.

Articles like these are useful and bring back some interesting memories but I always have to ask: how do pilots forget these things?

myke.predko@gmail.com

Comments regarding "Is Sim Training Sufficient" by Fred George, September *BCA*

While I agree with what's lacking in 142 sim training, knowing airspace, runway specifications and conditions is part of being the PIC. 91.103 states all those items are part of pre-flight planning. I've been after CAE for years to let us bring scenario based training into and out of airports we actually fly to and their answer is always the same " we can't use those airports because the FAA hasn't approved them". I will be the first to say to the FAA to let the training providers develop a Part 91 curriculum that can be tailored to the client, after all we are the ones paying.

rblanchard via email

Comments regarding "My Gulfstream G500 Initial" by James Albright, September *BCA*

Great review about a great plane and a great training course.

tedesco99@comcast.net

. . . the elephant in the living room can be that half of the residual attention you preserve by using the automation is devoted to trying to figure out what the automation is doing. – *via email*

Comments regarding "Urban Upheaval" by Patrick Veillette, September *BCA*

Very nice, detailed and wide-ranging review of the UAM ecosphere — listing infrastructure challenges, regulatory and airspace issues, and revolutionary eVTOL and DEP technologies. And you mention five of the six Uber partners, the non-linear noise advantages of reducing rotor tip speeds and what may be possible with slowing a proven rotor, and FAA certification and regulatory issues — but you don't mention Jaunt Air Mobility. They are the sixth Uber Partner, use proven slowed rotor technology with an eVTOL air vehicle that looks similar to a helicopter, but is distinctly different, and plan for known FAR Part 29 — using a team lead by the former chief engineer of the first civil fly-by-wire certification program.

grynchlynch@yahoo.com

That's a great idea for using the unused areas within cloverleaf exits for helipads. The problem is that most highways over the last 20 years have been moving away from the cloverleaf design and instead use the straight off-ramp design now.

jimbo0117 via email

Comments regarding "Stick and Rudder Versus Digital Dependence" by James Albright, August *BCA*

An excellent analysis with which I completely agree . . . in principal. I'll offer a couple of observations.

First, the elephant in the living room can be that half of the residual attention you preserve by using the automation is devoted to trying to figure out what the automation is doing. It would help if the software geeks stopped trying to out-think the inflight situation. Why, for example, has the airspeed bug suddenly dialed itself back to 200 kt. . . . which, if you weren't looking at that precise moment, you may not notice.

Second, a significant departure from the normal constraints of this discussion is how we fly the Boeing 737 at American Airlines. The B737 has a full-time authothrottle. We do not autoland — ever. Instead, we use a HUD, equipped on the captain's side only, to fly Lower Landing Minimums approaches. We can fly a single engine CAT III to fail-passive minimums — by hand. When doing so, we rely on the autothrottle to manage speed, and at 27 ft., it will retard to idle, hopefully, while we fly the flare cue in the HUD.

The preferred practice is to use the autothrottle continuously through all approaches, including visuals. Being a long-time Boeing pilot, I raised the old objection to this during training. Boeing has always recommended that the autothrottle be disconnected when the autopilot is disconnected. Turns out that is no longer true. Analysis of speed data revealed much tighter speed control with the autothrottle than without. And given the ref speeds of the 737, the company likes avoiding the required wind additives when operating without the autothrottles.

So I decided to cooperate and graduate, and started using the autothrottle all the time. Three months after I checked out, I got an airplane with the autothrottles deferred. No big deal; we flew back and forth across the Atlantic for years that way. We took off, made the big left turn northbound out of MIA, levelled off at 7000 ft., and the next thing I know we're doing 290 kt. Three months is all it took for me to become totally dependent.

Now I fly almost all visuals without the autothrottles, just like we did in the B727, MD80, and for some of us, the B767. Like you, I will use all of the automation down to VMC; and if we are close to minimums, we'll just fly a HUD CAT III. But flying as often as is safe without them has vastly improved my mental model of what should be happening and when.

We have the ability to pull up a report on each approach following the landing. It will show the time from 50 ft. to touchdown, speed, vertical speed and glideslope max and min deviations, and the altitude you were fully configured. I do this after every landing as a way of grading myself. This may be a form of what Ericsson means by "purposeful practice." Sadly, I have had more than one first officer tell me that I am the first guy they've seen do that.


Safety

Stick and Rudder vs. Digital Dependence

Practicing without a purpose

Lastly, the difference between the definition of the ILS critical area in the US and the rest of the world is crucial. During the LLM certification for Eos Airlines, which I managed, we flew over 200 autolands in VMC. We emphasized this difference extensively in training. We also discovered, contrary to the POI's opinion, that ATC at JFK has no control over the ILS critical area. That is managed there by the Port Authority. You can ask ATC to protect the critical area all you want; they can't do it unless the weather is actually below 800 and 2.

cromwellgreen via email

Great article. Thanks. As a retired pilot with 50 some years in the cockpit, there is no substitute for comprehensive recurrent simulator training. I cringe when I remember some of the dumb things we did when training in the airplane. However, the erosion of basic airmanship in this age of autoflight is a real factor that needs to be addressed. Thanks again for a great article.

rlathrop@msn.com

Comments regarding "A Personal Medical Marathon," July *BCA*

Hey Fred, as a physician pilot (board certified in Aerospace Medicine) with both military and civilian PIC time over 4,000 accident free hours, I can only empathize with you. I too had the experience of being caught up on the FAA's special issuance treadmill. Despite being an instructor in the FAA's AME training program on several occasions, it was only because I was acquainted with the exact information requirements and physicians involved in the review and decision making process for special issuance actions that I was able to get my packets through the system several years in a row.

In general, I found that physicians and AME's without military experience do not understand the complex systems and processes involved in the special issuance processes. In my case, for several years I made sure that the appropriate medical information was generated and then wrote the annual aeromedical summary for my physicians to review, sign, and then forward to the FAA.

I remember many times during those years thinking, where would I be if I didn't understand what to do, how to do it, and have the opportunity to communicate with contacts at the FAA to make sure the packet was received and reviewed. Unfortunately, the FAA like many other federal agencies doesn't see your success as part of their success most of the time. And, let's just say that in general, customer service at the FAA is underdeveloped; lots of opportunity for improvement, but in too many situations improvement is not perceived as part of their mission success.

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If you would like to submit a comment on an article in BCA, or voice your opinion on an aviation related topic, send an email to jessica.salerno@informa.com or william.garvey@informa.com


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NEWS / ANALYSIS / TRENDS / ISSUES

THE LEADING U.S. DEVELOPERS OF SUPERSONIC AIRCRAFT have called on the Transportation Department (DOT) to modify its proposed rule on Mach+ flight authorizations, arguing the proposal's wording amounts to an effective prohibition. The comments on Aug. 27 came in response to DOT's June 28 notice of proposed rulemaking (NPRM) to streamline the application process for supersonic flight authorizations. The rulemaking — which is expected to be published in the *Federal Register* by year-end — will not constitute a repeal of the current prohibition on overland flights in excess of Mach 1, although FAA will reserve the authority to approve supersonic operations on an individual basis. In its comments, Nevada-based Aerion, which is developing the AS2 business jet and a 55-seat supersonic jet with Boeing called the Overture, wrote that the rulemaking's requirement that test flights cause "no measurable sonic boom overpressure to reach the surface . . . would effectively create a ban on all supersonic flight."

"This requirement does not recognize the possibility for a sonic boom or evanescent wave to be produced that is barely noticeable on the ground — if noticeable at all — but can still be detected by some scientific measurement method," the company wrote. **Aerion suggested DOT eliminate the "no-measurable-overpressure" standard,** instead allowing companies to perform environmental analyses using predictive technologies that can accurately model the noise impact of supersonic booms. In separate comments, airliner developer Boom Supersonic wrote that the NPRM's requirement that manufacturers first demonstrate that test flights could not be performed over the ocean, in order to justify later overland flights, "is not economically reasonable and undermines safety."

"For a new entrant manufacturer located far from a coast, testing supersonic aircraft over the ocean requires setting up additional test facilities that will cost many millions of dollars. For such an enormous expense, the public may be spared a few dozen half-second disturbances (on par with cracks of thunder, motorcycles backfires and other noises already tolerated in the environment) per year," wrote Boom.

A MAJOR CONSOLIDATION IN THE FUEL SUPPLY business is occurring with World Fuel Services agreeing to buy Universal Weather and Aviation's UVair Fueling Division for $170 million. The move, announced in late August, will affect business and general aviation customers at more than 5,000 locations worldwide. In turn, World Fuel will become the official fuel provider for Universal's international trip planning customers. **Miami-based World Fuel provides fuel procurement and management services at more than 8,000 locations in 200 countries.** The strategic acquisition will greatly bolster that business. "Universal has the industry's most comprehensive end-to-end mission management infrastructure, integrating more phases of the mission, and supporting more global trip legs, than anyone else," Universal Chairman Greg Evans said. "World Fuel Services has built an unparalleled global fuel supply network. With this new agreement, our customers will continue to benefit from having Universal seamlessly manage their trips, while at the same time enjoying the advantages of World Fuel's global fuel supply network."

Jet-A and Avgas Per Gallon Fuel Prices

September 2019

Jet-A

Region	High	Low	Average
Eastern	$8.72	$4.40	$6.20
New England	$7.71	$3.79	$5.16
Great Lakes	$8.08	$3.27	$5.48
Central	$7.46	$3.37	$4.91
Southern	$8.17	$4.35	$5.98
Southwest	$6.85	$3.26	$5.27
NW Mountain	$8.69	$3.35	$5.31
Western Pacific	$7.95	$3.90	$6.01
Nationwide	**$7.52**	**$3.71**	**$5.54**

Avgas

Region	High	Low	Average
Eastern	$8.85	$4.85	$6.52
New England	$7.45	$4.80	$5.90
Great Lakes	$8.59	$4.59	$6.06
Central	$7.59	$4.51	$5.44
Southern	$9.15	$4.30	$6.28
Southwest	$7.19	$4.12	$5.70
NW Mountain	$8.46	$4.65	$5.83
Western Pacific	$8.52	$4.89	$6.34
Nationwide	**$8.22**	**$4.59**	**$6.01**

The tables above show results of a fuel price survey of U.S. fuel suppliers performed in September 2019. This survey was conducted by Aviation Research Group/U.S. and reflects prices reported from over 200 FBOs located within the 48 contiguous United States. Prices are full retail and include all taxes and fees.

For additional information, contact Aviation Research/U.S. Inc. at (513) 852-5110 or on the Internet at www.aviationresearch.com

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NATA's Illegal Charter Website

The National Air Transportation Association (NATA) and its Illegal Charter Task Force have launched a new website at **nata.aero/advocacy/avoid-illegal-charter.aspx** *to assist members and the traveling public in identifying, avoiding and reporting illegal charter activity. The*

site is divided into five areas with fact sheets and information NATA says is essential to air charter operators, owners, brokers, consumers and the FAA.

ADS-B Equipage Rate at 79% in July

According to FlightAware, the ADS-B equipage rate to meet the FAA's Jan. 1 equipage deadline among turbine-powered business aircraft rose to 79% in July, an increase from 56% a year earlier. The report says of the 17,494 such aircraft registered in the U.S., 13,862 had been. Models with the highest compliance rates include the Cirrus Vision SF50 at 98%, Honda Aircraft's HondaJet at 96% and the Gulfstream G150 at 96%. Models with the lowest compliance included the Learjet 55 at 42%, Cessna Citation III at 55% and Dassault Falcon 20 at 56%.

THE ONLY REMAINING BACKCOUNTRY AIRFIELD IN DEATH VALLEY National Park, commonly called Chicken Strip, has been officially authorized, removing any question about its legal use by visitors. The unpaved California strip, officially named the Saline Valley Warm Springs Airfield, is well-known among recreational pilots for its dramatic desert scenery and challenges to pilots of small aircraft, according to the National Park Service. The landing strip's ongoing use had been a non-enforced violation of National Park Service (NPS) regulations after the area was added to Death Valley National Park in 1994. Volunteers with the Recreation Aviation Foundation (RAF) have been maintaining the strip at no cost to taxpayers, according to RAF and the park. **The aviation community showed its desire to continue access to Chicken Strip with volunteer labor and input during a public comment period, said Rick Lach, RAF California liaison who organizes seasonal volunteer work parties at the strip.** "The major credit for this accomplishment goes to everyone who got involved, wrote letters and remained engaged to save and preserve an airstrip," said John McKenna, RAF board chairman. The authorization takes effect immediately. Chicken Strip, located in Saline Valley Warm Springs area in California, has been in continuous use for decades, predating management of the area by the NPS, RAF said. The landing strip is 1,400 ft. x 35 ft. and a "challenging aviation experience," RAF said. To which the NPS noted, noting that fact "is therefore somewhat self-regulating."

GULFSTREAM AEROSPACE HAS EXPANDED ITS MAINTENANCE, repair and overhaul operations at Appleton International Airport in Wisconsin. The airframer recently opened a new $40 million, 190,000 sq. ft. aircraft maintenance facility there Aug. 10. Its service center includes 101,853 sq. ft. of hangar space plus offices, back shops, support space, sales and design center and increased access to Gulfstream's design portfolio. The project has meant nearly 100 new jobs for the site. The company says it plans to open four other new or expanded service centers in 2019 and 2020, including in Savanna, Georgia; Van Nuys, California; Palm Beach, Florida and Farnborough, England. In addition, Gulfstream has added two Brazilian aircraft services companies, Lider Aviacao and Aero Rio Taxi Aereo, to its authorized warranty facilities.

QUANTUM AIR IS ACQUIRING 22 FOUR-PLACE BYE eFLYER 4's and a pair of two-place eFlyer 2 all-electric airplanes. The Los Angeles operator has also signed a comprehensive agreement that includes two future advanced aircraft under development from Bye Aerospace."With the arrival of electric aircraft, we are entering a new Golden Age in aviation," said Tony Thompson, Quantum CEO. "Since the dawn of flight, point to point air travel has been a luxury available only to a privileged few. Quantum's groundbreaking air taxi service will finally make point to point air travel widely available.""The future has arrived," added Scott Akina, Quantum's vice president and chief pilot. "By electrifying aviation, Quantum will ignite urban and regional mobility. Electric aircraft are safer, quieter, and more efficient than legacy aircraft, and they are more fun, more comfortable, and do not pollute. "As part of the selection, Bye Aerospace CEO **George E. Bye will join the future air taxi operator's board of advisers.** According to Thompson that appointment will allow Quantum to "tightly integrate with Bye Aerospace, producing a superior flight experience for our customers."

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Sweden to Buy Six PC-24s in Ambulance Configuration

Sweden's Kommunalförbundet Svenskt Ambulansflyg (KSA) recently selected six Pilatus PC-24s in a fully equipped air ambulance configuration to provide aeromedical care across the country beginning in 2021.KSA is a national organization owned and financed by all 21 Swedish regions that are responsible for ensuring that all residents have equal access to good healthcare. Given the country's vastness, the formation of a national air ambulance service provides all residents with access to rapid, professional aeromedical care.

Pilatus Chairman Oscar J. Schwenk, Chairman of Pilatus, said of the selection, "I'm delighted to see the first air ambulance organization in Europe opt to buy the PC-24. The highly professional selection process confirmed that the PC-24 is indeed the perfect aircraft for medevac missions. I'm also particularly happy that we managed to carry the day with our Swiss aircraft in a highly competitive market segment."

A NEW STUDY COMMISSIONED BY THE U.S. COMMERCE DEPARTMENT has found that the Global Positioning System (GPS) has provided $1.4 trillion worth of nongovernment economic benefits since 1984, and that an outage would cost $1 billion a day in losses. From precision agriculture practices to high-frequency stock trading and better positioning for offshore oil and gas rigs, GPS has provided major benefits to at least 10 leading sectors of the U.S. and global economy. Low-cost navigation tech, smartphones and fast wireless networks drive more than 90% of the estimated benefits, according to the study which was presented in August. By service type, 51% of the estimated economic benefits stemmed from telecommunications, the study said. For instance, GPS was a key enabler of 4G LTE wireless networks, enabling more than $650 billion in economic value for wireless subscribers. Telematics accounted for 24%, with 9.4 million commercial vehicles in the U.S. using telematics service for parcel delivery and related benefits such as labor and fuel optimization. Location-based services came in at 16%, while surveying, oil and gas, electricity, mining and agriculture all ranked just single-digit percentages. **A widespread outage of GPS would result in $30.3 billion in economic damages over 30 days, the study said.** During planting season, economic damages in the agriculture sector could increase 30-day losses to $15 billion due to lower yields.

DRONE DELIVERY SYSTEM DEVELOPER FLYTREX AND jet charter and management company Causey Aviation report FAA approval to begin food deliveries by drone in Holly Springs, North Carolina. Announced by the companies in mid-August, the approval permits flights of Flytrex multirotor drones along a predetermined delivery route between Holly Springs shopping mall and a nearby outdoor sports and recreation facility. The route spans mostly unpopulated areas but crosses Route 55, a state highway. The flights are to comply with the FAA's Part 107 regulation, including operation within visual line of sight of a remote pilot in command. Flytrex, based in Tel Aviv, and Causey Aviation Unmanned developed the service under the FAA Unmanned Aircraft Systems Integration Pilot Program effort led by the North Carolina Department of Transportation. Other participants are the town of Holly Springs and Kite Realty Group Trust, which owns and operates the shopping mall. Flytrex has developed a cargo box-carrying, six-rotor drone capable of flying payloads of up to 6.6 lb. to a distance of 3.5 sm and back. The aircraft lowers a package to the delivery site from 80 ft. above ground, releases it and returns to its base. The company said its self-triggered parachute recovery system recently was validated by the Northeast UAS Airspace Integration Research Alliance based on standards developed by ASTM International.

SIERRA NEVADA CORP. (SNC) SUBSIDIARY 328 SUPPORT SERVICES is relaunching the Dornier 328 twin turboprop targeting the regional, cargo and special missions markets. The upgraded D328NEU is planned to be assembled in Leipzig, Germany. According to company officials, the first aircraft is to be delivered in 2023. SNC took control of the program in 2015. Production of the first-generation 328 stopped in 2005 following the subsequent bankruptcies of Fairchild Dornier and AvCraft Aviation. There were two main versions of the aircraft — the original turboprop and the 328JET. In total, less than 220 units were built and the project has been a financial failure for its owners. Fairchild Dornier had launched a stretched 428JET but collapsed in 2002 before it could move ahead with the project. Plans call for the D328NEU to be stretched slightly to accommodate 39 passengers, and feature new engines and props, a new cabin and new avionics.

IN A TWO-STEP TRAINING PACKAGE, CAE PLANS TO BUY a significant interest in SimCom Holdings for $85 million. And Directional Aviation Capital, whose subsidiaries include fractional operators Flexjet and Flight Options, along with Flairjet, Sirio, Nextant Aerospace and Corporate Wings, will sign 15 year training agreements with SimCom and CAE. In addition, SimCom will purchase equipment from CAE, including five full-flight simulators. Under the deal, CAE will form a joint venture with Directional's affiliate, Volo Sicuro, to acquire the stake in SimCom. "We are very pleased that Directional Aviation has chosen CAE to be its training partner of choice," said Marc Parent, CAE president and CEO. "Our investment in SimCom is another step in the expansion of CAE's business aviation training business that gives us access to a rapidly growing customer base as Directional Aviation affiliates' exclusive training partner."For its part, Directional Aviation is planning for significant growth, said Kenn Ricci, the company's principal. "With this partnership with CAE, our operators will have access to the latest solutions in aviation training from the industry leader." SimCom, with headquarters in Orlando, currently operates 47 simulators representative of jet, turboprop and piston-powered aircraft.

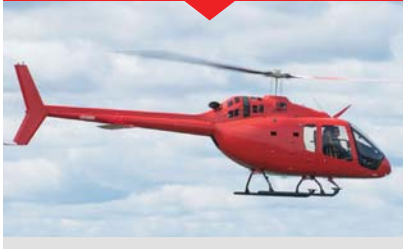
ROBOCOP IS REAL THANKS TO FLIGHTSAFETY INTERNATIONAL. The well-known aviation training provider is now offering a specialized small Unmanned Aerial Systeme (sUAS) remote pilot course for civil and government services. The trainer says the course is designed to assist federal, state, and local government agencies to establish a UAS program, or to increase the effectiveness of their existing equipment. The course features ground school and instructor-led practical hands-on flight training which presents scenarios that are relevant to specific missions including those of first responders and others. It also offers Safety Management Systems, Resource Management, Weather, and Fatigue Management training. According to Clint Strong, Manager of FlightSafety's Unmanned Systems Training Centers in Wichita, Kansas and Las Vegas, Nevada, "These courses feature a set of comprehensive training elements designed to help drone pilots develop the skills and tools required by commercial and government UAS operators," added Clint Strong. "Completing these courses will help to establish a foundation that is needed for safe, reliable, and professional UAS operations." The company also provides Advanced Remote Pilot Series practical training courses, a Flight Risk Assessment Tool that is available through the App Store, as well as a series of eLearning courses. Professional Remote Pilot Fundamentals and sUAS Standards Instructor courses are conducted at FlightSafety's Las Vegas Learning Center in conjunction with Praxis Aerospace Concepts.

VOLOCOPTER, A GERMAN COMPANY DEVELOPING THE VOLOCITY, a two-seat electric vertical-takeoff-and-landing (eVTOL) air taxi, has raised an additional $55 million (€50 million) in the first part of a funding round, taking the total capital raised so far to $95 million (€85 million). The round was led by Chinese carmaker Zhejiang Geely Holding Group, which owns Volvo and Lotus. Volocopter says it remains in discussions with additional investors for a second closing around year's end. German carmaker Daimler is already a strategic investor in the company. Volocopter aims to launch a branded commercial air taxi service within three years, and has signed an agreement with Geely to create an urban air mobility (UAM) joint venture in China. Geely and Daimler already have an agreement to create a high-end ride-hailing joint venture in China.

Dassault/TAG Plans Finalized

Dassault Aviation has finalized the acquisition of TAG Aviation's maintenance, repair and overhaul business. The acquisition includes service centers in Geneva; Farnborough, England; Paris-Le Bourget, France; and Lisbon, Portugal and satellite facilities in Luton, England, and Moscow. The new organization has been named TAG Maintenance Services and is being operated as a Dassault affiliate. It will continue to service all aircraft types previously supported.

200th Bell 505 Delivered



Bell recently delivered its 200th Bell 505 Jet Ranger X. The aircraft went to Austrian operator Hubi-fly Helikopter GmbH and will be used for executive transport. The rotary wing manufacturer delivered the first Bell 505 in March 2017 to Pylon Aviation of Chandler, Arizona.

L.J. Aviation Expands Facilities, Adds Challenger 350s To Fleet

L.J. Aviation is expanding at its base at Pittsburgh International Airport in Pennsylvania. The facility includes a reception area, private offices, lounge and meeting rooms and a 36,000-sq.-ft. hangar and shop space with 42-ft. doors to accommodate aircraft as large as a Boeing Business Jet or Airbus Corporate Jet. The company also added two Challenger 350 business jets to its fleet of more than 40 aircraft under management. The aircraft are available for charter in the Mid-Atlantic states.

Standdown at Capacity

Bombardier reports its 23rd annual Safety Standdown reached full capacity two months prior to the Nov. 12-14 event. The company moved this year's event from Wichita, Kansas to the Omni Fort Worth Hotel in Fort Worth, Texas. The focus of this year's seminar is "Elevate Your Standards." It is open to all aviation professionals and free of charge.

AN ERA IS ENDING. DASSAULT FALCON JET CEO Jean (John) Rosanvallon is retiring after 44 years with the company, 23 of those as its top executive. Rosanvallon will now serve as special senior advisor to Dassault Aviation Chairman and CEO Eric Trappier. **Succeeding Rosanvallon is Thierry Betbeze, who advances from senior vice president of Finance.** He joined the company in 1984 as a cost accountant, later switching to export financing before being promoted in 2004 to his most recent position. Dassault Falcon Jet is responsible for marketing, sales and support of the company's civil jets in the Americas. In announcing the selection, Trappier cited Betbeze's "extensive experience in international finance." He also noted the recent appointments of Carlos Brana, as executive vice president of Civil Aircraft and head of worldwide Falcon Sales and Marketing, and the elevation of Jean Kayanakis, as senior vice president of Worldwide Falcon Customer Service and Service Center Network. Those appointments, he said, "will ensure the enduring success of the Falcon brand." Rosanvallon joined Dassault Aviation in 1975. In 1979, he moved to Dassault Falcon Jet, based in Teterboro, New Jersey, as assistant to the president. He later served 11 years in France in several executive capacities with Dassault Aviation before returning to Teterboro as senior vice president of Sales and Marketing. He took charge of the business in 1996. **Rosanvallon's retirement had been expected, but it will be difficult to imagine the company without him, said Rolland Vincent,** president of Rolland Vincent Associates. "Jean has been the face of Falcon, especially in the biggest markets." Vincent noted that Rosanvallon has long been deeply engaged with his customers and the industry, adding that the latter could pick up the phone and speak with him directly. In addition to having high ethical standards and a big-picture view of the market, Vincent said of Rosanvallon, "He's also just one of the nicest people you want to sit down and have a glass of red wine with."

A GLIMMER OF HOPE CAN BE SEEN FOR THE SALES OF DASSAULT'S Falcon business jets in the recent acceleration of orders after years of sluggish transactions, according to numbers released during the company's biannual press conference at its Saint-Cloud headquarters near Paris. The first half of 2019 was difficult, with seven Falcons ordered. But many prospects morphed into firm orders in July and August. **The first eight months of the year thus ended with 26 Falcons ordered.** "It is rare to see as many sales in July and August," CEO Eric Trappier says. **The backlog has improved to 56 as of Aug. 31, from 53 at the end of last year.** Moreover, the second half of the year is usually more active than the first. Some orders were signed for the in-development Falcon 6X. Trappier hopes the program will help Falcon sales grow. "We lost more than four years with the Falcon 5X," he says, referring to a program terminated in December 2017 because of repeated engine issues. Trappier maintains Dassault's guidance for 45 Falcon deliveries this year. This would be an increase over last year's 41. But it would only mark a modest rebound toward the healthier levels seen between 2006-14, when annual deliveries stood above 60. **Bombardier, Embraer and Gulfstream also saw deliveries of super-midsize and large-cabin business jets decline or stagnate in recent years.** Asked about the continuing lean years for Falcons, Trappier appears unfazed. He answers that stabilization at an annual 45 deliveries would "not be annoying." Thanks to the airframer's dual civil-military activity, design offices and factories can be kept busy, he points out. **(See Fred George's Falcon 8X Operators Survey on page 64.)**

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Yingling Making Plans For Generational Succession

Lynn Nichols, chairman and CEO of Wichita-based full-service FBO Yingling Aviation, has announced the elevation of his son Andrew Nichols from chief financial officer to president. "The move is the 'logical next step' in our generational succession plan, designed to provide a smooth transition for the company and position it for continued success," Lynn Nichols said.

Business Aviation Ops In Europe Drops In July

Business aviation flight activity in Europe declined 5.2% in July, compared to a year ago but rose 5.2% when compared to May, according to Argus International TraqPak data.

July activity compared to a year ago fell in all aircraft categories, with the largest decrease in turboprop activity, which fell 8.3%. Large jet activity fell 6.3%, light jet activity decreased 4.0%, while midsize jet activity declined 1.9%. Compared to May, June activity rose in all aircraft categories, with the largest increase in midsize jets, which rose 7.6%, followed by turboprops with a 4.6% increase. Large jet activity was up 4.5%, turboprop activity rose 4.6% and light jet activity increased 4.3%, compared to May, Argus reports.

THERE ARE FBOS THAT GO BEYOND client expectations, and then there's Sweden's Grafair Jet Center, offering everything from an on-site wine cellar to an amphibious Cessna Caravan for charter flights through the regionals archipelagos. Bromma Stockholm Airport, built in 1936, is home to the Grafair which, interestingly, has roots in the United States. The FBO was built in 2004 by Bengt Grafström, a Swedish pilot and businessman who had spent time flying in the U.S. and had earlier operated a Swedish-owned flight school in Vero Beach, Florida. Unlike most European FBOs, where a la carte pricing is preferred, Grafström wanted something more like the U.S. model, with a single, inclusive fee. At Grafair today, that single fee includes everything from all aircraft handling to an on-site laundry. Last year, Grafair celebrated completion of a $4.3 million, 21,500-sq.-ft. hangar that can accommodate aircraft as large as a BBJ2. It offers such features as a new service kitchen, a catering preparation and holding area, ice dispensers, dishwashers, and even a well-equipped gym.

According to Co-founder and General Manager Johan Emmoth, it is perhaps the only FBO in the world with a wine cellar under the hangar floor. The cave was carved during hangar construction. It is surrounded by natural bedrock, and includes humidity monitoring and stabilization, and a stainless steel door. The cellar is managed by noted wine expert and author of *Champagne: 49 million bubbles in a bottle,* Fredrik Schelin. A recent tasting brought forth a 1911 Charles Heidsieck Millésime Brut and a 1928 Ayla Vintage Millésime. For catering, Grafair has a handshake partnership with nearby Muhren Inflight Catering, offering a varied menu 24/7, with golden Swedish caviar (Kalix Löjrom) as a unique and popular culinary choice. The large atrium in the main features a warm fireplace and a grand piano on which Emmoth said aircraft crews and passengers alike frequently perform. But perhaps the most remarkable staff member there is **Emmoth's Yellow Headed Amazon parrot named Papegojan, or simply Papsi,** who often flies freely through the atrium.

The Bromma airport has noise restrictions that allow air traffic from 5 a.m. until 10:00 p.m. Monday thru Friday; from 7:30 a.m. to 5:00 p.m. on Saturday; and from 12:00 noon to 10 p.m. on Sunday. To accommodate operators, the FBO opens an hour earlier than the runway and remains open for 30 min. after the runway shuts down. More convenient still, Grafair has a second FBO at the larger Stockholm Arlanda International Airport, where there are no noise restrictions. Also, according to Emmoth, the Arlanda FBO offers the same services and essentially the same amenities as at Bromma. Visitors may wish to consider other facets of Grafair: aircraft management; a share in Grafair's owned-fleet of business jets; and the company's air charter service. One of the more unique attractions is an amphibious Cessna Caravan air taxi that has been outfitted for comfort. The service covers most of the Baltic Sea and the north of Sweden, including the Stockholm and Årland archipelagos. Flights may include full day excursions, including sightseeing, lunch and dinner ashore. Between traffic at Bromma and Arlanda, Emmoth expects the two FBOs will see a close to 10,000 movements in 2020. Grafair has no grand expansion plans, he added, other than what is necessary to meet and exceed customer expectations.

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Capt. David Pettet

President
National Gay Pilots Association
St. Louis Park, Minnesota

A Northwest Ohio native, Pettet became enamored with aviation as a boy when his parents drove him to Cleveland-Hopkins International (KCLE) to watch airplanes coming and going. So determined was he to make flying his career, he enrolled in a now-defunct flying academy in Florida. There he rapidly attained the credentials to become a flight instructor, a professional position in which he logged all of 25 hr. before being hired to fly for Gulfstream International Airlines. He was 19. During the 13 years since, thanks to boom and bust air carrier economics, he's flown for nine different airlines, earning nine type ratings and logging over 8,000 hr. Today he is a captain with American Airlines, where he represents its inclusion and diversity initiatives and is a member of its pilot hiring team. He is also a member of the Allied Pilots Association's National Professional Standards committee. Pettet joined the NGPA in 2008, became a board member two years later and was elected to his current position in 2014.

Questions for Capt. David Pettet

1 **What's your association's history, purpose and make up?**

Pettet: It was founded in 1990 — we're planning a major, 30th anniversary celebration in Palm Springs next February — with the goal of building, supporting and uniting LGBTQ (lesbian, gay, bisexual, transgender and queer) aviation professionals and enthusiasts worldwide. We promote aviation safety, provide a professional network, give scholarships, advocate diversity and inclusion, encourage community members to become aviation professionals and, most importantly, bring our community together locally and internationally as a home and safe space.

We have 2,400 paid members — more than a quadruple increase since 2014 — plus another 6,000 non-paid. Eighty percent of the members are pilots, split almost evenly between professionals and non-, and the members cover the whole aviation spectrum above and below the wing, from airline, corporate and military pilots and flight attendants, to mechanics, air traffic controllers and we even have plane spotters. And that includes both sexes. In fact, Jan Anderson, a Boeing 777 captain with American, is the association's vice president.

2 **You've clearly drawn the support of industry.**

Pettet: We're backed by nearly every U.S. and Canadian airline and many international carriers and scores of aviation companies and organizations. We'll have more than 65 aviation businesses represented at our industry expo and anniversary weekend at the Riviera Palm Springs Hotel, where we expect over 1,000 attendees. United Airlines is the main sponsor for both events. Thanks to all of those institutions and individuals, the NGPA's annual budget now exceeds $1 million, and in February we'll be awarding over $150,000 in scholarships along with a 737 type rating. Our aviation scholarship program has become one of the largest in the country.

3 **The association also attends events.**

Pettet: The NBAA convention is a great venue for us to connect with business aviation members, and the NBAA is one of the NGPA's major sponsors. This will be our third year at this convention, and I've agreed to be on its "Diversity and Inclusion" panel. We also exhibit at the European convention in Geneva, and at Oshkosh, among others. In mid-November, the NGPA is hosting an Aviation Inclusion Summit in Scottsdale, Arizona, at which speakers from a variety of organizations will be addressing "isms" and phobias, such as racism, sexism and homophobia and transphobia. And the NBAA is sending a speaker to address the issues pertaining to business and corporate aviation.

4 **What of your own experience as a gay aviator?**

Pettet: I never believed that being gay was going to be a barrier for me or defined who I was since I was always focused on becoming an airline pilot. Once in the flight deck, I'd get the typical questions about having a wife or girlfriend or sometimes about so-called lifestyle, as if we get to choose. For a while, I'd lie in response because it was easier, but after a while I had trouble keeping track of my answers and who I told. This is common with most LGBTQ aviators from my generation and before. So, over a period of time I came out in the workplace. Now, I don't take my seat and announce that I'm gay; that strikes me as weird. But communication is important because the issue could impact safety. And I think it's important to be your authentic self every time you get into an airplane.

5 **How important is an organizational policy of diversity?**

Pettet: It's important, but being inclusive is the key to being successful in this journey. If there's no true inclusive culture, then diversity is just a box being checked. The problem can be geographic, cultural or one of leadership. The NGPA has an inclusion training team that goes to airlines, flight schools and individual companies to help bring about change. And it works. **(https://www.ngpa.org)** BCA

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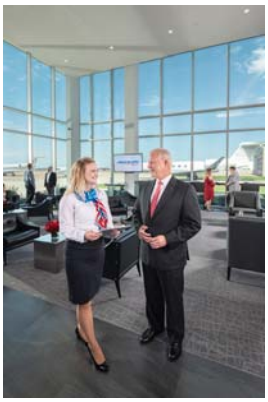

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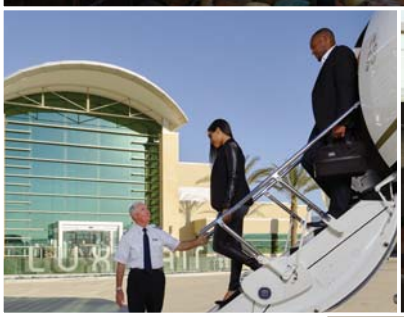

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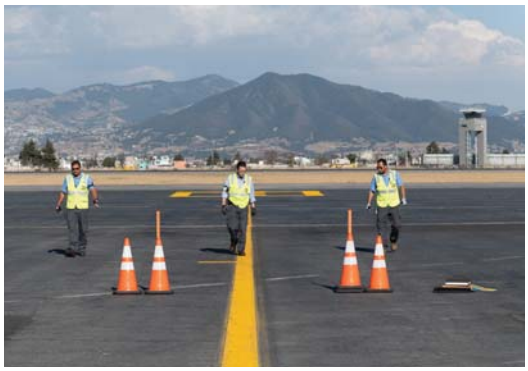

Believing that safety is a top priority in any operation, Manny Aviation is the first handler in Mexico to become ISBAH registered in Toluca in 2016. The commitment to safety continues and in 2018 Manny Aviation Services obtained stage II, which ensures that safety management activities are targeted, and safety risks are being effectively managed.

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AVIATION WEEK NETWORK

Reclaiming Situational Awareness

Circumventing academic annexation and **putting SA to practical use**

A German Taube plane hunted down by a French plane with a machine gun, 1914.

BY **JAMES ALBRIGHT** james@code7700.com

Ask any fighter pilot about situational awareness and the response will focus on the best ways to turn the odds during aerial combat and how to improve one's survivability in any set of circumstances. While outside of military aviation our interests don't include the need to "apply steel on target," survival should be a top concern of all who fly. The problem with the term "situational awareness" is that its meaning has been appropriated by the academics. But does it take a Ph.D. and volumes of text to explain something so primal and basic for those of us who fly?

When I started my U.S. Air Force career 40 years ago, nobody spoke of situational awareness, but it was a top concern. My first instructors were Vietnam vets who emphasized that knowing the "vertical situation" was just as important as the "horizontal situation" in air combat. When flying in formation we practiced our abilities to keep a mental three-dimensional map of our part of the sky and the airplanes with which we shared it. During low-level navigation, 360 kt. just off the deck, we cradled the stick in one hand while propping a terrain chart just under the glareshield so as to minimize the travel time of our eyes between paper and dirt. All of this, of course, was meant to refresh the mental image of our environment even as we sped through it at incredible speed.

I first heard the actual term for this mental magic almost 10 years later. I was at the Air Force accident investigation course with 20 other service pilots learning to turn a crumbled aircraft pile and human remains into a list of causes and recommendations. "He lost his SA and now he's a mort," the fighter pilots would say. Mortality, I get that. But SA? Within a few years every Air Force pilot was talking situational awareness because it was a proven lifesaver in all cockpits.

In my world of flying the "heavies," good situational awareness meant knowing where an instrument approach could get you in trouble or how the airplane's deteriorating health could turn

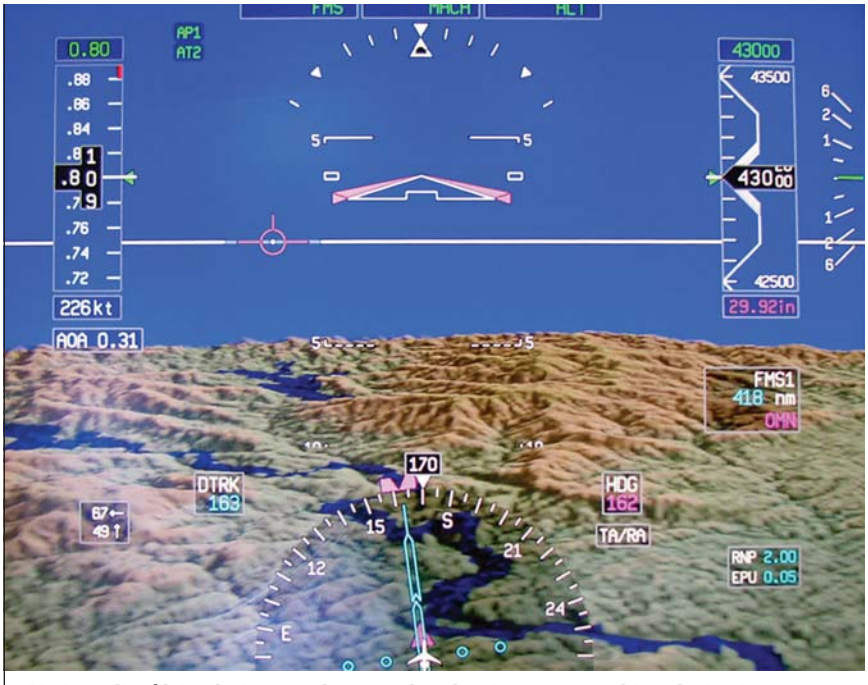
it from an aerodynamic masterpiece into a falling object with the glide characteristics of a rock. We were slow to embrace the technological SA afforded by Ground Proximity Warning Systems (GPWS) or Traffic Alert and Collision Avoidance Systems (TCAS), which meant most of our SA came from within ourselves or our crews. We embraced SA because it worked.

I believe the U. S. Air Force was the first to adopt the term "situational awareness," though that might be service partisanship from a 20-year veteran. But I am ashamed to say it was also my service that did the most to obscure SA into what it is today, a talking point for academicians who wanted to make something simple (and useful) into something complicated (and just another topic for ground school). In 1995, the chief scientist of the U.S. Air Force — yes, we had one of those — turned SA into a "human factors construct." Situational awareness was boiled down to perception of a situation, comprehension of that situation and projection of one's future status. Very large charts and Venn diagrams with doctorate level terms started to obscure what was once simple.

Fortunately, the rest of the flying world came to the rescue and we now have a concise and well-written guide on how to recognize good SA in Appendix 1 of Advisory Circular 120-51E, Crew Resource Management Training:

- ▶ Active monitoring of all instruments and communications and sharing of relevant information.
- ▶ Monitoring of weather and traffic information.
- ▶ Avoiding "tunnel vision" caused by stress.
- ▶ Being aware of factors that can degrade vigilance and watching for performance degradation in other crewmembers.
- ▶ Staying "ahead of the curve" in preparing for planned situations or contingencies.

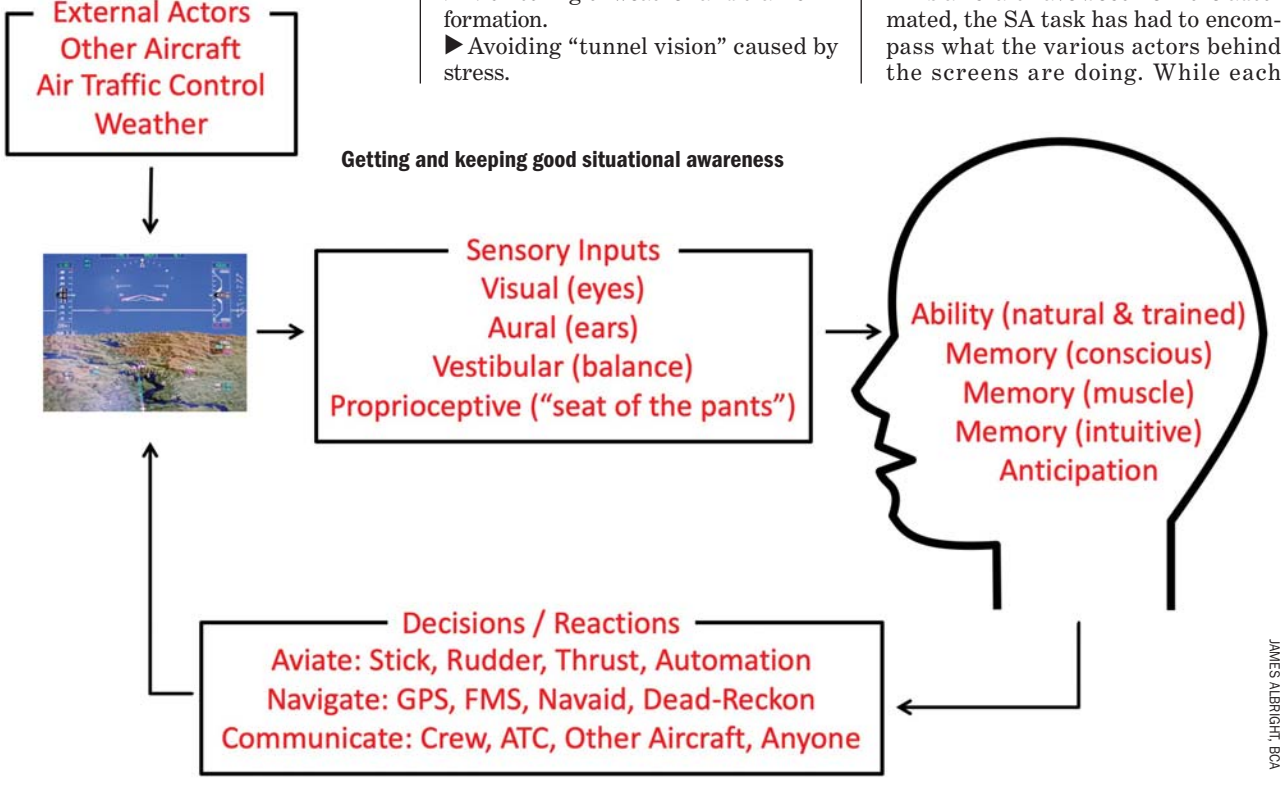
As aircraft have become more automated, the SA task has had to encompass what the various actors behind the screens are doing. While each



JAMES ALBRIGHT, BCA

Modern pilot flight displays can improve situational awareness with a single glance.

Getting and keeping good situational awareness



JAMES ALBRIGHT, BCA

manufacturer has put its own spin on the issue, I like what Airbus has been saying about SA from early on. The main components of situational awareness are:

▶ **Environmental Awareness:** Awareness of other aircraft, communications between ATC and other aircraft, weather or terrain.

▶ **Mode Awareness:** Awareness of aircraft configuration and auto flight system modes. The latter includes such aspects as current and target speed, altitude, heading, AP/FD armed/engaged modes and the state of flight management system (FMS) data entries and flight planning functions.

▶ **Spatial Orientation:** Awareness of geographical position and aircraft attitude.

▶ **System Awareness:** Awareness of the status of aircraft systems.

▶ **Time Horizon:** Awareness of time management (*e.g.,* fuel status/monitoring, time factor in smoke situation or emergency electrical configuration).

At first glance, becoming situationally aware would seem to be all about gathering data. At the most primal level, we humans collect information with our eyes and ears. But as pilots, our inner ears (vestibular balance) and our "seat of the pants" (proprioceptive) senses can help or hinder our SA. One need only consider the many "graveyard spirals" suffered by non-instrument-rated pilots to realize not all inputs are valid. But the same can be said of other information sources, such as a plugged pitot tube leading to faulty airspeed and altitude information.

Looking at most SA models, including the one I've drawn here, it is easy to get lost in the long and winding road from environmental factors to cockpit avionics to you, the pilot, and finally to the decisions you make as a result. The typical approach is to closely analyze each element in the process in hopes of finding flaws to fix; thereby improving pilot SA. I think it is more productive to consider these elements as ground already covered. Let's skip that and go right to the task of improving our SA.

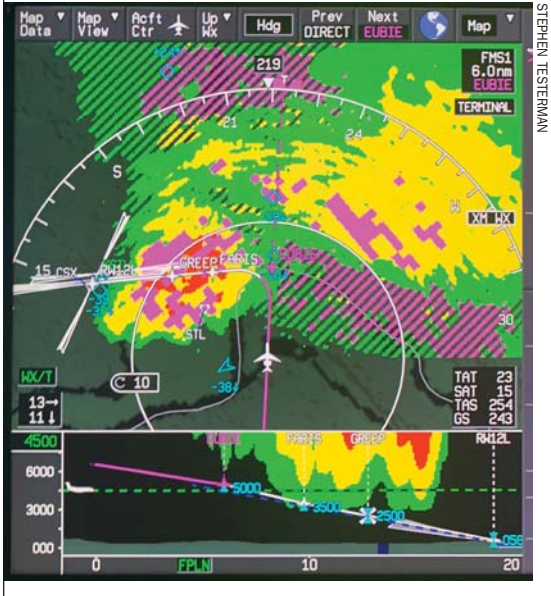
Collecting Better Intel by Becoming Better Users of Technology

When I started flying, the best source of weather was from an Air Force weather shop or the local Flight Service Station (FSS). Charts were hand-drawn every 6 hr., reflecting a meteorologist's best guess, and those charts were sent to selected stations. Once airborne, the best you could do would be to call the FSS or another ground station and hope to get an accurate verbal description of the weather ahead. Our radars had two colors: green and black. Reading the faint signals was an art and even a trained eye was fooled now and then.

U.S. AIR FORCE

A pilot improving his weather SA in the 1960s.

These days, with an XM weather account, you can have the best images available from a ground-based network of 159 Doppler radar stations based throughout the U.S., stitched into one image on your cockpit avionics as if it were a real-time image. (There is actually a 10- to 20-min. delay, but that is nearly real-time.)



STEPHEN TESTERMAN

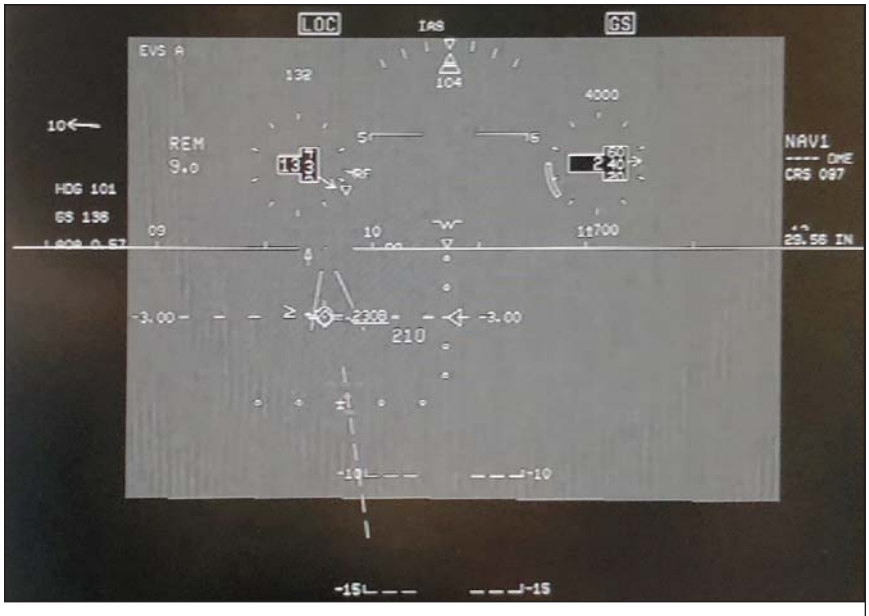
A look at the weather prior to landing, using a 3-D radar in a Gulfstream GVII-G500.

With an inflight internet connection, you can do even better. Not only will you be privy to the latest weather, but you can get news of ATC delays, volcanic activity, or even civil unrest that makes the flight plan you filed hours before less than optimal. Even without that airborne connection, a few minutes of internet surfing prior to takeoff can greatly improve your SA. While many of these cockpit upgrades can be very expensive, you can equip yourself with an inexpensive iPad and take screenshots (press the "Home" and power buttons simultaneously), which you can use later in the flight.

Avoiding Target Fixation

Fighter pilots will tell you there is a real danger to becoming so fixated on a target you are trying to destroy — be that a ball-bearing factory or an enemy fighter – that you run the risk of flying right into it. This kind of "target fixation" is also a problem for those of us simply trying to make it to Point B unscathed. You cannot narrow your focus on the objective while forgetting about the rest of the world. I think the best example of this is the low-visibility landing.

I've flown many Category II



The best technology is useless if you don't know where to look. In this photo, the 1,000-ft. roll bars (horizontal approach lights) can be seen below the synthetically drawn runway, but only if you are looking for them.

instrument landing system (ILS) approaches to minimums and never seemed to have any trouble spotting the approach lights in time to make the landing or go-around decision. In fact, over my many years of doing this, I've only had to go around a handful of times. These approaches were in large aircraft (Boeing 747) and small (Gulfstream III), all equipped only with the minimum equipment needed for a Cat II ILS.

A little more than 10 years ago I added a head-up display (HUD) with an enhanced flight vision system (EFVS) and forward looking infrared (FLIR) camera. The magic of being able to see through clouds and not having to repeatedly move my eyes from the cockpit instruments (heads down) to the runway (heads up) promised to make this easy! It did not. I was suddenly struggling to see the approach lights and this caused a missed approach or two. It took me a while to identify the problem: me.

In the HUD-less airplane my eyes were traveling from the instrument panel to the glareshield where I expected to see the runway. Between those two points, just below the expected runway point, the approach lights lie in wait. With the HUD, my eyes no longer had to make the long trip from heads down to heads up. I was fixating on the flight path vector (FPV), which would be placed exactly where the runway's touchdown zone was expected. I was getting target fixation. The time to spot the approach lights at minimums before having to go around can be measured in fractions of a second. But even with multiple fractions, having target fixation robbed me of the view. Once I figured this out, I started scanning the lower half of the HUD routinely. And low-visibility approaches were easy once again.

Employing the Intel With the Most Basic of Rules: Aviate, Navigate, Communicate

Ponder this: How many pilots are in a modern flight deck? When I flew with flight engineers, I would have answered that there were three. Now, without the engineer, I still say three. Our autopilot is pretty good. Two or three? Either answer is better than just one.

If the status of the airplane's viability as an air machine is in doubt, a pilot should be dedicated to the task of keeping the machine airworthy. Make an announcement of that fact with the clear understanding that this pilot will concentrate exclusively on this task: "I will fly the airplane, you sort everything else out." There are two reasons for doing this. First, you should not multi-task when the airplane's flyability is in doubt. Second, if part of your brain is dedicated to stick and rudder chores, the decisions made by the rest of the brain will be degraded.

Automation can be a phenomenal aide: It can automatically ensure there is sufficient power, that the airplane is pointed in the right direction, and that you have enough airspeed. But automation can also be the cause of what ails you. It is up to you to decide. To that end, the flying pilot must get back to basics and assess the situation. Is the automation keeping the airplane in steady, coordinated flight? Airspeed and altitude stable? If not, make adjustments to the automation and if that fails, cancel automation modes as necessary. Let the other pilot know what is going on, such as, "Good autothrottles, but the autopilot is confused. I am hand-flying the airplane, we are stable."

When the chips are down, it is often best to give the lesser experienced pilot the airplane and have the more experienced pilot do everything else, including giving the flying pilot "big picture" instructions.

The navigation imperative can be as simple as, "Get us out of this valley" to as complicated as "Where in the heck are we?" Fortunately, this problem has gotten easier over the years.

The amount of faith you put in the GPS is inversely proportional to the accuracy required. If you are in the middle of the ocean, having a GPS position is great. In the middle of a narrow valley, it depends on your system. Remember also that a GPS can give you an altitude readout to verify or discount a suspect altimeter.

An FMS can be the least accurate navigation tool on the flight deck, depending on its health and the status of its sensor inputs. Aircraft systems knowledge is key here.

If you are down to using ground-based navigational aids, be wary of readings outside a navaid's service volume and be especially careful with non-directional beacons, which can be worse than non-directional!

What about communications? When the stress level goes up, we have a tendency to latch onto the first solution that comes to mind and start to tune out alternate ideas. An especially willful captain with a good reputation can unknowingly shut off other crewmembers with better ideas, without them even realizing what has happened. Here are a few techniques.

State the nature of the problem and entertain ideas. Do not immediately critique ideas that are obviously wrong — they could stimulate ideas that are obviously right. Formulate a plan and articulate it. Do not end your discussion

with "Do you agree?" Instead, try "What am I not thinking about?" If "group think" has taken over, try to stimulate alternatives. "Has anyone heard of this happening before? What did that crew try?"

Remember you have resources outside the airplane, too, i.e. phone a friend. The people on the other side of the radio can be very helpful when it comes to figuring out items of navigation ("Where am I?") and communication ("Who should I be talking to now?"), but be careful when asking about aviating questions. Many air traffic controllers are private pilots who think they understand high-performance aviation but may not.

To that point, in 1996, the pilots on AeroPeru Flight 603 lacked enough air sense to realize their blocked static ports were causing airspeed as well as altimeter problems. Unfortunately, ATC only fed to that deficit. Their Boeing 757 was experiencing classic blocked static port symptoms and when the air traffic controller reported their transponder readout agreed with what the pilots saw in the cockpit, all concerned believed the altimeters were working. Everyone on the airplane died as a result, but the controller lived on.

There is a community of aviators out there and that is especially evident when one of our group is in trouble. You will see this when flying oceanic or in remote areas. The universal pilot interplane frequency in most of the world is 123.45. Keep a listening watch when in oceanic or remote airspace, and perhaps you can come to the rescue of a fellow aviator.

If you don't have a satellite phone, you should get familiar with HF phone patch procedures and at least have the frequencies listed on the oceanic en-route charts available. Most of the people on the other side of the radio are not air traffic controllers but work for commercial services out to make money. If you need to get in contact with someone, they will work to make that happen. Of course, you will get a bill, but chances are you will be happy to pay it.

With or without a satellite phone, you should never leave home without a list of critical phone numbers. For me, that list includes those of my aircraft mechanic, my aircraft manufacturer's 24-hr. emergency hotline and MedAire.

Detecting a Loss of SA

How do you know you've lost situational awareness when you are not aware of your situation? It is a conundrum. It has happened to me more than a few times and I've noticed it in others while seated in the "all knowing" comfort of a jump seat while administering a check ride. I've noticed that when confronted with evidence that a loss of SA was happening or was imminent, some pilots become upset and agonize over "How could this have happened?" Other pilots will be in denial or offer excuses, such as "It could have happened to anyone." I am in the first group and I think that is the healthier group because we are likely to ask the follow-on question: "How do I prevent this from happening again?" That is the critical question.

I think you can detect an imminent loss of SA by being on the lookout for a few syndromes that are indicative of that loss. These include:

- The "What's it doing now?" syndrome — If the aircraft automation commands a change in aircraft horizontal or vertical navigation that surprises you, you either have an automation problem or you have lost SA.
- The "Why's it doing that?" syndrome — If an aircraft system starts to act up, chances are it is a systems-related problem. But it could also be an error in programming or other user input due to the user's confusion caused by a loss of SA.
- The "I guess we are there" syndrome — If the airplane gets to an event sooner than you expected, for example, if you get a vertical alert announcing the top of descent, you may have lost SA.
- The "It's awfully quiet on the radio" syndrome — If you are preoccupied in the cockpit and realize you haven't heard anything on the radio for a while, you or ATC may have missed a handoff. You have lost SA.
- The "We are there already?" syndrome — If you get to an event sooner than anticipated and suddenly feel rushed, you may have lost SA.

It all boils down to this: If the airplane gets to some point in space and time before your brain does, you have lost situational awareness.

Getting Your SA Back

We pilots are a diverse crowd and we are products of our experiences. If you've lost your situational awareness the cure may be unique to you. But, on the other hand, some of my solutions might work for you:

(1) Fly the airplane. Make sure one pilot is devoted to keeping the airplane right-side-up, the airspeed indicator above the stall and below the red line, the altimeter where it should be (usually that means level flight), and the nose pointed away from the edges of the air. (The edges of the air are the ground, water, other objects and extraterrestrial space.)

(2) Make the automation make sense. The autopilot and autothrottles can greatly simplify your SA or they can be the cause of your problem. Once you've evaluated the aircraft's attitude and speed trend, decide what part of automation is helping and what part is hurting. Disable the latter and take over manually. Let the other pilot know, "I am hand-flying," so he or she will know your attention is going to be devoted exclusively to that task. In a similar fashion, evaluate the aircraft's navigation and decide what components of the flight management system need to go.

(3) Evaluate the big picture. It may be helpful to verbalize the situation from the very big picture to the smaller details as a way of getting your brain back into the game. "We are still at cruise altitude, our airspeed is right at planned Mach, the FMS says we are on course, but our heading doesn't make sense."

(4) Buy time. If things are not going well, if you have enough fuel, and if there isn't a dire reason to get the airplane on the ground, look for a way to buy time. Ask for a holding pattern or delay vectors.

(5) Communicate. It never hurts to ask for some help, and that can come from air traffic control, other aircraft, your home base or somebody from the company that built the airplane.

(6) Step back and reassess. If your current view isn't helping, step back and take a look from another perspective. "What would they have told me to do on day one at initial?" or "What would Wilbur and Orville have done?"

(7) Calm down. Take a breath and take stock of what you have going for you and what is working against you.

I am not a fighter pilot, but I've known a few, many of whom have been combat tested. For them, situational awareness is a tool meant to keep them on the giving (and not receiving) end of the trigger. It is a tool needed for survival. It is a tool that military aviation has stamped into my DNA.

Don't let the academics glaze your eyes over with talk about goals, preconceptions and perceptions. Take SA back and add it to your tool bag. Do that, and you improve your odds of survival in what can be a dangerous occupation. **BCA**

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BY **ROSS DETWILER** rossdetwiler.com

There, at the bottom of the AirNav.com "Airport" page under "Additional Remarks" was this: "WATCH FOR HORSES OR BIG GAME ANIMALS ON RY." Fair warning about an unwelcoming committee. As you might expect, the airport in question, 8U2, is rural — way rural, actually. Known by locals as Schafer Meadow, the 3,200-ft. grass strip is operated by the U.S. Forest Service, open to the public and set deep within Montana's Great Bear Wilderness.

A mile high and a long way from what passes for "civilization," it features tall trees, crisp air and an almost disquieting silence. It's exactly the kind of setting where a pilot might expect to encounter wildlife; it's their natural habitat, after all, and there's no triple fencing to keep them out.

But as the FAA makes clear in "Wildlife Strikes to Civil Aircraft in the United States, 1990-2015" (**https://wildlife.faa.gov/downloads/Wildlife-Strike-Report-1990-2015.pdf**), encounters with denizens of the natural world are hardly restricted to wild places where pilots might be extra alert for them. No, the creatures can appear almost anywhere and pose sudden and serious danger. That, too, is underscored by the FAA document whose tally is telling.

In the 25-year animal/airplane accounting, the FAA reports there were 166,276 strikes throughout the U.S., plus another 3,580 involving U.S. aircraft while operating internationally. And as a result of those furred and feathered impacts, 68 aircraft were totaled.

When considering wildlife encounters, it's natural to first consider bird strikes. And the most notable success story in that vein is Capt. Chesley "Sully" Sullenberger's successful ditching of his Airbus A320 in the Hudson River after geese snuffed his two engines during climb-out from New York's LaGuardia Airport in January 2009. But there have been countless incidents in which larger quadrupeds and aircraft come together unhappily, with the most damaging such strikes in the U.S. generally involving coyotes and deer. Considering the mass and energy difference between a critter and even a very light airplane at the point of impact, the animal is usually doomed.

While deer and coyotes seem to be the lead "colliders" in the U.S., I wondered just how big have been some of the other animals in such encounters. I didn't have to search for long to find out.

A report from Indonesia's National Transportation Safety Board, with some revision for ease of reading, provides one measure.

On Aug. 6, 2013, a Boeing 737-800 (PK-LKH), operated by PT Lion Mentari Airlines (Lion Air) had conducted a scheduled passenger flight from Indonesia's Sultan Hasanuddin Airport

(WAAA) at 12:03 UTC to Djalaludin Airport (WAMG). In addition to the two pilots, there were five flight attendants and 110 passengers on board. The flight from WAAA was uneventful with clear weather at the destination.

At 13:13 UTC, the aircraft touched down on Runway 27 and during landing roll the flight crew saw there were some animals ahead crossing the runway. At approximately 1,700 ft. down the runway at an aircraft speed of approximately 120 kt., the Boeing struck at least one of the animals.

Afterward, the pilots felt ineffective brake response and the aircraft slowly veered off to the left and stopped on the left side of the runway shoulder about 2,100 meters from the beginning of Runway 27. The smell of burning meat entered the cabin during the landing roll but was undetected once the engines were shut down. At 13:15 UTC, the pilot told the tower that the aircraft had hit animals and requested a check as to whether there was any fire and also asked firefighting units to come to the site. The tower controller responded that no fire could be seen.

The pilot in command (PIC) informed the passengers of the situation and requested they remain seated and await further instruction from the flight crew. Regardless, some passengers evacuated the aircraft through the right over-wing emergency window and leaped to the ground. Two of them suffered sprained ankles as a result.

The airport rescue and fire service personnel arrived and confirmed that there were no fires on the aircraft. At that point the PIC decided to disembark the passengers via right forward and aft service doors using stairs brought into place. With the immediate emergency resolved and the passengers safe, investigators turned their attention to the cause and discovered parts of two dead cows not only on the runway but also crushed into the aircraft's left main landing gear assembly. There also was damage to the hydraulic lines of the brake system and weight-on-wheel sensor.

The investigation noted that the airport had bird and animal hazard management as stated in the Aerodrome Manual chapter 4.12. But an audit by The Directorate of Airport dated July 11, 2013, found that some fences north and south of the runway about 500 meters long were broken and parts of those fences were erected in accordance with instructions. Further, people who lived near the airport reported that even they might enter the airport perimeter and sometimes cross the runway through the broken fences. A herd of 100+ cows lived and grazed in the fields just outside the airport fences, and especially along the south of the runway.

The accompanying airport layout shows the broken fences that were found in the earlier report and had not been fixed as of the day of the incident. These areas of broken fencing and the location of the herds of cows are discernible in the diagram by red lines and red circles. It is most likely that the wildlife hazard along the runway was extremely high since the last audit.

And then there was this report from India's Director General of Civil Aviation (DGCA) — again, with minor revisions for the sake of clarity.

On June 11, 2014, a SpiceJet aircraft, also a Boeing 737-800 (VT-SGK), with six crewmembers and 151 passengers on board was involved in an accident while taking off on a flight from Surat to Delhi.

During takeoff roll on Runway 4, when the aircraft was at around 350 meters from the runway start and about a meter or so to the left of the centerline, the left engine struck an animal. The takeoff was immediately aborted and the aircraft brought back to the apron. While there was substantial damage to the engine, there was no fire or injury to anyone on board.

The same aircraft had previously

Overtime Assist

Have a look at some of the more remote airports you may frequent. If the plate has statements such as "Tower hours" or "After tower closed, activate lights on CTAF," be wary. Those statements mean that there are times when the full team of ATC and airport specialists may not be available and any wildlife incursions will likely go undetected. For business and general aviation pilots and even some carrier crews, that list of airports is probably extensive.

Hopefully, your company's operating rules and practices require that extra overtime be paid to folks to keep the lights on and be watchful for wildlife for after-hours arrivals.

Airports with scheduled commercial operations are required to have a Wildlife Management Program in place. This typically involves fencing, noise generators, monitoring, reporting and removing creatures whose presence is known. Like any program, there can be things that could never have been prevented or been foreseen. After all, deer can leap over barriers twice their height. Bears can just bull their way through obstructions designed to keep smaller animals out. For those who believe hub-size airports are animal-free, I found a report from just such a facility in which a "creep" (I looked up the term) of tortoises burrowed under a fence and found pavement, and then there are two CRJ pilots who won't soon forget encountering and impaling a pair of wild turkeys at 110 kt. while rolling for takeoff from Runway 30 at Dulles International Airport.

You get the idea.

For many years, we flew into Adirondack Regional Airport (KSLK) at Saranac Lake, New York, on a regular basis. The local weather is what you would expect for a location with tall mountains to the south and southeast and a large body of water just to the east and northeast. The entire surrounding area can be CAVU, yet KSLK will be at minimums for an approach or departure. Thanks to their equipment and experience with air carrier and Olympics traffic, the folks at KSLK know how to keep a runway open.

Over the years we talked a lot with airport personnel about the low-viz operations and they agreed to do a runway check for us when we called when 10 min. out. Also, we gladly paid extra for them to remain after hours to ensure the lights would come on and the runway was in good shape and critter-free. It gave us an idea of what was going on. And on a low-viz departure, after we were given "if not off by . . ." they'd then speed down the runway and make a final check. **BCA**

DGCA

During walk around inspection the Pilot in Command observed that the engine cowl was badly damaged and there were holes on the sides of engine.

flown from Delhi to Surat and arrived at 12:46 UTC. Prior to the flight's arrival, ATC had instructed the fire staff to inspect the runway, which they did and reported everything was normal.

On the accident flight, the aircraft received a taxi clearance to Runway 4 via Taxiway A at 13:29 UTC. Visibility reported at the time of departure was 6 km (3 sm) with calm winds. There was no significant clouding. Temperature and dew point were 29C and 15C, respectively, with QNH 1011. After entering Runway 4, the aircraft backtracked, lined up and reported ready for takeoff at 13:35 UTC. It was cleared for immediate takeoff.

The PIC reported that during takeoff roll at a speed of about 78 kt. he saw something in his peripheral view moving toward the aircraft. It was otherwise pitch dark and nothing was visible beyond the cone of aircraft lighting. (The report here goes into a detailed discussion of the limitations of vision directly ahead at night). Thereafter, he heard a "Bang!" and the aircraft felt as if it had gone over a bump. The PIC immediately called for the abort, initiated the same and ATC was so informed. The crew also told the tower that they'd struck a dog on the left side of the aircraft. Since all the parameters were normal and there was no sign of fire or vibration, the flight crew asked ATC for permission to return to the bay.

Once returned, the engines were shut down and all necessary checks carried out. Following that, the cabin crew and passengers were briefed on what had occurred. During the subsequent walk-around inspection, the PIC noted that the engine cowl was badly damaged and there were holes on the sides of engine. At that point it was decided to disembark passengers.

An airport vehicle contacted ATC requesting permission to cross the runway, which was granted. The jeep then radioed the tower that there were two water buffalo on Runway 4/22, one was dead and the other was roaming. Upon that report, the runway was immediately closed. Only after the dead animal was removed (and, presumably, the live one corralled) and the runway inspected was it declared operational again.

It's worth noting that an Aerodrome Surveillance Inspection that was carried out July 17-18, 2013, by the DGCA highlighted broken boundary walls on both sides of the accident runway. And there were no records to show that the risk assessment submitted to the DGCA was actually carried out.

Airport Authority Manual on Aerodrome Licensing of All Airports dated

Accidents in Brief

Compiled by Jessica A. Salerno

Selected Accidents and Incidents in August 2019. The following NTSB information is preliminary.

▶ August 27 — About 1835 PDT, a Cessna 172, (N4108F) was destroyed following impact with trees during climbout at Mc Kenzie Bridge State Airport (00S), McKenzie Bridge, Oregon. The private pilot and passenger were killed. The airplane was registered to a private individual and operated by LebanAir Aviation as a Part 91 personal flight. It was VFR and no flight plan was filed for the local flight, which departed Lebanon State Airport (S30), Lebanon, Oregon about 1800.

Three witnesses who were positioned beneath a tree canopy near the center of the runway observed the accident airplane several seconds before it crashed. According to two of the witnesses, the airplane was about 5 ft. AGL flying east on Runway 6 when it came into their visual range. The airplane appeared to be moving slowly as the wings rocked; however, the engine sounded smooth and continuous. Seconds later the airplane began a shallow climb as the wings continued to rock and disappeared from the witnesses' view as it reached about 20 ft. AGL. The third witness reported that the engine harmonic resembled a low power setting when the airplane came into his view. The engine power then increased and the airplane yawed from left to right as the wings rocked just before the airplane disappeared behind a group of trees. Approximately 15 min. later, one of the witnesses observed dark smoke coming from the accident site.

An intermediate impact point was observed along the debris path and marked by several broken tree branches at the top of an approximately 120-ft. tall tree about 75 ft. southeast of the IIP.

▶ August 25 — About 1500 CDT, a Cessna 425 (N300GD) registered to Downing Aviation LLC of Edmond, Oklahoma, was heavily damaged following an emergency gear-up landing at Wiley Post Airport (PWA), Bethany, Oklahoma. The private pilot, who was the sole occupant, was not injured. It was VFR and a flight plan was not filed. The personal flight was being conducted under Part 91.

The pilot reported that he planned to fly the airplane locally to test a newly repaired autopilot. After a normal preflight and run up, the pilot took off from runway 17L at PWA. All gauges were in the green with torque stabilized, and rotation was smooth at 98 kt. The autopilot was not engaged. After confirming a positive rate of climb, the pilot raised the landing gear and confirmed it was locked in the up position. The airplane then suddenly yawed to the left with a slight dip of the left wing, followed by a yaw to the right, followed by a yaw back to the left. Then, after a more pronounced yaw to the right, the pilot determined that directional control was not possible. He decided to abort the takeoff by reducing power to idle, and landed gear up on the remaining part of the runway. The airplane slid off

January 2013, Para 4.5.7 refers to, 'Weekly Inspection by WSO (ATC) for Boundary Wall/Fence. But no proper format, including a wildlife log, was being maintained.

Obviously, these animal encounters are not reserved for exotic locales since as already noted, there were 166,000 strikes in the U.S. alone over a 25-year period. The accounting provides some useful statistical insights. For example, half the bird strikes (52%) occurred between July and October; nearly a third of the collisions with deer (29%) occurred in October and November. Ground-bound mammals are more likely to be struck at night (63%) whereas that same percentage of bird impacts happen during daylight hours. Birds, beasts and bats are all much more likely to be struck during an aircraft's arrival phase of flight (61%, 64% and 84%, respectively) versus takeoff and climb-out (35%, 33% and 14%, respectively).

For commercial and general aviation aircraft, nearly three-quarters of all bird strikes occurred at or below 500 ft. AGL.

Above 500 ft. AGL, the number of strikes declined by 34% for each

DGCA

The hydraulic lines of the brake system and weight-on-wheel sensor were damaged.

the runway onto a concrete pad that housed the PAPI lights. The airplane continued sliding onto grass for about 100 yd. After coming to a stop, the pilot secured the airplane and exited.

▶ August 21 — About 1132 PDT, a Cessna 560XL (N91GY) overran the departure end of Runway 2 following a rejected takeoff from Oroville Municipal Airport (OVE), Oroville, California. The two airline-transport pilots and eight passengers were not injured. The airplane was destroyed by a post-crash fire. The airplane was registered to Jotts LLC, and was operated by Delta Private Jets, as a Part 135 on-demand charter flight. It was VFR, and an IFR flight plan was filed. The flight was originating at the time of the accident and was destined for Portland International Airport (PDX), Portland, Oregon.

The pilot flying reported that prior to takeoff, they had a waypoint fix and departure change, which he updated within the flight management system. As they taxied onto Runway 2, he called for the before takeoff checklist. Following completion of the checklist, they initiated takeoff, and the non-flying pilot called "airspeed alive," V_1, and V_R. The pilot flying stated that "it was just a weird sensation" as he pulled the yoke back and the airplane didn't lift off. The pilot flying further stated that he pulled the yoke back a second time and noticed no movement of the nose. Shortly after, the non-flying pilot called for an abort, and the pilot flying applied full thrust reversers and maximum braking. Subsequently, the airplane exited the departure end of the runway, impacted a ditch, and skidded across a grass covered area, where a post impact fire ensued.

Review of surveillance video from a fixed-based operator (FBO) located at OVE showed the airplane holding short of Runway 2 for about 3 min., 44 sec. The airplane then taxied forward toward Runway 2, stopped, and remained stationary for about 18 sec,, until it began to taxi again onto the runway. After lining up on the runway, the airplane remained stationary for about 16 sec.. Once the takeoff roll was initiated, the airplane traveled out of the camera frame 48 sec. later. The position where the airplane moves out of the camera frame was about 730 ft. beyond the departure end of Runway 2.

▶ August 20 — At 0915 CDT, a Schweizer G164-B airplane (N3631Z) crashed near Hays, Kansas. The commercial pilot was killed in the accident. The airplane was destroyed by impact forces and post-impact fire. The airplane was owned and operated by Werth Aerial Spraying Inc. Part 137 aerial application flight. It was VFR. The local flight originated from the operator's private airstrip.

The airplane was observed departing the airstrip by a family member of the pilot for the pilot's first flight of the day. The airplane was seen taking off to the east and starting a turn to the west before the witness turned away. The airplane's fuselage, cockpit and inboard sections of each wing were mostly consumed by fire. The wreckage and engine were retained for further examination. **BCA**

After the immediate emergency was handled and the passengers were safe, investigation revealed that there were parts of two dead cows not only on the runway, but crushed into the aircraft left landing gear assembly.

1,000-ft. gain in height for commercial aircraft, and by 44% for general aviation aircraft. Notably, strikes occurring above 500 ft. were more likely to cause damage to the aircraft than strikes at or below that altitude. The record height for a reported bird strike was 31,300 ft.

In the period studied, aircraft collided with 529 species of birds, 43 species of terrestrial mammals, 22 species of bats and 18 species of reptiles. Waterfowl, gulls and raptors (birds of prey) were the birds that caused the most damage by impact, while among ground animals deer and coyotes held that same distinction. Although the percentage of wildlife strikes with reported damage averaged 9% during the period studied, this number declined from 20% in 1990 to 5% in 2015. A negative effect on flight was reported in 6% and 20% of the bird and ground animal strike reports, respectively, and resulted in 5,539 precautionary or emergency landings, including 53 incidents in which pilots jettisoned fuel (an average of 14,373 gal.) and 95 overweight landings. There were 2,232 aborted takeoffs following an impact with an animal, making such action the second most commonly reported negative effect on flight from such an event, and those included 520 aborts at speeds exceeding 100 kt.

With all the foregoing in mind, two stark operational realities emerge from airplane vs. critter encounters. First, smashing into a bird while airborne leaves flight crews no choice but to deal with the problem. But if you're about to hit an animal on the ground, it's best to stay on terra firma if at all possible.

Finally, I offer readers this — **https://www.newsflare.com/video/46313/animals/small-plane-hits-deer-on-runway#** — a video of a light airplane landing at a country airport, though not nearly as remote as the Montana facility mentioned in the opening paragraph. It's a grass strip, most likely with minimum protection from native wildlife. I estimate the aircraft is traveling at about 50 mph. The purpose of the video is to show that when wildlife are suddenly confronted with an onrushing aircraft, they lack the mental wherewithal to consider options like stopping or turning away. Nope, they're going to continue on their course or possibly stand to fight with dire consequences to them, but hopefully not you. **BCA**

Kernel Cushion

According to government-owned (50.02%) NTV, the Russian Federal Air Transport Agency, the Russian TASS news agency, and numerous other sources, on Aug. 15 a Ural Airlines Airbus 321 with 233 people aboard had just departed Moscow's Zhukovsky International Airport bound for Simferopol, a city on the Crimean Peninsula, when it flew through a flock of birds causing one engine to shut down.

The pilot reported that upon the initial bird strike, he intended to circle the field on the good engine and land. However, shortly after the first engine failed more birds got vacuumed into the second engine, causing it to fail as well. Both failures reportedly caused brief inflight fires.

The *Moscow Times reported that* Moscow regional officials initially rejected claims that the birds, thought to be gulls, may have come from a nearby landfill. They insisted that the closest garbage dump to the Zhukovsky airport was 14 km away. But later, a flock of birds was "discovered after all." These were found near a waste sorting station and an illegal garbage dump approximately 2 km from the airport, the Moscow region's top environmental official told Interfax, another Russian news agency.

The absolute critical phase of flight after a total power loss is the transition from powered climb to unpowered glide. This must be accomplished immediately and, depending on speed, can require a very large change of pitch. With only 750 ft. of altitude, Capt. Damir Yusupov established the glide and then committed to an off-airport landing into a corn field.

He left the landing gear up, in contravention to Airbus procedures, but that decision proved to be critical to the outcome. As did Capt. "Sully" Sullenberger when ditching his Airbus on to the Hudson River years earlier, Yusupov kept his aircraft's energy high enough to maneuver and, as contact with the corn became imminent, he leveled the plane and let the tall stalks act as a braking force.

One person was hospitalized in the crash landing, but only some minor injuries were reported to some other passengers. More significantly, in the end, all on board survived.

The 41-year-old captain and the 23-year-old copilot were presented "Hero of Russia" awards by Russian President Vladimir Putin. The cabin crew also received high civilian awards as well. **BCA**

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Eurocontrol, Business

The daily challenges include capacity, staffing and **satisfying all member states**

BY **DAVID ESLER** david.esler@comcast.net

Eurocontrol, the European Organization for the Safety of Air Navigation that coordinates air traffic control among 41 Western European members plus Israel and Morocco, is grappling with staffing and airspace capacity issues at a time when traffic over the Continent is growing.

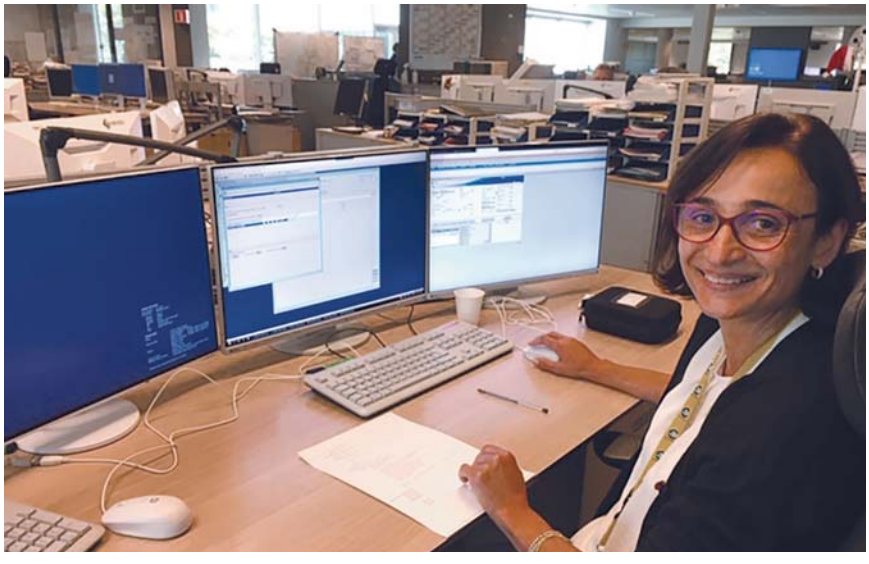
The intergovernmental agency, founded in 1960 and headquartered in Brussels, provides a range of services enabling air navigation for operators transiting across Europe, the most important of which is strategic and tactical flow management overlaying the ATC services of its individual member states. Other activities include:

- Airspace reorganization to reduce civil aviation congestion.
- Liaison with its members' militaries for allocation of airspace for training and maneuvers.
- Assistance to member air navigation service providers (ANSPs) and airport managements.
- Controller training.
- Collection of air navigation fees.
- Considerable research devoted to air traffic management (ATM) and development of procedures with an emphasis on safety.

Eurocontrol is not an agency of the European Union (EU) nor part of the confederation's European Aviation Safety Agency (EASA), but the EU is a Eurocontrol signatory and its 28 states are all members. Further, EASA has designated parts of its Single European Sky ATM Research (SESAR) program for ATC modernization to Eurocontrol for regulation and implementation. In a modern, highly secured building next to the North Atlantic Treaty Organization (NATO) headquarters on the outskirts of Brussels, an international staff of more than 2,000 people carries out Eurocontrol's mission.

DAVID ESLER, BCA (2)

In the Eurocontrol Network Manager Operations Center, two flow control planners carve out temporary protected airspace parcels to accommodate military operations over Western Europe, one of Eurocontrol's responsibilities in addition to managing flow control for civil operations.



A flow control planner in the Eurocontrol Network Manager Operations Center in Brussels, Belgium.

Aviation & More Part 1

Eamonn Brennan, Eurocontrol's director general, compares his charge to NATO in the sense that it is "an intergovernmental agreement." In a recent interview, Brennan identified his "bosses" as "the 41 director generals of civil aviation in each state." Eurocontrol is unique in that it is a civil/military entity, he claimed, adding that the military has equal rights in the organization, and the airspace is shared with the civil sector. "There are 41 military representatives as well as 41 civil," he said. "We work very closely with them to maximize the availability of airspace."

The challenges implicit in this can be appreciated when one considers both the real estate and political structure of the airspace that Eurocontrol oversees. Imagine, for a minute, if every state in the contiguous U.S. was its own air navigation service provider and that the FAA had to organize this panoply of ATC systems into a cohesive entity allowing air traffic to transit the vast American continent in a controlled but uninterrupted manner. Consider also the jet airplane and how it must be controlled with adequate separation while traveling at near Mach speed passing through the airspace of some smaller states (think: New England) in minutes.

Now, add the military factor, the necessity of allocating appropriate airspace for training and maneuvers, often in different places and at different times. And further consider that Eurocontrol cannot require individual states to upgrade their ATC infrastructure, or stop any of them for refusing to comply with flow control or merge sectors with neighboring states for more efficient operations due to arguments about sovereignty. And if any those states' air traffic controllers decide to strike during peak travel season, the stress on the system, individuals and nerves as ad hoc adjustments are implemented is severe.

Finally, add to all that a burgeoning airline industry growing at up to 5% a year, an ATC system operating at capacity, a shortage of controllers and states' reluctance to hire more, and the introduction of drones into the airspace, and you have the situation Eurocontrol must manage every day in Europe.

These two illustrations are from a presentation given by Eamonn Brennan, Eurocontrol's director general.

Sovereignty Issues

Most European countries are relatively small, operate their own ATC system, and all are sovereign political entities. The matter of sovereignty was an issue for Eurocontrol right from the start. Although the Eurocontrol Convention was signed in 1960, within two years the plan for harmonized ATC over the Continent was imperiled by a rift between France and the U.K. over national military airspace control. Meanwhile, the four other founding members — Belgium, the Netherlands, Luxembourg and West Germany — agreed two years later to establish a merged international ATC center at Maastricht in the Netherlands to manage upper level airspace, especially for traffic arriving from and departing into Atlantic airspace. (The center still operates, now under

EUROCONTROL (2)

Supporting Emissions Trading Documentation

"Environmental sustainability is a key issue on the political agenda in Europe," Eurocontrol Director General Eamonn Brennan reminds non-European operators.

"We are keen to see the carbon offsetting plan [CORSIA, or the Carbon Offsetting and Reduction Scheme for International Aviation] implemented on schedule," Brennan told *BCA* during a visit to Eurocontrol in June. "The new European Commission and Parliament have put it at the top of their agenda. We need to demonstrate a plan for aviation to expand sustainability."

Last year, aviation in Europe grew by 3.8%, but carbon emissions increased by 5.2%, and Brennan maintains this is unsustainable. "The fragmented ATC network in Europe, which results in longer routes and level capping procedures being used by the Eurocontrol Network Manager [to reduce delay times], has a negative effect on the environment."

Aviation CO2 emissions have to be less than the rate of aviation growth, Brennan believes. "The problem is that all of the advances we have made in aviation, such as quiet and more efficient engines, composite airframes, new ATC procedures, and so forth, are being lost because of the fragmented nature of European airspace.

Andrew Watt runs Eurocontrol's environmental unit a few floors below Brennan, and he pointed out that the flow control organization provides Environmental Trading Scheme-related services to aircraft operators, states and the European Commission. "We have a colossal data warehouse, and we've developed apps that interrogate the database, pull data out, process it and deliver it from an environmental perspective. Operators seek us out to provide estimates of their CO2 emissions."

In 2018, Eurocontrol delivered 380 reports to operators and almost 2,000 since 2012 when the organization launched the service. "The business aviation community is our biggest customer," Watt said. "The route-charging data is the basis for this, as once the operator pays for the service, we then know a flight has actually taken place, as a flight plan is only an intention. We also have fuel-burn estimation models."

Eurocontrol charges a "nominal price" for the reports, a fee that has remained stable for seven years, and it is claimed to be delivering more reports for the same price. "Our data offers a means to reduce and, in certain cases, eliminate third-party verification costs," Watt said. "ETS has generated a net saving of 193 million tons of CO2 between 2013 and 2020 through the funding of emissions reductions in other sectors." (The price for a ton of CO2 on the Euro carbon market in June was €25.)

Eurocontrol keeps close contact with the business aviation community through the European Business Aviation Association, NBAA and other organizations. "A small emitter and operators with low traffic can take our report data at the end of the year and submit it to the competent authority [i.e., the state] without going through and paying for a third-party verifier or auditor," Watt said. "Our report costs €400, whereas an auditor's report could be 10 times that, and our data is considered sufficiently accurate to supplant the audit."

Eurocontrol also wants operators to engage with the organization and provide samples of their actual fuel burns on an annual basis to allow Eurocontrol to keep its fuel models up to date. **BCA**

the auspices of Eurocontrol, staffed by controllers from the four founding states.)

In 1997, a revised Eurocontrol Convention was signed promising greater political support for the organization but no overall authority to force members to cooperate. From 1965 through 2016, other states signed on to the agreement, the 41st being Estonia in 2015; Morocco and Israel came aboard in 2016 under an agreement to include non-European states whose operations are closely tied to the Continent's aviation network. But as of today, just like the International Civil Aviation Organization (ICAO), Eurocontrol has no executive power — but as we'll see, this could change.

Regardless, Eurocontrol has consistently risen to manage increasing air traffic levels with daily organized flow control, airspace allocation and coordination between the ATC establishments of its member states. But with available airspace now at full capacity and unable to accommodate more traffic in a relentlessly expanding commercial market, creative ATM solutions must be devised and implemented — which experience has proven is one of Eurocontrol's fortes.

"We are doing 37,500 commercial flights a day right now in the European system," Brennan told BCA. "This is at record levels and never achieved before. In parallel, we are dealing with a capacity issue in Europe — a number of areas are short of capacity, particularly Germany, the south of France and Austria."

Because of the shortage of capacity, Eurocontrol has for the first time implemented "network measures" that involve changing routes to move traffic away from low-capacity to high-capacity areas with the object of minimizing delays. "We are moving 1,100 flights daily from the core area to relieve the German capacity problem and reorienting into areas like Poland, Belgium and the U.K.," Brennan explained. "Our plan this year is to use Eurocontrol's Network Manager to eliminate about 20 million minutes of delay. Without this, Europe would have 41 million minutes of delay this year. The large network carriers in Europe like Ryanair have 2,400 flights a day, and last year, one in three of them had an ATC delay averaging 40 min. during the peak summer months."

Razvan Bucuroiu, who heads Network Strategy and Development at Eurocontrol, added that, just as last year, 2019 has developed as "extremely challenging, mainly because we have in some parts of the network a deficit of controllers at various centers." As a result, significant delay-producing bottlenecks coalesced in Germany, France and Hungary. "In addition to that," he continued, "there is a genuine traffic saturation in some parts of the network that will require a complete restructuring of the airspace in the future to be able to respond to traffic growth and operational requirements."

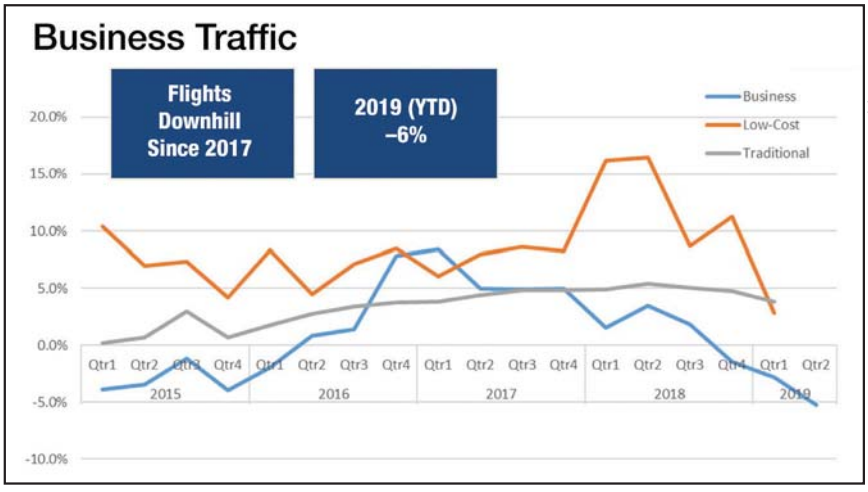
For now, the action plan cited by Brennan has produced some fruit. Had nothing been done, Bucuroiu pointed out, the aggregate en route delay in Europe would have increased by a factor of eight. As a result of applying strategic and tactical mitigation measures, he said, "we estimated that the delay could be reduced from 4 min. per flight to about 2.3 min. or even lower" — as much as a 50% decrease. In practice, by midsummer, delay reductions were running slightly better than predicted, so the measures appeared to be working.

Bucuroiu noted that while rerouting flights from low-capacity areas to those with more capacity has increased route lengths for some users, that negative impact has been counterbalanced by the positive effects of other major airspace changes in the network, including "free routing." As a result, "We have a slight improvement to-date in flight efficiency in Europe in 2019 compared to the similar period in 2018," Bucuroiu claimed. "So they are working, but we need much more structural action in the short term to eliminate the current constraints. So, we are going to address two directions."

One is looking at restructuring European airspace, while the other is coordinating the implementation of best-in-class operational procedures and practices, technical changes, local system support, air traffic flow management and civil/military enhanced procedures. Termed "Operational Excellence," the goal is to be able to lift all the ATC centers in Europe to a level of performance similar to those that are best in class today. Both initiatives will be implemented between 2020 and 2025.

Free Routing as a Solution

Over the next five years, "structural actions" will be necessary to address the European capacity crunch. "We are looking for the ANSPs to recruit the necessary number of controllers to fill the understaffing," Bucuroiu said. "At the same time, we are looking at a complete free route cross-border



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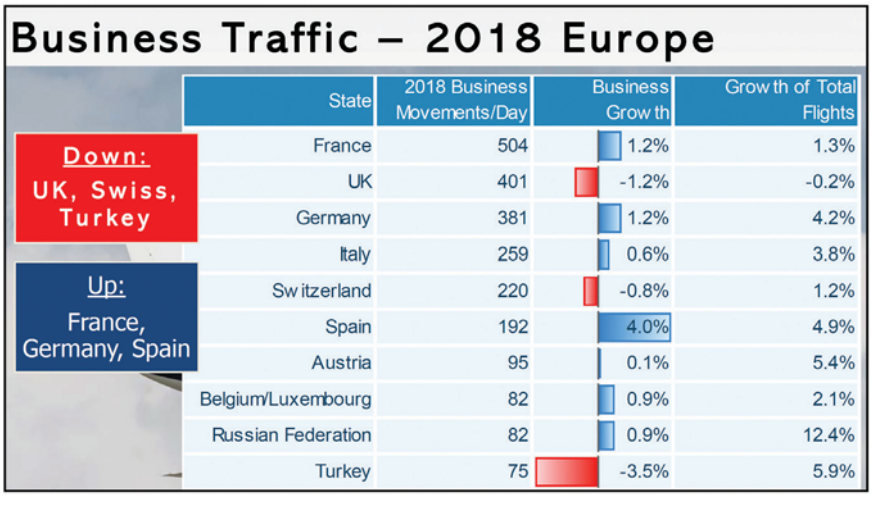
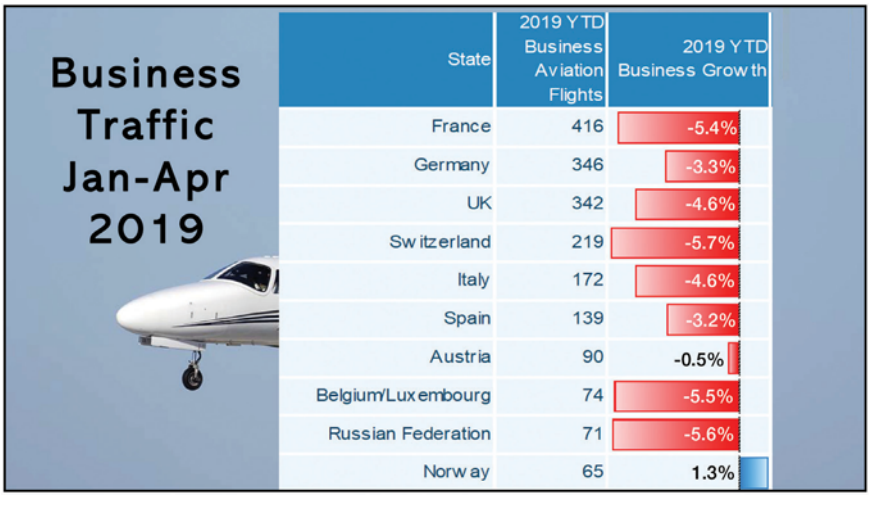


State	2018 Business Movements/Day	Business Growth	Growth of Total Flights
France	504	1.2%	1.3%
UK	401	-1.2%	-0.2%
Germany	381	1.2%	4.2%
Italy	259	0.6%	3.8%
Switzerland	220	-0.8%	1.2%
Spain	192	4.0%	4.9%
Austria	95	0.1%	5.4%
Belgium/Luxembourg	82	0.9%	2.1%
Russian Federation	82	0.9%	12.4%
Turkey	75	-3.5%	5.9%



State	2019 YTD Business Aviation Flights	2019 YTD Business Growth
France	416	-5.4%
Germany	346	-3.3%
UK	342	-4.6%
Switzerland	219	-5.7%
Italy	172	-4.6%
Spain	139	-3.2%
Austria	90	-0.5%
Belgium/Luxembourg	74	-5.5%
Russian Federation	71	-5.6%
Norway	65	1.3%

Droning on in Europe

Just as the FAA is struggling to integrate unmanned aerial systems (UASes, or drones) into U.S. airspace, so are aviation authorities in Europe, and Eurocontrol has taken the lead in coordinating drone introduction among its 41 Continental members.

"From the business aviation perspective, the key issue with the drone is safety in mixed airspace and around controlled airspace," Philippe Merlo, Eurocontrol's senior director, stated. "Is safety secured? This is our main concern in terms of drone activities. Now it presents a risk for traditional manned aviation."

Merlo cited the incident at Gatwick in south London this spring, which shut down the airport "just because there were a couple drones overflying the field, amounting to a huge financial cost." Then there is Heathrow International, where environmental activists have threatened to fly drones over the airport to halt operations. "So we have to consider the drone activities as a permanent reality and risk for aviation and find a way to ensure the right level of safety."

Then there is the consideration of legitimate drone activity in airspace from military and professional operators. "What is the impact of accepting these bigger drones in IFR airspace? They often fly slower and are not as well equipped as manned aircraft." This is "uncharted territory," Merlo believes, requiring the compilation of an entirely new safety case.

And this ties into concern for the lack of a drone-use safety culture. "The drone operators are often start-ups, very dynamic but not aware of the level of safety we have to achieve in aviation," Merlo said. "Sometimes, they think they can operate in airspace with no coordination. We have to educate them in the field of safety, have to explain that in aviation you have to demonstrate the level of safety — the safety case — and that is not easy because you do not have the pilot in the aircraft. For example, very often, the communication with the drone is based on a 4G mobile link, which is cheap, but is it safe enough? So again we have to start from scratch and demonstrate the level of safety."

Merlo believes this new mixed-use operating environment calls for the introduction of flexible regulation. "I hope that the operators are aware they cannot operate their drones everywhere. There is also the desire in Europe not to implement too stringent regulation too soon. The start-up dynamic has to be preserved. There is huge potential for added value here, even on airports, like airborne inspection of airframes. We need 'drone caging' in order to do that. We also know that utilities are interested in using them for inspections, and these are companies with funding to be able to do this. So, we should progress step by step, taking each case separately. What do we need in terms of BVLoS [Beyond Visual Line of Sight], for example? This effort is underway in many places in Europe, everywhere where industry has detected this technology and wants to use it."

What is Eurocontrol's role in this? "We believe we have a strong role, first, because we have tools available to support the development of validations and experiments," Merlo explained. These include software that can assess risk of collision in uncontrolled airspace, "a kind of simulator where you introduce a scenario including traffic and situations. These tools can help to quantify the separation risk." Other tools include the European Aeronautical Database (EAD) already in use by civil aviation authorities to communicate accessibility of airspace parcels, such that if one member wants to create a dedicated piece of airspace for operation of drones, this would be announced in the database. Also as in the U.S., drone operators have developed a mobile phone app for determining prohibited drone operation areas that can be downloaded, allowing them to determine when and where they can fly. **BCA**

implementation in the entire European airspace supported by a complete resectoring of the airspace that will need to be done irrespective of national, FIR [flight information region] or ANSP boundaries." Given the thousands of years of national rivalries on the Continent, that will be a big order.

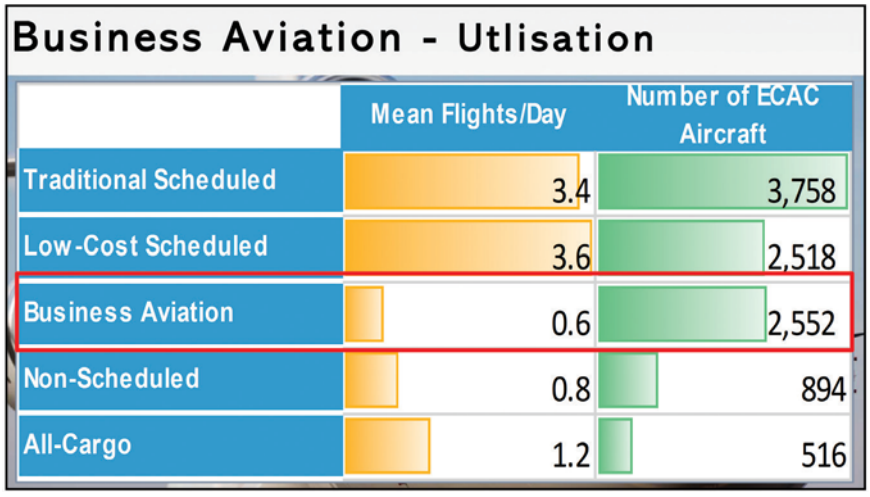
Free routing has been gradually implemented since 2008 through close cooperation between Eurocontrol and the ANSPs. "It does not require any additional technology," Bucuroiu said. "In practice, there is no need for a fixed route network, as airspace users are allowed to freely flight plan from one significant point to another on the basis of their own choices. At this point in time, we are using just published significant points, but we are working toward the possibility, in the long term, of using any lat/long point. This will, of course, require further developments of the users' flight planning systems. But from an ATC point of view today, we can use lat/long points without any problem."

The free routing procedure is claimed to be able to de-conflict major traffic flows by having a better spread of the conflict points. Further, it can slightly decrease the controller workload. It is implemented in almost three-quarters of European airspace now with almost no negative post-operational feedback. Another advantage of free routing is increased traffic predictability. "Today, controllers do not fully respect the flight plans," Bucuroiu observed. "They give tactical directs, but in a free-route environment, you will get a flight plan whose trajectory will coincide to a very large extent with the final trajectory of the flight."

Eurocontrol believes that the flight efficiency improvements reaped over the last decade are, to a large extent, due to implementation of free-route airspace. "In congested airspace like Europe, the difference between the actual trajectory and the great circle is today only 2.7%, so basically on a 100-nm segment, the actual segment flown will be 102.7 nm, a very small deviation from the most direct distance," Bucuroiu explained. "From a conceptual point of view, Europe is the first in the world to have implemented free-route airspace — and it did it in a very complex environment — and a lot of our neighboring regions are asking for advice on how to implement it in their airspace."

Airlines Pushing Out Business Aviation

In 2018, carriers in Europe chalked up their worst year ever in terms of ATC delays. "Aviation in Europe is growing at 2% per annum, and by 2030 we are expecting 52,000 flights per day," according to Eurocontrol's Brennan. "To give you context, the difference between Europe and the U.S. is that European aviation is growing much faster because there is more competition between legacy and low-cost carriers and more airlines entering the market. In the U.S., it is consolidated much more. There are areas in Europe that are growing between 5 and 7%, like Poland, Austria and the Czech Republic, and even traditional markets like Spain are showing 3% growth rates." The market that is flattest is the U.K. due to what Brennan termed the "Brexit effect" engendering economic uncertainty and thus discouraging airlines from adding new routes.



EUROCONTROL

In addition to the ATC capacity crunch, another challenge Europe is facing is limited ground infrastructure.

Managing 'Disruption'

Christos Rekkas, who heads Eurocontrol's surveillance unit, added a note on the element of "disruption" that characterizes so much of the high-tech revolution. "At Eurocontrol, we have a multi-domain group supporting the work of integrating drones and cooperating with all the stakeholders in Europe and other continents to help make it happen. Disruption is expected."

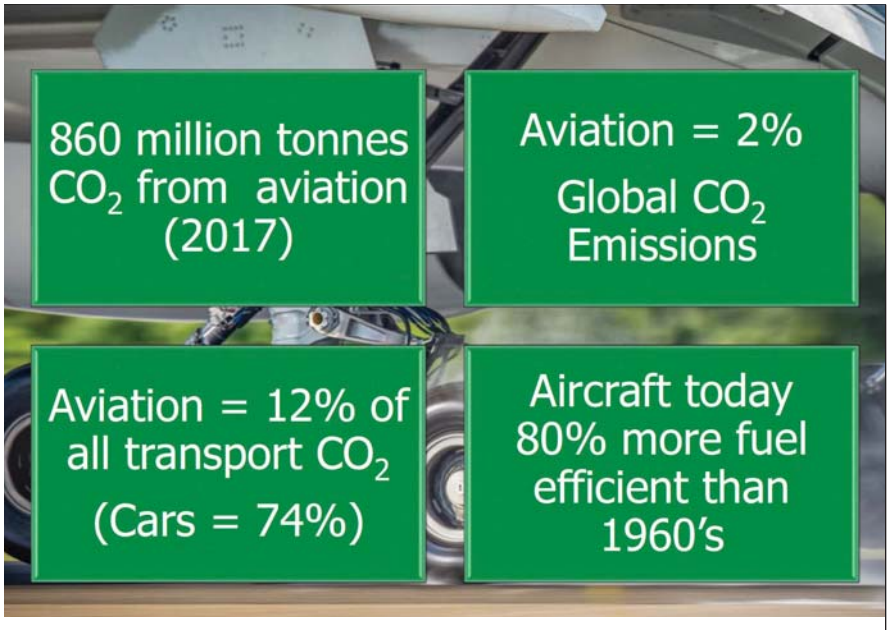
Rekkas believes the drone community needs to "learn a lot about how ATM works and vice versa in the sense that we can learn from them in terms of, for example, autonomous operations. One key area of interest is detection of drones to keep them out of sensitive areas like airports, so we are working together to determine a means of detection and procedures to be followed when it happens. They are small and fly differently than other aircraft, and the means of tracking them offers challenges for creating an integrated traffic picture for ATM."

Eurocontrol is separating the different cases between interference and normal control of drones. New terms are emerging: U-space for airspace dedicated to drone operation and UTM for UAS Traffic Management. "There are different use cases to be considered," Rekkas pointed out: "intrusion or pop-ups; UTM, a cooperatively managed system; and IFR or VFR in air traffic management. U-space includes airspace below 500 ft., schematically. U-space and ATM are expected to be procedurally separated, at least initially. So, different types of service will have to be offered for each case."

Back to Merlo: "In Europe, we still need to federate, better coordinate . . . all the drone activities all over Europe in order to introduce more cooperation and accelerate related regulations. We're lagging a bit behind the U.S. here where the FAA has convened its Drone Management Program. Creating a European drone management program, at the European Commission level, this is what we are trying to do."

Earlier this year, the European Commission created a U-space drone operation network to pull all stakeholders together and exchange information on different initiatives, identify lessons learned, set priorities, build a common roadmap and establish cross-border cooperation, with the intention of accelerating the development of drone activities in Europe. "Eurocontrol has been ordered to support this," Merlo said. "We set up the meetings and are trying to facilitate both cross-border operations and the definition of a common roadmap and to steer the discussion of what we think the priorities should be to move forward as fast as possible.

"We are happy with the development of drone activities in Eurocontrol because we have favorable feedback," Merlo concluded. "Our stakeholders understand the need for a facilitator/coordinator and that, with our skills and tools, we are positioned to play this role. So they are happy to have us behind them." **BCA**



EUROCONTROL

As Brennan pointed out, no country other than Turkey, which opened its new Istanbul Airport (LTFM) in 2018 near the Black Sea, is building new runways. "Because of that, there is a direct effect on business aviation — the low-cost carriers are moving away from the congested hubs and into secondary airports all over the continent, pushing general aviation out of these tertiary airports."

As a result of competition from the expanding low-cost carriers, business aviation is under increased pressure to obtain slots in Europe. "At Luton [EGGW] in London, there is now regular commercial service from EasyJet and Ryanair," Brennan said. "Also Charleroi [EBCI] in Belgium, which was previously occupied by business aviation, is now a commercial base.

"Business aviation generally works OK in Europe," he continued, "but the challenge to them is what they will do every year as the commercials take up 2% more of the airspace. The airspace is increasingly congested." Business aviation traditionally took advantage of the traffic "trough" in the middle of the day and later in the evening at European airports that was delay-free. Now that the trough has filled in, the times of the day when there was light or no traffic is disappearing, resulting in slot delays during these periods as well. **BCA**

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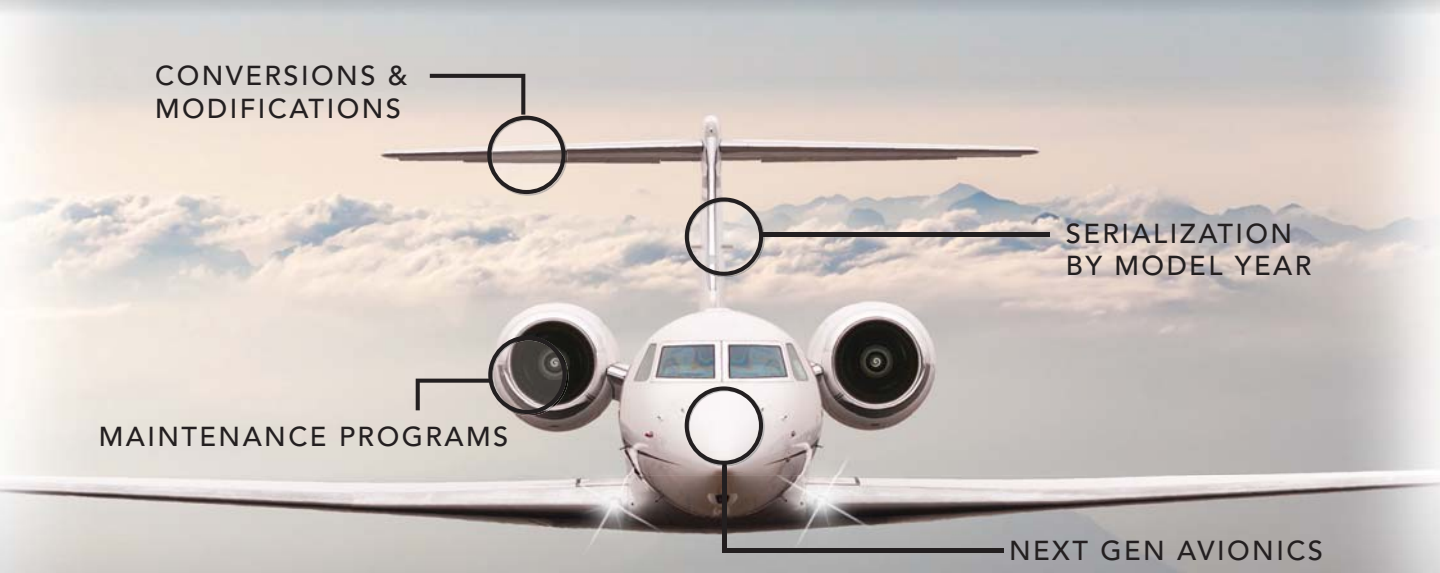

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HONDAJET

HondaJet Elite

Unparalleled **attention to detail**

BY **FRED GEORGE** fred.george@informa.com

The second-generation HondaJet Elite speaks reams about the long-term commitment of Michimasa Fujino, founding president and CEO of Honda Aircraft Company, Inc. (HACI) to perfecting his pioneering light jet. Compared to the original 2015 model, it weighs less, flies farther and it's even more fuel miserly. Its Garmin G3000 flight deck offers higher resolution displays, more computing power and a host of new standard and optional functions that both improve situational awareness and reduce pilot workload. An optional belted potty seat accommodates a seventh passenger on shorter trips.

Peter Kriegler, HACI's sales director for the eastern U.S. and Canada, walked us around s.n. 162 to note several small changes to the Elite that improve performance and provide greater utility. Most notably, aero modifications make possible reduced V speeds and significantly better runway performance. The original HondaJet has a 3,934-ft. sea-level/standard day takeoff field length. Elite's TOFL is only 3,491 ft., yet it has a 100-lb. higher maximum takeoff weight. Departing *BCA*'s 5,000-ft. elevation, ISA+20C airport, Elite needs 5,166 ft. of pavement when at its 10,700 lb. MTOW. The original aircraft requires 6,108 ft. of runway loaded to its 10,600 lb. MTOW. Elite's runway advantage only gets wider as density altitude increases, plus its OEI second segment climb performance is significantly better than that of its predecessor.

Aero mods largely make possible the performance gains. They include adding 7 in. more span to the horizontal tail and elevators to improve pitch response, especially effective at forward CG. The wider span tail also eliminated the need for vortex generators (VG) on the bottom surface of the horizontal stabilizer. The Gurney flap T-strip also has removed from the trailing edges of the elevators.

The small VGs on the inboard sides of the winglets and the mid-aileron fences are gone. But the 14 VGs on the underside of the wing, ahead of the aileron, are retained to enhance lateral control surface response during high-Mach cruise. The flap gap seals are removed with a negligible impact on drag. The engine inlets have been upgraded with perforated honeycomb acoustic treatment. That enabled up to 40 lb. of acoustical insulation to be removed from the fuselage.

The GE Honda HF120 turbofan engines have also been retuned for a tiny bit more thrust, although that has a negligible effect on performance.

The aircraft holds 104 lb. more usable fuel to help boost range with three passengers by more than 200 nm, assuming basic spec kit. Typically equipped, the Elite can fly 100 to 150 nm farther than the original aircraft, depending upon payload. Serial number 162, for example, has 249 lb. of options, so its single-pilot BOW is 7,353 lb. That's a scant 5 lb. above the BOW of the average delivered aircraft in *BCA*'s June 2019 *Purchase Planning Handbook,* thus it can fly four passengers 1,165 nm, two passengers 1,435 nm and a single pilot 1,495 nm.

Refueling the aircraft takes patience, as it takes a little while for the last 17 gal. of kerosene to settle into the tanks. To cue line service personnel when to reduce the refueling rate, a new two-color

HONDAJET

The G3000 Advanced has higher resolution displays and considerably more processing power to support runway performance computations, vertical profile graphics, dynamic mission profile planning including climb, cruise and descent phases, plus more than a dozen new features.

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push button annunciator light has been installed near the gravity fuel filler access door. Pressing it causes an "on" annunciator to appear, signaling that full flow from the nozzle can be used to replenish the tanks. When the total fuel quantity reaches 335 gal., a "fuel slowly" annunciator light illuminates to prevent overflowing. The refuel port sits high in the right aft fuselage. Most line service personnel will still need a short ladder to reach it because of its relatively tall height.

Let's Go Flying

As we entered the aircraft, Kreigler pointed out the optional side-facing chair across from the entry door, belted lavatory seat, left-hand stowable work table, personal storage compartments under the club chairs, ankle high HondaJet logo lights on the sidewalls and electric pleated window shades. The aircraft has other nice features for passengers, including a Bongiovi audio system that uses the interior side panels for bass speakers, enhanced cabin management system and Sirius XM satellite radio entertainment package.

HondaJet has the highest degree of integration between its Garmin G3000 touch-screen avionics system, engines and systems of any light jet in production. The Elite takes this to a whole new level.

As with the original model, this starts the ease with which G3000 enables the pilot to check external doors, engine oil level, fuel quantity in each tank, hydraulic system health, air-conditioning and pressurization system functioning and electrical system status, including battery charge state — all from the comfort of the cockpit.

Avionics upgrades aboard s.n. 162 include a second Mode S ES transponder, controller-pilot data link communications, XM satellite radio weather and an enhanced digital flight control system with electronic stability control and coupled go-around, among other new functions.

As soon we turned on the battery switch, it was quite apparent that the new Garmin GDU1450W widescreen ultra-extended graphics array displays are considerably higher resolution than the 14.1-in. displays in the original aircraft. The CPUs in the touchscreen controllers and throughout the avionics package are an order of magnitude faster and more powerful than ones in the original aircraft. They support many more functions and computing is noticeably faster.

New features include an angle-of-attack indicator, power-on "hot swap" LRU removal and replacement, graphic display of waypoint altitude restrictions on the MFD moving map, dynamic climb/cruise/descent flight planning that factors in winds and temperature aloft, ADS-B and TIS-B IN and visual approach guidance, plus almost a dozen other enhancements.

Cockpit pre-start checks are automated, weight and balance initialization is quick and flight planning is easy using the Garmin touchscreen control units. Elite provides a weight and balance graph on the MFD Now, Garmin's Flight Stream 510 is optional, enabling two-way transfer of flight plans between the G3000 and compatible tablet devices, such as iPads running either the Garmin Pilot or ForeFlight integrated flight application.

Pre-start checks are short and an electronic checklist guides the pilot through the steps. To start the engines, the start buttons and throttles are advanced from cut-off to idle one at a time. FADECs handle most of the start safety checks, but the crew still has to hawk the ITT indications to assure the engines stay within start limits.

The day we flew the Elite, the weather was unusually cooperative for an IFR demo flight, considering central Oregon is normally bone dry, gently breezy and intensely sunny in summer. A frisky, western Pacific storm system was coming ashore in the Pacific Northwest, bringing with it thunderstorms, rain squalls, icing, turbulence and gusting winds. Near perfect for our mission, I thought.

Our flight plan would take us from Roberts Field Airport (KRDM) in Redmond, almost due west over the Cascades to Newport on the Oregon coast, a short jog south to BOSVE intersection near Searose Beach and then east back to Bend for our first approach. We then planned to return to Redmond for another approach and VFR pattern work. Weather radar showed thick clouds with plenty of rain over the Cascades, with tops to FL 370.

The Elite now has an airport performance computer function that calculates V speeds, runway distances and OEI second-segment climb performance. We entered weights for two pilots, stores and supplies. That day, s.n. 162's zero fuel weight was 7,631 lb. Loaded with 2,270 lb. of fuel, ramp weight was 9,901 lb. It's easy enough to plug in winds and weather and have the G3000 compute the numbers. But now the G3000 can automatically import datalink weather with one press of a touchscreen icon and use it for takeoff and landing computations. The pilot still has to enter runway condition to finalize the numbers, but the new feature saves time and prevents fat-finger entry errors.

PHONDAJET

Cabin, already the quietest in class has become even quieter because of upgraded engine inlet treatment and targeted acoustical insulation. Fit and finish are second to none.

Based upon KRDM's 3,082-ft. field elevation, 16C OAT and 30.08 altimeter setting, computed takeoff field length for the Elite was 3,691 ft. The original aircraft would have required about 4,300 ft. The Elite's takeoff speeds were 104 KIAS for V_1, 109 KIAS for rotation and 115 KIAS for V_2. For the original aircraft, they would have been 110 KIAS, 115 KIAS and 119 KIAS, respectively.

Synthetic vision remains a popular option, but as with most other such systems, the only airport features depicted are runways. Between ramp and

runway, it appears as though you're taxiing through grass. The bird's-eye view on the MFD, though, shows the position of the aircraft on the runway surface and it labels all the taxiways by name.

As we rolled out of the chocks, the cold steel disc brakes felt a little grabby. And the hydraulically powered nosewheel steering (NWS) seemed a little high strung, almost twitchy, until I reacquainted myself with its characteristics. Powered NWS allows the pilot to steer the aircraft in tight quarters with little or no thrust increase once the aircraft is moving.

As we taxied for takeoff from Runway 23, Kriegler also pointed out a new feature of the optional Garmin Surface Watch function. When crossing an intersecting runway, it automatically turns on landing lights and strobes, then deactivates them when the aircraft is clear on the other side. It's important to select the desired runway for takeoff, otherwise Surface Watch can't tell the difference between the assigned runway and crossing runways.

I pressed the TO/GA (takeoff/go around) button on one of the throttles to set desired pitch attitude for departure. The V bars stabilized at 9-deg. nose-up attitude. Kriegler mentioned that the flight director commands a constant pitch attitude based on flap configuration and whether one or both engines are operating.

When taxiing onto Runway 23 for takeoff, operation of external lights, airframe ice protection and both transponders was automatic with manual override at the discretion of the pilot. I advanced the throttles to the forward stops. Once again, I noticed how quiet the aircraft is compared to other light jets. The innovative over-the-wing-engine-mount, coupled to the HF120 engines being located aft of the cabin, isolates the cabin from powerplant noise and vibration. The unique mounting arrangement also allows for a longer cabin, one that includes a full-width lavatory with the only externally serviced toilet in this class.

The main landing gear are well aft of the CG, so it took a healthy pull on the yoke to rotate the aircraft. With a positive rate of climb, we retracted the landing gear. Passing 130 KIAS, we retracted the flaps and settled into a 200 KIAS climb until we cleared Redmond's Class D airspace. Then, we settled into the standard 210 KIAS/0.57M climb to FL 430.

As we climbed on assigned course to the west, we alternated between using XM satellite radio datalink weather and the Elite's Garmin GWX 70 solid-state weather radar.

HONDAJET

Adding 104 lb. more usable fuel and an aggressive drag reduction program boosts range by more than 200 nm. We recorded 390 KTAS while burning 570 lb./hr., beating book predictions.

Heading toward the storm clouds over the Cascades, the aircraft was climbing at 2,500 fpm through 15,000 ft. in clear air at -5C. Approaching the towering cumulus, we turned on engine anti-ice. The increased engine bleed-air drain had minor impact on climb performance. But when the bleed-air wing anti-ice system automatically activated in icing conditions, climb performance diminished substantially. We noted that the horizontal tail's electro-expulsive deice system is almost inaudible in operation as it sheds ice accretion, which is quite a contrast to some other light jets we've flown; the systems in those aircraft thump repeatedly as though someone were knocking at the back door. Climbing through FL 350, for instance, the aircraft only could climb at about 500 fpm. Without anti-ice on, the aircraft would have climbed at nearly 1,700 fpm.

Clear of clouds west of the Cascades, we switched off engine and airframe anti-ice, and climb rate increased to nearly 1,000 fpm. When level at FL 430, we checked cruise performance. At 9,500 lb. and ISA+3C, we recorded Mach 0.676/390 KTAS while burning 570 lb./hr. The book predicted 0.657 Mach/372 KTAS on 607 pph. Clearly, the Elite squeezes more speed out of a pound of jet fuel than any other twin turbofan business aircraft in *BCA*'s *Purchase Planning Handbook*.

After reaching the Oregon coast, we headed back east toward central Oregon, requesting a descent into Bend. Seattle ARTCC directed us to turn 90 deg. to the south and descend without delay to FL 240 to stay clear of large numbers of jetliners arriving into the Seattle area. Serial number 162's optional speedbrake was quite effective in increasing descent rate to 7,000 to 8,000 fpm as we nosed over and accelerated close to the aircraft's 270 KIAS/Mach 0.72 redline.

Once we were below the airline traffic, Seattle vectored us back west toward Bend Municipal Airport (KBDN). We slowed to 200 KIAS due to the dark cumulus clouds, laden with heavy rain. This provided an opportunity to experience the Elite's ride in turbulence. With the heaviest wing loading of any aircraft in its class, it has a superior ride in rough air, on par with most midsize business aircraft, in our opinion.

Yet, approach and landing speeds are reasonably slow because of the 30% chord, double-slotted trailing edge flaps. At an estimated landing weight of 9,100 lb., VAPP at flaps 15.7 deg. was 112 KIAS and VREF using 50-deg. landing flaps was 108 KIAS. Unfactored landing distance was 3,580 ft. with 5,200 ft. available. Wet runway landing distance was 4,654 ft. We noted that landing at KBDN could have been challenging had the runway been icy as it often is during winter months. The aircraft doesn't have ground spoilers.

We requested the RNAV (GPS) Runway 34 approach and were cleared direct HARBU, the initial approach fix, to fly the full procedure. The procedure depicts a holding pattern in lieu of procedure turn. The Elite's G3000 guided us into a proper teardrop entry and then steered us back over HARBU a second time inbound to the airport.

The system provided barometric vertical nav guidance with a magenta diamond symbol that appeared on the

glidepath indicator. We hand-flew most of the procedure to get a feel for Elite's slow-speed handling characteristics. Thrust change with throttle movement is quite linear, making it easy to control speed. But the engines are mounted well above the center of gravity, so thrust change results in pitch moment change. Configuration changes have little impact on pitching moments.

About three miles from the runway, we coupled the aircraft to the autopilot to sample the aircraft's new coupled go-around capability. At the 4,100-ft. minimum descent altitude, I pressed the TO/GA on the throttle, causing the flight director command bars to indicate a nose-up pitch angle. The autopilot followed and missed approach guidance was activated in the FMS. We added thrust, retracted the flaps to takeoff/approach and retracted the landing gear with a positive rate of climb. We retracted the flaps accelerating through 130 KIAS and then hand flew the aircraft for the remainder of the flight.

We contacted Seattle Center and asked for vectors for the ILS Runway 23 at neighboring KRDM. Again, the weather cooperated for our purposes. We were in and out of the clouds all the way to short final.

The aircraft again proved that it's quite easy to land smoothly but stopping it in the AFM published distances requires precise technique. It's essential to reduce thrust promptly to idle when crossing the threshold at 50 ft. AGL. The low-mounted wing produces plenty of ground effect at VREF or faster. When we touched down, I lowered the nose until all three gear were on the pavement and then applied heavy braking.

The runway was wet at Redmond and the anti-skid system slowly alternated between decelerating the aircraft until the tires started sliding, then releasing all brake action for a few moments, and then reapplying braking. In our opinion, the aircraft could benefit from a brake system upgrade, one that would meter brake pressure more responsively, more proportionately in relation to wheel speed deceleration.

We taxied back to Leading Edge Jet Center and shut down after the 1-hr. 43-min. flight. Total fuel burn was 1,292 lb.

Constant Pursuit of Perfection

Fujino's team at Honda Aircraft earned approval for the Elite less than three years after the original model went into full-scale production. The dozens of enhancements incorporated in the second-generation model reflect the long-term commitment the company has to product improvement.

Owners of the original model are not being left behind. Honda offers a $250,000 package of Advanced Performance Modification Group retrofit improvements that can be installed by authorized dealers. APMG endows older aircraft with the Elite's increased maximum takeoff weight, improved runway performance, drag reduction kit and many of its G3000 software upgrades.

At its $5.28 million base price, Elite delivers the most integrated, most capable avionics system, the quietest and roomiest cabin, the largest external baggage capacity and the best fuel efficiency of any entry level twin turbofan aircraft. Arguably, it also provides the smoothest ride in turbulence because of its relatively high wing loading. Aero performance modifications provide access to many more airports that were off limits to the original aircraft.

HONDAJET

Cockpit pre-start checks are automated, weight and balance initialization is quick and flight planning is easy using the Garmin touchscreen control units.

As with the original model, fit and finish of this aircraft are unsurpassed in the light jet class. Exterior surface tolerances are tight, all doors fit precisely and the paint work is superb. There are new two-tone exterior paint scheme options and also more subdued monochrome white finishes with accent stripes. Interior furnishings also are first rate and there are more choices to personalize the décor.

Customers are likely to load the aircraft with comfort and convenience options, including the externally serviced lavatory, speed brakes, and solid lavatory pocket door, plus a belted potty seat, side-facing forward chair and high-end entertainment system equipment. Extras can add as much as $500,000 to the base price.

Honda Aircraft clearly is positioning the Elite as the premium offering in its class, a luxury model that is constantly being refined and improved. Insiders say that the Elite isn't the end state model of the HondaJet. Rather, it's more of a milestone in Fujino's journey toward building the ultimate light jet.

Building market share will be a challenge, however, as there is a glut of aircraft in the entry level light jet segment. There are close to 425 Citation CJ1, CJ1+ and M2 jets in operation and nearly 350 Phenom 100/100E aircraft. Most business aircraft manufacturers have shifted to developing super-midsize and larger models, capable of flying 8 to 12 people across continents and over oceans.

Kriegler says that the HondaJet Elite appeals to a different light jet customer demographic, thus improving its chances for market success. And the Elite also is a flagship product for the Honda corporation, a technology demonstrator that helps sell consumer products. As we wrote in our original report, Honda is a company with long patience and deep pockets. Its recently expanded Greensboro, North Carolina, campus has capacity to build much larger and more capable business aircraft. There is every indication that Honda intends to be in business aviation for a long time to come. **BCA**

Flutter

Prevention of **flutter and other aeroelastic modes** requires proper maintenance, preflight attention and **immediate reactions if it occurs in flight**

BY **PATRICK VEILLETTE** jumprsaway@aol.com

On Sept. 16, 2011, The "Galloping Ghost," a highly modified P-51D Mustang racer piloted by James K. "Jimmy" Leeward, had just rounded pylon No. 8 at the famed National Championship Air Races when the racer suddenly pitched up abruptly, rolled inverted then nosedived. The aircraft hit the Reno/Stead Airport (RTS) apron at over 400 mph in front of the grandstands in an area containing box seating, disintegrating on impact. Seven people, including the pilot, died at the crash site, and four more died later.

The NTSB began examining the wreckage after the crash along with photographic evidence taken just before the crash. The latter revealed that part of the left elevator trim tab was missing. The extensively altered aircraft showed signs of extreme stress demonstrated by buckling of the fuselage aft of the wing in addition to gaps appearing between the fuselage and the canopy during flight.

The investigation report found that the probable cause of the crash was the reuse of single-use locknuts in the left elevator trim tab system that then loosened. This led to a fatigue crack in an attachment screw and allowed the trim tab to flutter. This flutter in turn caused the trim-tab link assembly to fail, which resulted in a loss of control. When the trim tab failed, Leeward was subjected to 17 Gs, which quickly incapacitated him and likely rendered him unconscious.

Flutter is one of the aeroelastic phenomena that can occur on any aircraft not properly designed, certified or maintained to airworthiness standards. Aside from flutter, these phenomena include divergence, control

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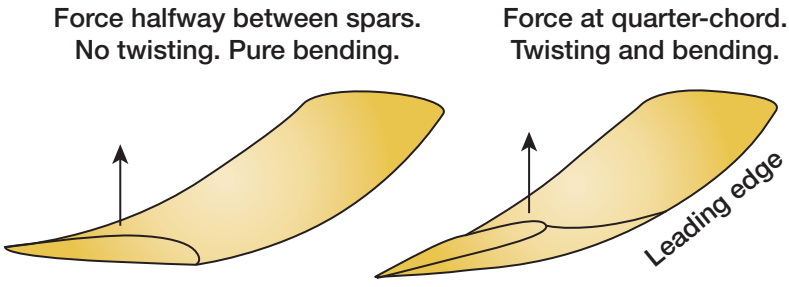

Notice in the wing on the right that inadequate stiffness to resist torsional twisting allows the leading edge to twist upward, creating a higher angle of attack and thus more lifting on the outer portion of the wing. The wing on the left is designed with additional stiffness to resist the torsional twisting forces.

buzz, control effectiveness, control system reversal and propeller whirl flutter.

Aircraft structures are meticulously designed to provide maximum stiffness and strength at minimum weight. When exposed to modest aerodynamic forces, a properly designed wing, lifting surface or any other structural component of the aircraft should deform only a limited amount.

Now, visualize the outboard portion of the wing bending and twisting a small amount as the aircraft goes faster. The additional aerodynamic twisting moment can bend the leading edge of the wing upward. This, in turn, would create increased angle of attack (AOA), causing more lift, and, yes, this would result in additional upward twisting force. Fortunately, engineers anticipate this and design the wing structure to resist this upward twisting motion.

Keep in mind that aerodynamic forces are proportional to the square of the velocity. Accordingly, the aerodynamic force at 100 kt. is four times stronger than that at 50 kt. And the additional force at higher airspeeds can cause more pronounced twisting in the wing. So, assuming the leading edge of the outboard portion of the wing is twisted upward by 4 deg., this structural deformation causes additional lift, particularly over the leading edge. If the wing is adequately designed and maintained, the wing's structural stiffness will counteract this deflection and bend the wing back toward a neutral setting. But the combination of the wing's stiffness and inertial force bend the leading edge into a nose-down position. The strong aerodynamic force can counter this as well as the wing's torsional stiffness, which can re-twist the wing back toward the 4-deg. position. The ultimate intent of the design and testing phase is to make certain that the interactions tend to become smaller and smaller until a condition of stable equilibrium is reached.

As the airspeed increases, there is a point at which the structural damping is insufficient to counter the increasing force. If the interactions tend to get bigger (the terminology used in engineering is "divergence"), the aerodynamic structure's deformations will grow to the point of failure. The spectacular failure caught on film of Washington state's Tacoma Narrows Bridge in 1940 provides a vivid example of such deflections growing ever larger to the point of complete rupture. The divergence in airframe vibrations can get much worse with small airspeed increases. Even accelerating the aircraft by a few knots can be enough to create a divergent flutter mode. Thus, a pilot sensing the onset of unusual airframe vibrations should immediately but smoothly reduce airspeed.

At its mildest, flutter can reveal itself as a "buzz" in the aircraft structure. At its most violent it can develop uncontrollably and even lead to the destruction of the aircraft. Though uncommon, there are examples of such extremes in everything from gliders through jets. Flutter can occur on fixed surfaces, such as the wing or stabilizer, as well as on control surfaces such as the ailerons or elevator.

A vivid visual example of flutter in a glider's wings can be seen in a video listed at the end of this article titled "Flutter."

Proper Maintenance Is Vital

An aircraft that is properly designed, certified and maintained should exhibit no tendency to flutter at speeds within 20% above the limit dive speed according to FAR Part 23.369 and Part 25.369. The big caveat in that sentence, however, deserves repetition: When the aircraft is properly maintained. When the aircraft is properly maintained Control surface flutter is a dangerous byproduct of excessive speed and/or improperly maintained flight controls. The fact is that low control-cable tension, worn control-surface bushings, unbalanced control surfaces or excessive play or flexibility in controls can cause flutter at airspeeds less than redline.

Av Pioneers Wrestled Aeroelasticity

Orville and Wilbur Wright made beneficial use of aeroelastic effects for roll control of their Flyer by using wing warping. They also were aware of the adverse aeroeleastic effects when a thin propeller's blade under high thrust loads would partially twist to unload itself, thereby reducing the net thrust produced.

Divergence was a problem that stymied engineers in the World War I era. The German Albatros D.III biplane had a narrow single-spar lower wing connected by a V-strut to a large upper wing. The lower wing tended to twist and wrench loose in high-speed dives, which was particularly problematic during aerial engagements. German ace Manfred von Richthofen, "The Red Baron," was among the lucky few who were able to land safely after dangerous cracks developed in the lower wing spar.

The early era of air racing also pushed the limits on flutter knowledge. In the 1925 International Schneider Marine Trophy Race, a Supermarine S-4 Racing Monoplane experienced wing flutter during a pre-race trial flight and crashed into the Chesapeake Bay near Baltimore. The pilot somehow survived. He described the wing's motion prior to the breakup as "fluttering like a moth's wings." The designer of the S-4 would use this knowledge when he designed the famed Spitfire.

World War II's rapid development of aircraft included fighter and long-range bombers of diverse configurations with a wider range of wing aspect ratios, as well as external armament and tip tanks. Aircraft returning from battle with structural damage that affected balance weights or reduced stiffness would suffer flutter well within the normal flight envelope.

The advent of transonic speeds brought new aeroelastic problems. Lockheed's P-80 "Shooting Star" suffered from wing flutter due to the tip-mounted fuel tanks. It also had a violent form of aileron oscillations encountered by National Advisory Committee for Aeronautics pilots during high-speed flight tests. Termed "aileron buzz," it was later discovered to be caused by interactions between aileron rotation and shock waves. Initial attempts using flight control mass balance were ineffective. Eventually, engineers discovered that increased control stiffness, dampers and profile shape changes would delay the onset of flutter.

Panel flutter occurs when a surface such as an external skin on a fuselage or wing is not adequately supported. Panel flutter depends on many parameters including Mach number and the boundary layer but especially on any compressive or thermal effects that tend to create localized buckles in the skin.

Wernher von Braun's team of German rocket scientists working on the V-2 rocket during World War II investigated more than 70 failures caused by panel failures as it underwent development. Many of these were attributed to flutter of a panel near the nose of the rocket. Years later, the Saturn V Apollo launch vehicle required costly investigation due to the same type of flutter. **BCA**

On March 7, 2005, at about 11:00, a de Havilland Beaver DHC-2 airplane, N3307S, was on a sightseeing flight approaching Alaska's Mount Denali at 11,000 ft. MSL when the airplane started to shake violently. Unable to control the airplane, the pilot elected to shut down the engine in the event it was the cause of the problem. He said when the shaking did not stop, he slowed the airplane to about 80 mph, at which point the shaking subsided. He then restarted the engine and flew to Talkeetna at a slow airspeed, with flaps extended. A post-landing inspection revealed that both wings were structurally damaged (NTSB Report ANC05LA046).

Investigators of the incident analyzed the sounds of the event from a camera recording that revealed a vibration for about 3 to 7 sec. in the 8.2 to 8.4 Hz range. There was nothing on the recording to indicate the airplane was being flown outside the normal operating envelope prescribed by the airplane's manufacturer.

Engineers from the FAA's Anchorage Aircraft Certification Office (ACO) examined the Beaver and noted its damage indicated the rear spars of both wings had oscillated up and down with significant amplitude at span station 92.5. They also noted the bushing holes in the rear spar attachment fittings were elongated, which, if preexisting, would have been a major contributing precipitator of the flutter. Additionally, they found that both the right aileron and rudder were severely under-balanced. They were not able to ascertain if the aileron cable tension was adequate prior to the event.

On Feb. 1, 1980, de Havilland Aircraft of Canada Ltd. issued Service Bulletin 2/29 for the DHC-2, which indicated that instances of aileron/wing flutter had been reported, and that at least two or more conditions out of four must be present to facilitate a flutter condition. The four conditions were: ailerons not balanced; slack aileron cables in the wing; deterioration in the stiffness of the aileron mounting structure in the fuselage; and/or the airplane being flown outside the limits of the flight manual. Nineteen days later, in response to that Service Bulletin, the FAA issued Airworthiness Directive AD 80-24-02, which mandated inspections of the airplane's wings, spars, and aileron cable tension and balance, based on service hours and part numbers.

Closely associated with flutter is limit cycle oscillation (LCO), which is most often caused by excessive free play within the flight control surfaces and associated components. Operators of Hawker 800XP and 850XP jets experienced wing/aileron oscillations at altitudes above 33,000 ft. and speeds over Mach 0.73. When the aircraft's speed was reduced and the airplane operating an altitude below 30,000 ft., the oscillations ceased.

Investigation of the incidents revealed the affected Hawkers were missing aileron bushings, had low cable tensions and improperly installed brackets. If the aileron system, including cable tension, is not properly maintained, wing oscillations could develop into divergent flutter, possibly causing

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severe damage to the structure. When corrective maintenance brought the aircraft into compliance with the type design configuration, the oscillations did not recur.

The FAA issued Special Airworthiness Information Bulletin NM-14-05 dated Nov. 27, 2013, recommending a one-time maintenance check to verify all the bushings in the aileron and aileron tab assemblies were correctly installed, that the free play was within limits, and ensuring that the hinge brackets were properly installed and the cable tensions correct.

During a preflight of cable-driven flight controls, pilots should check the free play by gently moving the flight control to determine the degree of slack. The exact amount of free play (i.e., the amount you can jiggle the flight controls without restriction) should be stipulated in the aircraft maintenance manual. If there's excessive free play during a preflight, it should be noted in the aircraft logbook and the aircraft should be grounded until the condition is corrected by maintenance technicians.

Later, the pilot conducting the post-maintenance flight test should be alert to the maintenance corrections made and know that subtle vibrations at relatively low altitudes will likely be exacerbated at high altitudes where true airspeeds increase.

On Aug. 24, 1996, a Burkhart Grob G-115D trainer experienced an inflight breakup over Dupuis Reserve near Indiantown, Florida, during a local aerobatic instructional flight. Both flight instructors were fatally injured. Parts were widely scattered, indicating an inflight breakup. The first item in the debris line was the top of the rudder; the lower portion of the rudder was never found. The stabilizer and both elevators were found 900 ft. from the main wreckage. The only part of the airplane left intact was the left aileron.

Maintenance logs revealed that the two-place airplane had been repainted 96 flight hours earlier, but the flight control surfaces had not been rebalanced. Grob specifications permitted a hinge moment range of -0.22 ft./lb. (meaning that the aileron was leading-edge heavy) to 0.074 ft./lb. The hinge moment of the retrieved aileron was between +0.138 and +0.200 ft./lb., or considerably "tail-heavy" and outside factory specifications.

Samples of the exterior skin were examined for paint thickness to evaluate the balance and residual hinge moments for the remaining flight control surfaces. The test determined that all control surfaces did not comply with Grob's specifications. The NTSB concluded the probable cause of the accident was "failure of maintenance personnel to rebalance the flight controls after the airplane had been repainted, which resulted in rudder flutter and inflight breakup of the airplane."

Any time you change a flight control's mass, it negatively affects the speed at which the flight control can flutter. That mass can change due to drain holes getting plugged or birds building nests within the structure. Even a change caused by a single additional layer of paint can create a previously non-existent flutter mode in a flight control surface.

> Flutter can occur on fixed surfaces, such as the wing or stabilizer, **as well as on control surfaces such as the ailerons or elevator.**

Propeller-Whirl Flutter

Soon after its introduction to the civil transport fleet, the Lockheed Electra suffered two widely publicized fatal accidents. On Sept. 29, 1959, an Electra cruising near Buffalo, Texas, disintegrated in flight. Investigations determined that the left wing had separated. On March 17, 1960, a second Electra crashed near Tell City, Indiana. Its right wing was found over 11,000 ft. from the crash site, torn from the aircraft at high altitude. Lockheed and NASA/Langley engineers identified a dynamic phenomenon called propeller-whirl flutter as the probable cause.

This particular flutter occurs when the dynamic oscillation of the engine mounts interacts with the gyroscopic torque produced by the engine/

Additional mass in the form of weights is often used to prevent wing/aileron flutter as well as to improve the balance of the flight control force. These should be checked for proper installation and security during preflight inspection.

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propeller combination and the natural flutter frequency of the wing structure. The interaction results in an unstable wobbling motion, which quickly led to catastrophic flutter of the wing within 30 sec.

Subsequently, the Electra's engine mounts were strengthened (and stiffened). Although the Electra is long gone from airline service, a derivative, the U.S. Navy P-3 anti-submarine patrol aircraft, has and continues to operate without further flutter incidents. (Videos of propeller-whirl flutter are listed at the end of this article.)

A flight control's effectiveness can be compromised by aeroelasticity. A wing section develops an upward aerodynamic force at the aileron hinge point when the aileron is deflected downward. If the wing lacks sufficient rigidity to resist this pitching moment, its leading edge will twist downward, reducing the local AOA, and the resulting lift will be lower, thereby reducing the rolling moment.

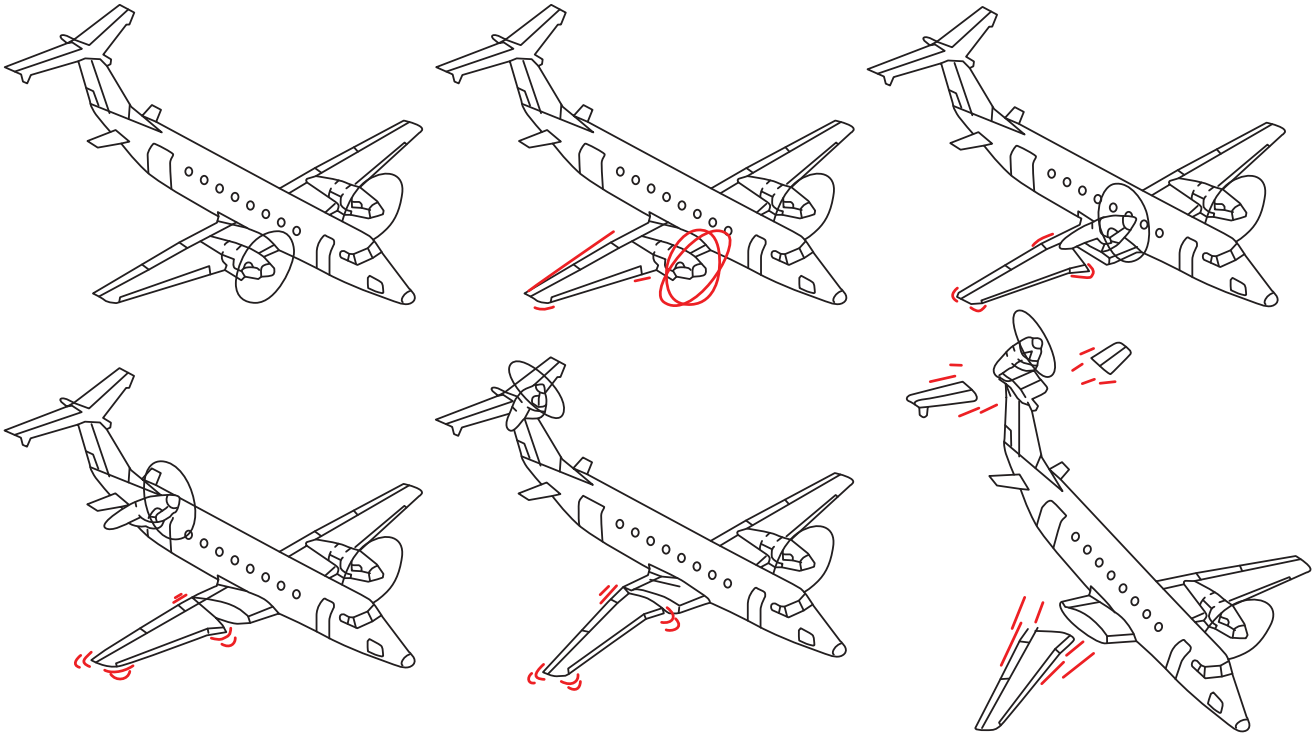
Control reversal is a condition that occurs at higher speeds when the upward pitching force at the aileron hinge point is so large that there is total loss of lift from that wing section

Why Inboard and Outboard Ailerons

The aeroelastic behavior of long, thin swept wings prompted engineers to incorporate inboard and outboard ailerons on such airfoils. Long wings are thin near the tips. In combination with the long distance, thinner structure and aerodynamic forces at higher speeds, the outer portion of such wings are prone to twisting. Deflection of an aileron near the tips of these wings can produce (additional) significant twisting force.

The incremental lift created by a downward aileron deflection not only causes detrimental nose-down twist of an aft swept surface but also bends the wing's outboard section upward, which reduces the aileron's effectiveness. At high speeds, a long, slender wing's torsional deflection can be so great that a rolling moment produced by an outboard aileron decreases eventually to the point at which it begins to produce a rolling moment opposite the direction of the aileron input. Stiffening a wing to counter this twisting motion would make it heavier. The moment arm of an aileron on a long wing also produces significant adverse yaw. Consequently, designers implemented "inboard" and "outboard" ailerons to minimize these negative effects from outboard ailerons. At slower speeds the aerodynamic twisting forces are not significant, so typically when an aircraft's flaps are deployed the outer ailerons are used for roll control. At higher speeds when the aerodynamic twisting forces are much higher, the outboard ailerons are "locked out" (associated with a flaps-up condition) and the inboard ailerons provide roll control.

Other long swept-wing aircraft such as the venerable Boeing B-52 Stratofortress are equipped with spoilers at mid-span to provide roll control. Spoilers used for roll control also produce "proverse" yaw as opposed to the adverse yaw created by conventional ailerons. **BCA**



Propeller-whirl flutter occurs on wing-mounted propeller aircraft when oscillation of the engine mounts interacts with torque produced by the engine/propeller combination and the natural flutter frequency of the wing structure. This interaction results in an unstable wobbling motion that quickly causes catastrophic flutter of the wing.

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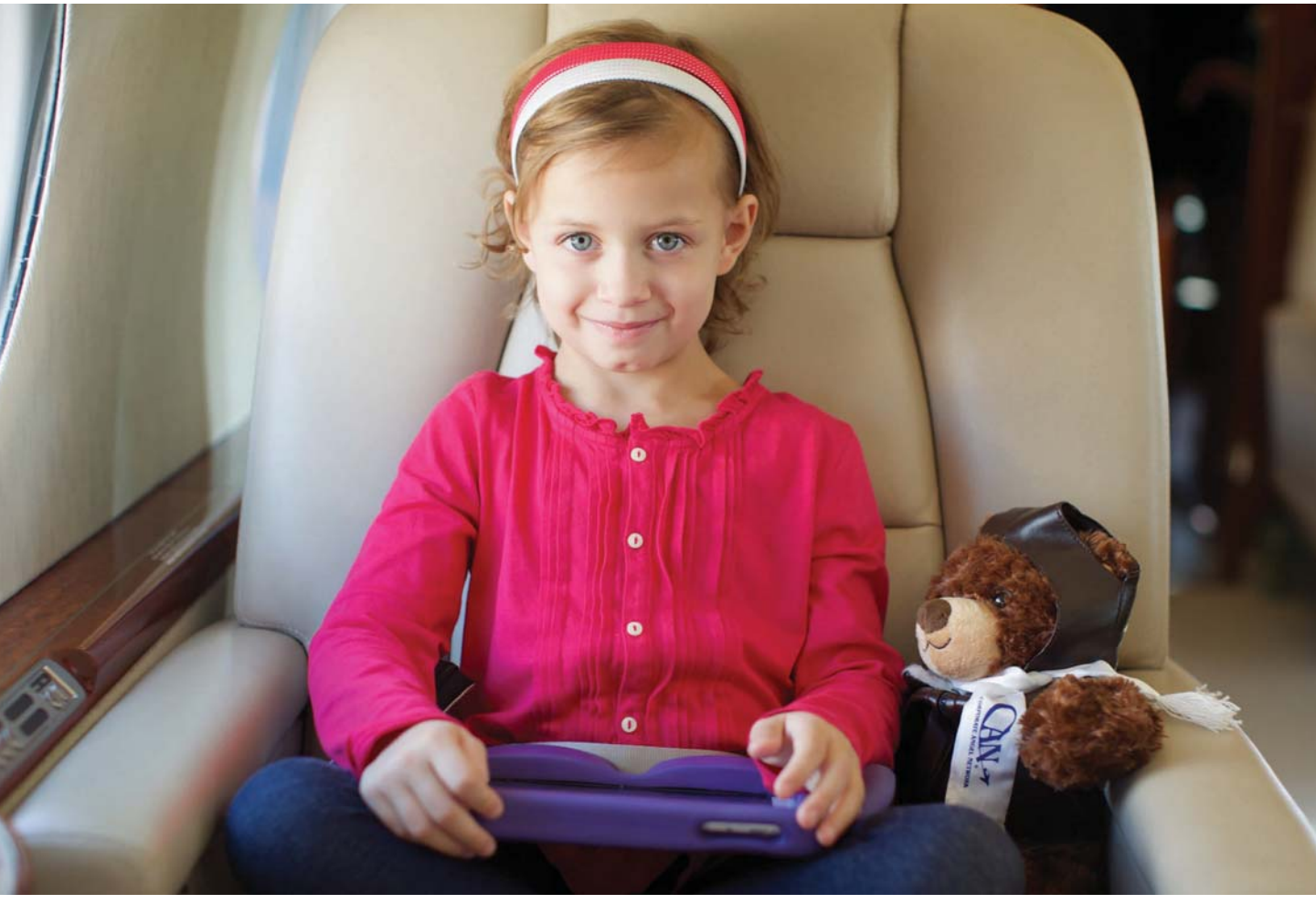

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when the aileron is deflected downward. In effect, an aircraft's roll rate reaches a maximum but then declines rapidly as airspeed increases. A point will be reached at which there is no response to application of the control surface. At speeds greater than this, the action of the controls reverses, and the aircraft rolls in the reverse direction.

Getting Buzzed

Control buzz became a problem in World War II when aileron vibrations were encountered as aircraft pushed to faster transonic speeds. Wind-tunnel tests identified the problem as rotation of the control surface about its hinge. It appeared that the phenomenon was caused by the formation of a shock wave on the wing's surface. It was noticed that the shock wave moved backward and forward, which in turn coincided with the oscillation of the flap or aileron. It also became apparent that the occurrence of this control buzz was primarily dependent on the Mach number rather than airspeed.

Further wind-tunnel testing determined that the lowest Mach number for buzz initiation is a little above the critical Mach number at which the airflow first becomes sonic over the airfoil's surface and is associated with a shock ahead of the hinge line causing separation of the boundary layer. Shock-induced separation on both the upper and lower surfaces of the airfoil in which each shock wave moves backward and forward (but not extending onto the aileron itself) is in synchrony with oscillation of the aileron. Once started, the oscillation will continue until the Mach number is lowered.

Stall flutter occurs on wings and tails at high AOA when separated boundary layers flow over adjacent portions of the structure, inducing vibratory deflections. Examples include the significant deflections discovered in the vertical stabilizers of the F-14 and F-15 when the airflow separates from the forward and inboard portions of the wings and fuselage. The vertical stabilizers on these aircraft were stiff, yet the power of the separated airflows still induced significant flutter in the tails that could eventually lead to structural fatigue and possible failure.

Flutter and other forms of aeroelasticity are complex phenomena that must be completely eliminated by design to prevent their occurrence within the flight envelope. Through design, extensive analysis and certification tests, all configurations of airplanes are free from flutter for all design conditions within the aeroelastic stability envelope. This envelope extends well beyond normal permissible operating speeds and applies to normal operation as well as failures, malfunctions and adverse conditions. FAR Part 23.301(c) and Part 25.301(c) require that the aircraft loads properly account for deflection of the structure. However, when an airplane is operated in a configuration or condition that is beyond these criteria, flutter may result within the operational envelope.

> At speeds greater than this, the action of the controls reverses, **and the aircraft rolls in the reverse direction.**

Four primary strategies that structural engineers use to limit flutter include restricting the maximum airspeed, moving the center of gravity of a flutter-prone component closer to its center of twist, increasing the stiffness/mass ratio within the structure (side note: this was the tactic utilized by Dutch engineers more than four centuries ago when windmills were discovered to have aeroelastic problems) and changing its aerodynamic shape.

According to FAA Advisory Circular 61-107a —"Operations of Aircraft at Altitudes Above 25,000 Feet MSL and/or Mach Numbers (MMO) Greater Than 0.75" — "The compulsion to go faster may result in the onset of aerodynamic flutter, which in itself can be disastrous, excessive G-loading in maneuvering, and induced flow separation over the ailerons and elevators. This may be closely followed by the physical loss of a control surface, an aileron buzz or snatch, coupled with Mach tuck, leading to a catastrophic loss of the airplane."

All these aeroelastic phenomena negatively affect an aircraft's flight stability, control and structural safety margins. When wing and/or tail surfaces deflect, that changes the aircraft's lift and in turn its "load factor." When the outboard portions of wings bend during aileron deflection, maneuverability is limited and that can lead to flight control problems including aileron reversal. Bending of long, slender swept wings also causes a shift in the center of pressure for the wing, which under some conditions can decrease an aircraft's stability.

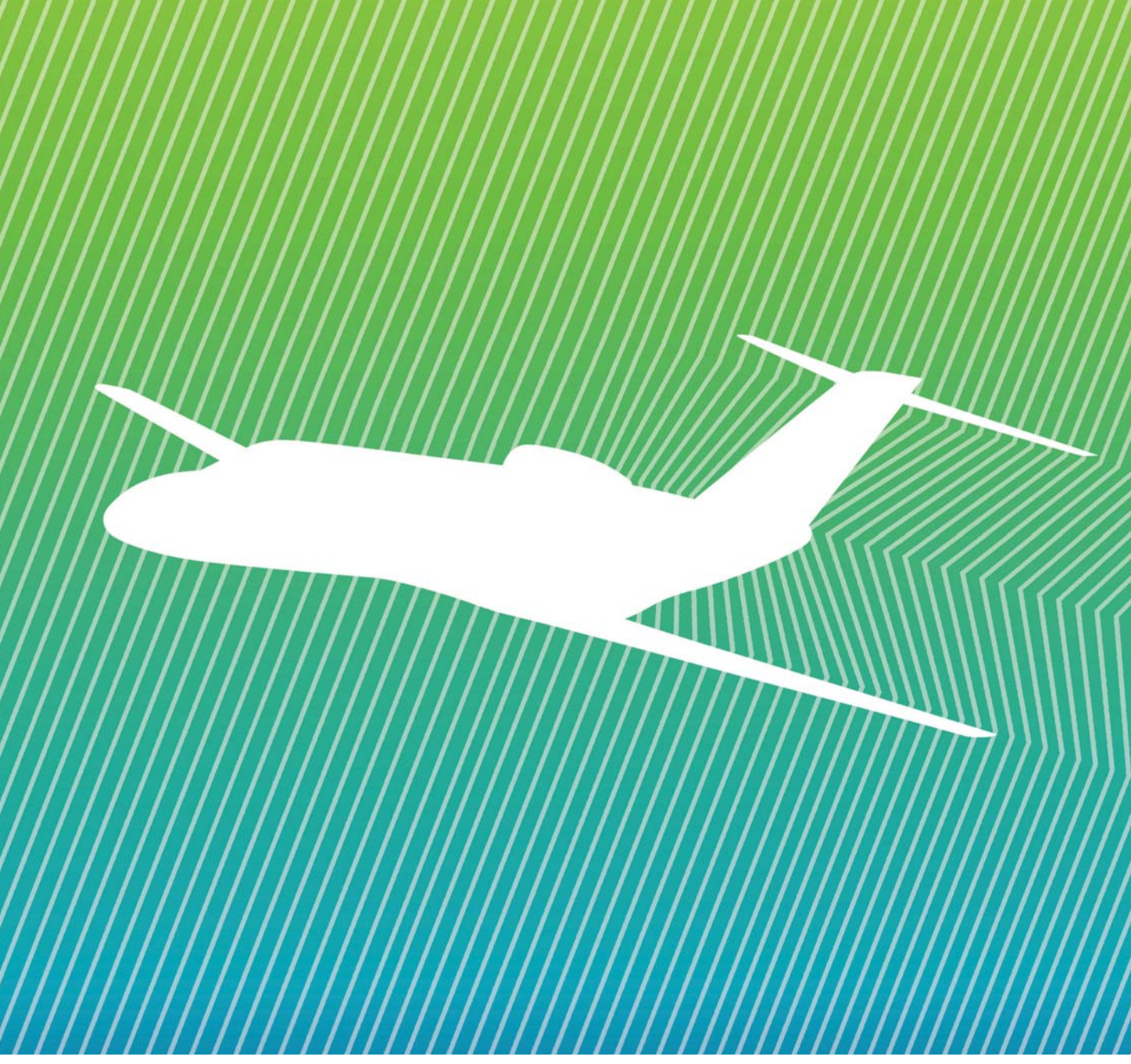
Structural deformation caused by flutter, even when the vibrations do not diverge, can cause structural failure in the short term and metal fatigue, which can be equally damaging in the long term. While aircraft certification extensively attempts to eliminate these forms of aeroelasticity, normal "wear and tear" on critical aircraft components or improper maintenance can allow these modes to occur within the normal flight envelope.

Should that occur, immediate detection and notification by a pilot to prevent further damage to the aircraft's structures and flight controls is critical. **BCA**

Resources

A number of excellent videos are available on-line to help pilots better understand aeroelastic phenomena. The C-141 video shows how an entire aircraft can begin to vibrate simply by aileron input.

Flutter: **https://www.youtube.com/watch?v=egDWh7jnNic**
Glider flutter: **https://www.youtube.com/watch?v=HwHQF0159X8**
C-141 whole-aircraft vibration: **https://www.youtube.com/watch?v=AK9QhG2hAWY**
NASA propeller whirl: **https://www.youtube.com/watch?v=jW8I2hX4GSs**
NASA Electra test: **https://www.youtube.com/watch?v=d0fFNWANK5M**
Aileron reversal: **https://www.youtube.com/watch?v=X8OpuijN4sA**



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Dassault Falcon 8X

A trijet **honed to perfection**

BY **FRED GEORGE** fred.george@informa.com

Falcon 8X operators are virtually unanimous in saying that the Dassault flagship is a substantial improvement over the smaller Falcon 7X. It flies higher, farther and more fuel efficiently. It's more spacious inside and even quieter. It can be optionally equipped with high-speed Ka-band satcom connectivity, a larger, more functional galley and a full-length crew rest area. And its third-generation EASy III flight deck, FalconEye HUD/EVS/SVS and refined digital flight controls reduce pilot workload and improve situational awareness.

"It's the 7X finally, fully complete," says John Olesen, vice president - design, development, test and evaluation at Air Alsie in Sønderborg, Denmark. With five 8X aircraft, six 7X jets and seven Falcon 2000-series aircraft, Air Alsie has become the largest Dassault Falcon operator in Europe.

"It's a very refined version of the Falcon 7X. There's such a remarkable difference. It's better in almost every way," says the chief pilot for a *Fortune* 100 company who is based in the Southwest U.S. The Falcon 8X's range advantage over the Falcon 7X is one of its most useful features. The chief pilot has flown it from San Jose, California, to Moscow and landed with close to 5,000 lb. of fuel reserves. "It's much easier to stretch to [flight plan] distance," he adds. The aircraft comfortably can be flown more than 12.5 hr. as it holds 14 hr., 40 min. of fuel.

"We've flown it from Tel Aviv to Teterboro and landed with 2 hr. of fuel," says Brad Tousignant, who flies for a private owner in Colorado.

"We're nothing but pleased. It's been 100% reliable and it out-performs the book numbers," says Mike Higgins, who has flown a dozen Falcon models since the Falcon 20 in the 1960s. "We've flown it from Washington to Haneda, Seoul to Houston and Dulles to Abu Dhabi."

According to its type certificate, the 8X is actually a Falcon 7X that's been updated with Dassault modification M1000, which stretches the fuselage 3.5 ft. and adds a lower-drag wing with new winglets. The 8X's three Pratt & Whitney Canada PW307 engines are peppier, each rated at 6,722 lb./thrust, thus improving high-altitude climb and cruise performance, and internal refinements reduce fuel consumption by 1.5%. Dassault shaved nearly 600 lb. from the internal wing structure, making

Operators say Falcon 8X is everything they wanted and needed that Falcon 7X lacked.

DASSAULT FALCON JET

Typical configuration features a conference grouping in the center section, but several firms have opted for a second four chair club grouping.

the wing more flexible for a softer ride in turbulence.

Fuel capacity has been increased by 3,200 lb. and maximum takeoff weight is increased from 70,000 lb. to 73,000 lb., boosting maximum range by more than 500 nm. Yet the Falcon 8X's basic operating weight is only 200 lb. heavier than that of the Falcon 7X due to an aggressive green aircraft weight reduction program and next-generation interior completion materials. Dassault targeted noise hot spots inside the cabin with high-density acoustical insulation and used lighter-weight materials where sound was less intrusive. Air Alsie quotes a 47 db average cabin sound level, which is 2 to 3 db lower than that of the Falcon 7X. That makes the Falcon 8X one of the quietest large-cabin business aircraft in production.

The flight deck is upgraded with EASy III, Dassault modification M1254, a growth version of the EASy II system aboard the Falcon 7X. It features dual touch-screen EFBs that flank the main flat-panel displays and a streamlined user interface.

Starting with serial number 401 in 2016, both M1000 and M1254 became standard on all Falcon 7X aircraft.

Fleet Demographics

Some 50 or so Falcon 8X aircraft have been delivered since initial certification in mid-2016. Industry sources say Bombardier and Gulfstream gobbled up much of the demand for 6,000+ nm large-cabin business jets starting in the mid to late 1990s, leaving Dassault to catch up with its 6,300-nm range flagship two decades later.

Most operators say they chose the Falcon 8X over Bombardier's Global 6000 because they're long-time Falcon Jet loyalists, many upgrading from the Falcon 7X or a Falcon 900-series trijet because of the need for more range. They also say the Falcon 8X has a lower profile ramp presence than competitors from Montreal or Savannah. And virtually all say the Falcon's superior fuel efficiency, compared to other large-cabin business aircraft, is a major asset. This largely is a function of the aircraft's unmatched structural efficiency. Its maximum takeoff weight is less than that of a 4,100-nm GIV-SP and its fully equipped basic operating weight only is about half of MTOW.

Lighter operating weights equate to lower airport and airspace user fees in Europe, an area that accounts for the largest share of Falcon 8X registrations. As noted, Air Alsie has the largest fleet. Five other 8Xs are based in Switzerland, split between Geneva and Zurich. Volkswagen in Wolfsburg, Germany, Global Jet Luxembourg and ExecuJet Europe each fly two aircraft. Shell in the Netherlands; Flying Group in Antwerp, Belgium; Aviaservice Air in Kazan, Russia; NetJets Europe; TAG at Farnborough, England; ExecuJet at Cambridge, England; and Abelag Aviation in Belgium each operate one aircraft. Others are registered in San Marino, Malta and Monaco. A few more are scattered throughout the Mediterranean, Middle East and India, including one operated by the Egyptian Air Force. Three are based in China.

In the Western Hemisphere, only six or so of the trijets are based in the U.S. Operators include Bechtel, Citrus Products, Energy Transfer, Honeywell, Sony and a private individual in Colorado, according to the FAA registry. Two aircraft are based in São Paulo, Brazil, but there are others in South America, though none yet in Canada, Mexico or Central America.

Operators we contacted say they fly the Falcon 8X on relatively long missions. Trips may average 1,000 nm to 3,000 nm, because of positioning legs. On such trips, they'll push up cruise speeds to Mach 0.83 to 0.85, planning on first, second, third and subsequent hourly fuel burns of 4,000 lb., 3,500 lb. and 3,000 lb., respectively. Operators say their aircraft meet or beat Dassault's book performance estimates for climb, cruise and range.

Many say they're comfortable pushing the aircraft to 6,000 nm to 6,450 nm, if the weather is favorable at the destination, if multiple runways are available and if there are several suitable nearby divert fields. On trips up to 11 to 12 hr., they'll cruise at Mach 0.83, a range-versus-speed sweet spot in the flight envelope. For the longest trips, they'll slow down to the aircraft's

DASSAULT FALCON JET

Flight deck features EASy III avionics, powered by Honeywell Epic. Upgraded processors and software streamline many functions. Dual HUDs are optional.

DASSAULT FALCON JET (2)

As with Falcon 7X, Falcon 8X has digital flight controls with side stick controllers. There's no steering tiller on the left side. Nose wheel steering is completely controlled through the rudder pedals.

Mach 0.80 long-range cruise speed. They report maximum endurance is 12 hr., 30 min. to 12 hr., 40 min., leaving a 2-hr. fuel reserve on touchdown. One Midwest operator said he's flown the aircraft from Vancouver to Buenos Aires, Argentina, in 13 hr., 40 min. Average fuel burn in cruise is about 2,250 lb./hr., according to *BCA*'s June 2019 *Purchase Planning Handbook,* making the Falcon 8X the most fuel-efficient business aircraft with more than 6,000 nm range.

Operators say they budget 420- to 450-gal./hr. fuel flows. Pratt & Whitney Canada's Eagle Service Plan that covers most engine maintenance costs $284 to $318 per hour per engine, depending upon annual flight hours, flight cycles, number of aircraft enrolled in an operator's fleet and added-value options, such as complimentary loaners, on-site services, engine packaging and freight. New aircraft are covered by a five-year tip-to-tail warranty that greatly reduces hourly maintenance costs. Basic maintenance intervals are 800 hr. and 12 months.

As expected, corporate and charter operators, especially those with multiple aircraft fleets, report relatively high annual utilization of 600 to 850 hr. on average. Individual operators seldom fly their aircraft more than 300 to 400 hr. per year. While most aircraft are configured to seat 12 to 15 passengers, six passengers may be comfortably berthed in the cabin's three sections. Corporate and individual operators say they seldom carry more than two to three passengers on the longest trips.

The cabin configuration is quite conventional for the large-cabin, long-range business aircraft class. There's a forward galley, forward lavatory and crew rest station. The main cabin has a four-chair forward club section, a four-seat conference grouping and credenza in the center and an aft stateroom with a three- or four-place sofa sleeper and one forward-facing or two facing chairs. The aft cabin has a lavatory with a rear door providing access to the baggage compartment below

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The Next Race Is ON

The latest Dassault trijet, the Falcon 8X, is building ever stronger brand loyalty, an important asset for the plane-maker's future since Bombardier and Gulfstream have garnered so much attention with their 500-kt. flagships. Such allegiance buys time for Dassault to refine the design of any future Falcon superjet and make it competitive with the best from Montreal or Savannah.

The Falcon 8X is highly competitive with the three-zone cabin, 6,500-nm-range jets from Bombardier and Gulfstream currently in production. But that race now is two decades old.

And while the big-cabin — 6 ft., 6 in. tall, 8 ft., 6 in. wide — 5,500-nm 6X twinjet will be a solid addition to the Falcon lineup once certified and in production, when the Global 7500 entered service earlier this year, the starting gun sounded for a new race of ultimates. The top end of the business aircraft market now is defined by 7,500- to 8,500-nm range, four-zone cabin jets that cruise efficiently at Mach 0.85 and can dash 6,500 nm to 7,000 nm at Mach 0.90. Such aircraft also have digital fly-by-wire (FBW) controls, first pioneered by Dassault on business aircraft, plus they offer wider and longer cabins.

The clock is running in this new larger, faster, farther luxe-class jet race. Bombardier took the early lead and now Gulfstream is coming back strongly. Both are formidable medal contenders. If Dassault doesn't want to settle for bronze, it must launch the biggest, swiftest and longest-range aircraft in its history.

Digital FBW, unmatched structural efficiency and superior fuel economy will be assets, but the next Falcon flagship must set new performance standards in the ultimate business jet class, rather than matching old benchmarks, for Dassault to substantially increase its market share by the end of the decade. Tick-tock, tick-tock . . . **BCA**

40,000 ft. The compartment has a 140-cu.-ft./2,000lb. capacity, but operators say the exterior door cuts into useful volume when it's closed.

Operators, however, say that Dassault offers a wide variety of optional cabin layouts. Two U.S. operators, for instance, have opted for dual, four-chair club sections in forward and mid cabin. Two of Air Alsie's Falcon 8Xs have right-side, three-place divans that replace two of the facing chairs in the forward club section. One of Air Alsie's Falcon trijets has two forward-facing chairs in mid cabin and a forward four-chair club section with extended legroom.

A highly desirable option adds a solid pocket door and hard bulkhead partitions to separate the mid-section from the aft stateroom replacing the standard curtain. But some operators say the electric door actuation mechanism is a work in progress since theirs fail to operate consistently, smoothly or silently.

The jet is available with forward and aft vacuum toilet systems. Some operators, though, have opted for a conventional chemical lav up front, noting that the different designs add redundancy.

Most operators we contacted say they've opted for the $900,000 Ka-band satcom system, providing up to 30 Mbps download and 3 Mbps upload speeds. Both passengers and pilots reportedly take full advantage of VoIP mobile phone communications that use internet connectivity in lieu of cell sites to provide telephone access virtually anywhere an Inmarsat-5 communications satellite is in view. For FANS-1/A functions, the Falcon 8X uses the Iridium communications satellite system or a VDL Mode 2 VHF radio.

Many operators have equipped their aircraft with FalconEye, a system that combines a 40-deg.-wide by 30-deg.-high HUD with a six-sensor, ultra-wide visible spectrum and infrared enhanced flight vision system (EFVS) camera, both provided by Elbit Systems, mated with a synthetic vision system. While the system provides impressive capabilities, users noted they had to travel to Paris for FalconEye training, since FlightSafety International's Le Bourget center has a Falcon 8X simulator with the Elbit HUD/EVS/SVS. They also caution others to make sure that the FlightSafety curriculum specifically includes an FAR Part 61.66 EFVS endorsement that authorizes operations to lower, straight-in landing minimums in accordance with using EFVS with FAR Part 91.176(a).

Aft lavatory has high-capacity vacuum toilet. A door provides baggage compartment access below 40,000 ft. Few operators chose optional shower for the aft lav. Right: Standard kit for the center section includes a left side four-chair conference grouping and a right side credenza.

DASSAULT FALCON JET (2)

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Best and Worst Features

Falcons have earned reputations as some of the nicest-handling airplanes built in more than half a century and the Falcon 8X is no exception. In 2007, the Falcon 7X became business aviation's first purpose-built aircraft with digital fly-by-wire flight controls, receiving praise from operators in our May 2016 survey because of improved handling ease and passenger comfort. The Falcon 8X has even more refined digital flight controls.

"It flies like a fighter jet," says Tousignant. Path stability is a key design feature of the control law, enabling pilots to set desired aircraft attitude within the normal flight envelope with no requirement for control inputs to compensate for speed, configuration and minor gusts.

Dassault's strict weight control program is another plus. Most operators reported their aircraft's BOWs, with three crewmembers and all popular options, are equal to, or less than, Dassault's 36,800-lb. estimate for fully equipped aircraft. Typically equipped, the aircraft can carry six passengers with full fuel, the maximum that can be berthed on overnight missions. Each additional passenger cuts range by 40 mi. Thus, the aircraft can fly most transatlantic missions with all seats occupied, if required.

The EASy III avionics system incorporates significant improvements over the EASy II flight deck of the Falcon 7X, including more powerful CPUs, operators say. FANS 1/A functionality is much better integrated, reducing the number of pilot inputs needed for controller-to-pilot data-link communications (CPDLC) using satcom and other functions. Left- and right-side CMA 1100 EFBs host a Falcon Perf, Jeppesen FlightDeck and a full range of Falcon Sphere electronic manuals.

Virtually everyone lauds the aircraft for its low cockpit and cabin sound levels. The operators maintain the 8X is the quietest Falcon Jet they've ever flown, perhaps the quietest aircraft of all. Complimenting the quiet is the 8X's softer ride. When Dassault slimmed down the internal wing structure, it made the wing more flexible. With a 3,000-lb. higher MTOW than the Falcon 7X, the Falcon 8X wing now has nearly as high a wing loading as that of the Global 6000. Yet, its new winglets and higher output turbofans enable it to climb as much as 2,000 ft. higher than the Falcon 7X, so it cruises above more weather.

Dialing up the thrust by 320 lbf per each of the three PW307D turbofans compared to those powering the Falcon 7X helps the Falcon 8X retain highly competitive runway performance, another asset appreciated by operators. Nevertheless, some operators maintain the aircraft could use even more thrust to push it to top-of-class in airport, climb and cruise performance. Tousignant, for instance, says he was stuck in the high 30s on a mission from Tel Aviv to Teterboro until he was more than half way home over the North Atlantic. On shorter missions, the aircraft can climb into the low 40s, but maximum cruise speed is thrust-limited to Mach 0.82 to 0.83.

Still, operators had difficulty coming up with more than a few shortcomings for the aircraft. Some say that cabin Wi-Fi has had teething pains, specifically the VoIP function when connected to ground-to-air telephone networks rather than Ka-band satcom. Another operator says the vacuum lav system needs frequent fresh water flushes to ensure the waste water system fully functions. And a few caution that the aircraft can be tricky to land in gusting crosswinds because of the highly flexible wing structure. They strongly recommend landing the aircraft in a wings-level crab, slightly upwind of runway centerline and kicking out the crosswind correction to align the nose with the centerline stripe just before touchdown.

DASSAULT FALCON JET

Falcon Eye is a popular option. It features a high-definition Elbit head-up display and combined synthetic vision/enhance vision system using a six-sensor infrared and visible light camera system.

When quizzed about specific aspects of the airframe, engines and systems, operators gave the aircraft impressively high marks. Some, though, say that both the FalconEye and EASy III need software revisions to reach their full potential. For instance, they'd like to HUD and PFD flare guidance functions for low visibility operations. And some insist autothrottles ought to be available full time, without the need to use vertical nav modes. Others report inserting a flight plan into the system after completing takeoff V speed and runway performance calculations causes EASy III to inactivate V speed indications on the PFD.

Operators very much appreciate the "one touch" fuel balance button that redistributes fuel to equalize the weights in tanks. They also say that the carbon wheel brakes are smooth, quiet and progressive, a much-lauded improvement over those on the Falcon 7X.

Most operators undergo initial and recurrent flight training at FlightSafety International. While they generally give the trainer high grades, they want the company to commission a second Falcon 8X simulator with FalconEye in the U.S. so that they don't have to cross the Atlantic for FAR Part 61.66 EFVS training at its Le Bourget facility. Yet, with so few Falcon 8X operators in the U.S., it's hard to make the business case for such a major investment.

CAE offers Falcon 7X training with EASy II, but not Falcon 8X training with EASy III and FalconEye. However, its Falcon 900EX EASy II simulator at its Dallas facility does have a FalconEye capability.

"The road map for earning FalconEye operational credit for flying down to lower minimums is rough," says Higgins.

Falcon 8X operators not only award their aircraft high grades, they also laud Dassault's considerable investment in product support. They say it's now on par with, or better than, that of other top large-cabin business aircraft manufacturers. However, they also say that Honeywell's product support could be improved. Some operators report faulty navigation database thumb drives, among other quality control glitches.

Overall though, Falcon 8X operators say their airplane is tough to beat. It has the lightest weight and the highest structural efficiency in its class. And even though it's not the highest flying, fastest cruising or farthest flying large-cabin business jet, Tousignant notes, "It's the only one with three-engine redundancy, plus it has the lowest fuel burn and great runway performance." His conclusion, shared by others, is that the Falcon 8X delivers "the best bang for the buck." **BCA**

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AVIATION WEEK NETWORK

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Bad Behavior in Back

If you see something, **what's required?**

SIGNS PLACED BY THE TRANSPORTATION SECURITY ADMINISTRAtion (TSA) at airports nationwide decree "If You See Something, Say Something!" But once you take your seat in the cockpit, the Non-Disclosure Agreement (NDA) that you signed when you were hired decrees that what happens in the cabin, stays in the cabin.

There are many legitimate reasons for NDAs in today's business aviation world. The cabin of a business aircraft provides a unique space for negotiations. Flight crews are often privy to highly confidential strategy sessions. Competitors could predict possible corporate mergers simply by knowing your company's passengers and destinations. And crews today need to be reminded not to participate in social media while on the job. If your Facebook post reveals your company's confidential itinerary, then you violated the NDA.

But what are an NDA's limits? Many NDAs acknowledge that the agreement does not prevent you from answering questions, if subpoenaed. It doesn't matter whether the NDA acknowledges the power of the courts, the agreement does not allow you to sit silent in a deposition or on the witness stand if you are being questioned about criminal behavior in the plane.

Pilots have testified in a variety of salacious situations. There have been shareholder lawsuits and government corruption scandals that featured pilot testimony about prostitution taking place in the cabin. In most instances, the pilots were offered immunity from prosecution or lawsuit in return for their testimony. It is important to understand that employees are not shielded from criminal prosecution simply because they felt that their job was threatened if they did not keep quiet. If pilots aid in a criminal activity by making the transportation possible, then they may become accessories to the crime.

In addition to pilot testimony, the courts are often interested in the pilots' flight logs, particularly if the logs or other records list passenger names. Does the law require you to keep track of passenger names? If you fly FAR Part 91, neither the FAA nor the TSA care about passenger names. However, if the company wants to protect tax deductions, then it needs to track who is on the plane and why.

Can you destroy flight logs when lawyers come looking for them? No! If the lawyers looking for the logs are prosecutors, then destroying or altering records would result in criminal charges against you for tampering with evidence and obstruction of justice. A person commits the crime of tampering with evidence when he or she knowingly alters, conceals, falsifies or destroys any record, document or tangible object with the intent to interfere with an investigation, possible investigation or other proceeding by the federal government. Tampering with evidence also includes destroying or altering documents or things "in contemplation of" an investigation or other proceeding that may occur in the future.

If the lawyers are working on a civil lawsuit, then destroying or altering records would result in civil charges of "spoliation of evidence." This is the intentional, reckless or negligent withholding, hiding, altering, fabricating or destroying of evidence relevant to a legal proceeding. The only way to safely destroy company records is when they are routinely discarded in accordance with an adopted record retention policy. Because company flight departments typically retain passenger information for tax purposes, these records are usually retained for a minimum of five years.

EXTREME PHOTOGRAPHER/ISTOCK PHOTO

There are many "whistleblower" laws designed to protect employees who report illegal activity within a company. However, these laws tend to be very fact-specific. For instance, there are federal whistleblower laws designed to protect air carrier employees who report safety violations to the FAA. These laws do not cover Part 91 operations. The Securities and Exchange Commission has adopted a rule barring agreements prohibiting disclosures from an employee to the agency. The rule prohibits actions to enforce, or threaten to enforce, a confidentiality agreement to prevent an individual from discussing a possible securities law violation with the Commission. The only exception is an agreement protecting information covered by attorney-client privilege. This law is quite specific, and not likely to protect a flight crew, because a flight crew would be less likely to know about the information that the SEC wants to investigate.

If you have signed an NDA or other form of confidentiality agreement, and you believe that you need to act in order to avoid becoming a party to criminal activity, then you should consult with an attorney who is well-versed in both the state and federal laws. This won't be an aviation attorney but rather a labor attorney. **BCA**

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Beechcraft King Air 350i

Fill the seats, fill the tanks **and feel the difference**

BEECHCRAFT KING AIR 350I, THE SECOND-GENERATION MODEL B300, is significantly quieter, more comfortable and more capable than the original aircraft. It's been in production since 2009 and more than 440 units have been delivered, including 35 to launch Wheels Up, the model's launch customer.

The 350i features triple-layer skin panel insulation, dynamically tuned vibration dampers, thicker thermal insulation and an acoustically isolated interior shell. The package is tuned to sop up noise at 1,500 prop rpm, reducing the interior sound level by 4 dB, resulting in a 78 dB cabin in cruise.

There are six 115 VAC outlets in the cabin and one more in the cockpit. A Collins Venue inflight entertainment system is standard, including a fold-out, 15.3-in. LCD monitor in the forward cabin. As with most current generation business jets, XM satellite radio, GoGoBiz air-to-ground connectivity and WiFi are available as options. A two-zone climate control system automatically adjusts heating, cooling and fan speed to achieve desired temperatures.

TEXTRON

As with the original King Air 350, the newer aircraft is based upon the King Air 300, but it has a 2.9-ft. fuselage stretch, 3.4-ft. span increase and winglets. The stretch makes room for double club seating in the 17+ft. long main cabin. It also has an internally accessible, 550-lb. capacity, 55.3-cu.-ft. aft baggage compartment. The seven closely spaced round windows in the cabin make it feel bigger than its 4.8 ft. high by 4.5 ft. wide cross-section. It's one of the very few business aircraft that enables business aircraft operators to fill the tanks, belt in seven to eight 200-lb. passengers, depart from a 3,300-ft. runway and fly nearly 1,500 nm.

But the King Air 350i is better suited to 300 to 600 nm trips. Dave Kaufman, COO of Wheels Up, says that the aircraft will arrive within 10 to 15 min. of a jet on a one-hour trip and its pair of Pratt & Whitney Canada PT6A-60A turboprops burn 700 to 900-lb. less fuel on such missions.

Since the King Air 350 is approved as an FAR Part 23 commuter category aircraft, it provides operators with certified one-engine-inoperative takeoff and climb performance similar to that of a transport category aircraft.

Hot and high airport performance is a strong suit thanks to its winglets. You can depart at MTOW from Albuquerque at 38C with full tanks. The winglets also improve cruise efficiency. The aircraft can cruise at 292 KTAS at FL 350 while burning 503 pph. Top speed is 312 KTAS at FL 240. If more performance is needed, Blackhawk offers a $1.8 million PT6A-67A upgrade that slashes time to climb by up to 60% and boosts cruise speeds by up to 68 KTAS.

The first 350i turboprops were equipped with Pro Line 21 avionics with full VNAV. Starting at s.n. Fl-1031 and on, plus FL-954 and -1010, cockpits are upgraded with Pro Line Fusion featuring touchscreens and synthetic vision.

Operators say the aircraft is easy to fly. Raisbeck dual aft body strakes are standard and they strongly dampen yaw oscillations. The 16-cu.-ft. Raisbeck wing lockers also are standard, quite useful when packing 8 passengers' baggage aboard.Dispatch reliability is strong.

Seldom, if ever, does the aircraft need maintenance outside of scheduled 200 flight hour Phase 1 – 4 inspections, 12/24-month calendar checks and 8,000 cycle/6-year landing gear inspections. However, after the airframe accumulates 10,000 cycles, more intensive maintenance is required to prolong its service life.

Average fuel flow is about 900 lb./hr. for most short-range missions. Budget $1,300 to $1,500 per hour for all up direct operating costs, once the five-year warranty expires. A pair of first run overhauls at 3,600 hr. cost about $500,000 to $550,000, but second run overhauls can cost up to $800,000 to $1.2 million. Landing gear inspections at 8,000 hr. can run $15,000 to $35,000.

The King Air 350i is rugged and reliable. The aircraft is considerably quieter and more commodious than the original, yet it has lost none of its Midwestern, down home utility. It has no direct turboprop competitors because of its blend of cabin size, tanks-full payload, range and runway performance. Asking prices range from about $3 million for early models with midtime engines to $4 million+ for late models equipped with Fusion avionics.

Sure, the King Air 350i lacks the panache of a jet, but its enduring value makes it a favorite with operators who need practical, affordable business air transportation. Its low-profile ramp appearance, unmatched range/payload versatility and turboprop operating economy move it into a class of its own. With no direct competitors, it's retaining an impressively high resale value in proportion to its price when new. **BCA**

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Edited by Jessica A. Salerno *jessica.salerno@informa.com*

News of promotions, appointments and honors involving professionals within the business aviation community

OWEN BUSCH

GARY STRAPP

HUW LEONARD

▶ **Bombardier, Montreal, Canada,** appointed **Jeff Cole** as sales director, Northeast U.S., responsible for driving sales of Bombardier's portfolio of business jets. His territory includes New York City, Connecticut, Massachusetts and New Jersey.

▶ **Cadence Aerospace, Anaheim, California,** appointed Anthony E. Lawson as vice president and general manager of Cadence Aerospace - Giddens Industries located in Everett, Washington.

▶ **Dassault Falcon Jet, Teterboro, New Jersey,** appointed **Anne Devilliers** international sales director for Great Britain, Ireland, the Balkans and Greece. Devilliers joined Dassault in 2003, most recently serving as international sales manager for new aircraft.

▶ **Duncan Aviation, Lincoln, Nebraska,** announced the **Rene Cardona**, a longtime member of the company's Aircraft Sales and Acquisitions team, recently earned recognition as an IADA-Certified Aircraft Sales Broker.

▶ **EnTrust Global, New York, New York,** announced that **Matt Meissner** has joined private debt and real assets division as vice president. He joins the company from Blue Moon Analytics, an analytical platform he founded for aircraft lease pricing and forecasting.

▶ **EPIC Fuels (part of Signature Flight Support), Irving, Texas,** announced the appointment of **Owen Busch** as senior vice president of sales for EPIC Fuels and the Signature Select FBO brand. His responsibilities included extending the company's global reach to independently owned and operated FBOs.

▶ **Flightdocs, Bonita Springs, Florida,** named **Danny Leon Leyva** as director of Client Services. Most recently he was the MST manager at StandardAero.

▶ **Freshfields Bruckhaus Deringer US LLP,** announced that **Amna Arshad** has joined the special counsel in its Washington, D.C. office.

▶ **Global Jet Capital, Danbury, Connecticut,** appointed **Vivek Kaushal** as COO, taking over from **Dave Labrozzi** who was recently appointed vice chairman. Vivek joined the company in 2015, in conjunction with Global Jet Capital's acquisition of the GE Capital business aircraft portfolio.

▶ **Jet Support Services, Inc. (JSSI) Chicago, Illinois,** appointed business aviation industry veteran Gary Strapp to the position of senior vice president, global program management and technical services.

▶ **National Air Transportation Association (NATA)** announced the **Shannon Chambers** has been promoted to vice president of Marketing and Communications.

JOHN TAN

JEFF FAVATI

JOHN BENOIT

ROBERT (BOB) RASBERRY

▶ **Metrojet, Hong Kong,** announced that **Dave Yip** rejoined the Hong Kong-based company as director of business development. Yip, who has 20 years of business and commercial aviation experience, served as a maintenance planner with Haeco before first joining Metrojet in 2006 as an engineering support manager and later taking roles, including COO, with Hongkong Jet.

▶ **Passur Aerospace, Stamford, Conn.,** announced that John Thomas, a director of Passur Aerospace, has been elected executive vice chairman of the board, upon retirement of **Beck Gilbert** as Executive Chairman of the Board of Passur.

▶ **Pegasus Universal Aerospace, South Africa,** appointed **Capt. Andrew Dietrich**, to the position of chief pilot responsible for overseeing compliance, safety procedures and the coordination of test pilots during the official test flight phase.

▶ **PivateFly, Fort Lauderdale, Florida,** appointed **Gregg Slow** as president for the Americas.

▶ **Private Jets, Bethany Oklahoma,** hired **Denver Craddock** as director of maintenance based at Wiley Post Airport in Bethany and **Stephanie Zepeda** as director of charter sales, primarily at Naples Municipal Airport in Florida. Craddock, who previously has held maintenance supervisory roles, will be responsible for the maintenance of Private Jets' fleet of 19 aircraft. Zepeda, who has 15 years of industry experience, will develop relationships with new and existing clients across Florida.

▶ **Satcom Direct, Hong Kong,** appointed **John Tan** as regional director for the Asia Pacific (APAC) region. His responsibilities include providing leadership to the regional commercial and technical team, maintaining and developing commercial activity in the region, and delivering valuable input into SD product innovation. He is based in Hong Kong.

▶ **Solairus Aviation, Petaluma, California,** announced the addition of **Mike Tamkus** to its executive leadership team. He brings to Solairus over twenty years of experience in the aviation industry most recently servicing as senior vice president of Client Services and Sales for NetJets.

▶ **TBD, Bridgend, South Wales,** appointed **Huw Leonard** to the post of senior Operations Manager (Director designate).

▶ **The Av8 Group, Houston, Texas,** added **Jeff Favati** to their sales team as Sales Manager responsible for sales and business development across all segments of Av8's markets.

ROBERT WOOD

RUSTY GARDNER

JEREMY TURNBOUGH

▶ **Universal Avionis, Tucson, Arizona,** named **John Benoit** to the position of director of Strategic Business Development. A U.S. Navy veteran, he brings 20 years of aerospace experience to his new role, previously holding posts at Esterline Avionics Systems, Aviage Systems, Performance Software, and Honeywell Aerospace. He joins **Marc Boullane** and **Robert Randall** on the team and will lead market development activities with OEMs, contribute to the development of robust product roadmaps and foster partnerships to complement UA's offerings.

▶ **Virginia,** named **Carole M. Mattessich, Esq.** as the program director for the newly created Smart Airport and Aviation Partnership centered in Southern New Jersey.

▶ **West Star, East Alton, Illinois,** announced the retirement of Chairman of the Board **Robert (Bob) Rasberry**. He has been with West Star for nearly 20 years. He will continue with West Star's Board of Directors as Chairman Emeritus and join Norwest Equity Partners, a middle-market equity investment firm and parent of West Star Aviation, as a senior advisor supporting NEP's continued interest in Aviation-related investments. **Robert Wood** was named as the new Paint Program assistant manager at West Star's East Alton facility. He will assist and collaborate on paint processes and projects. **Rusty Gardner** is the new Avionics Install manager at the company East Alton location. **Jeremy Turnbough** has joined the company as the new Paint Program Manager at East Alton.

▶ **Weston Aviation, Humberside, Ireland,** hired **Ruth Tootill** as aviation fuel manager. Tootill formerly was account manager of general aviation fuel sales in the U.K. for Air BP and has 23 years of oil industry experience. **BCA**

If you would like to submit news of hires, promotions, appointments or awards for possible publication in On Duty, send email to jessica.salerno@informa.com or call (520) 638-8721.

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Products & Services Previews

By Jessica A. Salerno jessica.salerno@informa.com

1. Simcom Upgrades TBM 700 Sim

With the support of Daher and Garmin, Simcom Aviation Training has upgraded its TBM 700 simulator with a new Garmin G600 TXi primary flight display and dual GTN-750 GPS/NAV/Comm/MDF's. The simulator is located in Simcom's Lee Vista, Orlando, Florida training center. This updated 700 sim will add to Simcom's line-up pf TBM training solutions including the TBM 850 and TBM 930 in Orlando as well as the new TBM 910 simulator in Scottsdale, Arizona.

SIMCOM
(407) 275-1050
www.simulator.com

2. Edmiston Partners with the London Heliport

Edmiston has taken over the title sponsorship of The London Heliport. Coinciding with the heliport's 60th anniversary, Edmiston has undertaken a major restyling of both the interior and exterior terminal, including a complete repaint of the landing, takeoff and apron areas. Effect August 1, the heliport will be known as The Edmiston London Heliport.

www.facebook.com/thelondonheliport/

3. Gar GFC 600H on the Bell 505

Garmin International, Inc., announced that it will certify the GFC 600H flight control system for the Bell 505 Jet Ranger X helicopter. The attitude-based (AHARS-derived) flight control

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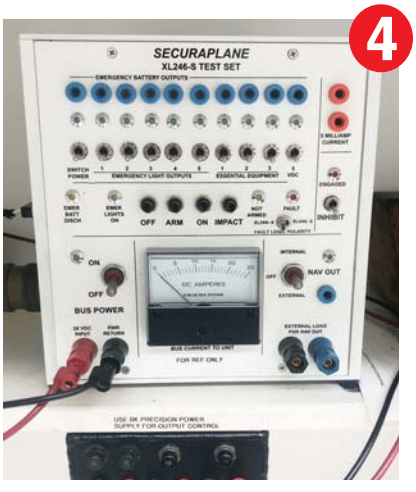
Flight image courtesy of
FlightAware (flightaware.com)

system has a number of helicopter-tailor features, including attitude hold, Garmin Helicopter Electronic Stability and Protection (H-ESP), dedicated return-to-level mode, hover assist, as well as overspeed and low speed protection. Certification is expected to be complete in the first half of 2020 and available at that time through select Garmin dealers as a retrofit installation. The GFC 600H on the Bell 505 is night vision goggle (NVG) compatible.

Garmin
www.garmin.com

4. West Star to Service Securaplane Batteries

West Star Aviation is authorized to service and repair Meggitt Securaplane Technologies Maine Shipp 9750W pure lead batteries at their full-service Alton, Illinois (ALN) location. The 9759 battery is available for most Citation



models. Additionally, West Star is authorized to perform "reblocking" of the XL245, LX246, XL249, XL2410 and 2411 series emergency batteries.

West Star Aviation
(800) 922-2421
www.weststaraviation.com

5. New from ForeFlight

VFR Flyway Charts from the FAA are now available as a georeferenced map layer in ForeFlight. These planning charts depict potential VFR routes through and around major metropolitan areas to help VFR pilots avoid Class B airspace and commercial traffic flows. Access the charts at the bottom of the layer selector's left column, and as a configurable download switch in More > Downloads > Download Settings > United States.

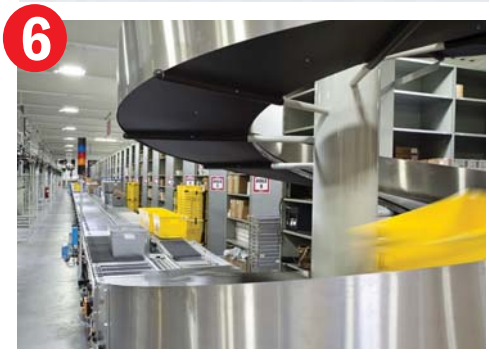
Graphical NOTAMs: ForeFlight customers in Europe can now view

graphical en route NOTAMs as part of the NOTAMs/TFRs map layer. ForeFlight uses geographic data contained in NOTAM descriptions to draw their actual shapes whenever possible, and color-codes NOTAMs gray, orange, or red based on increasing severity and type. Tap on each NOTAM to view its description and active times.

ForeFlight
www.foreflight.com

6. Textron Aviation Opens Parts Facility in Australia

Textron Aviation opened an aircraft parts warehouse in Australia to support its industry leading fleet of business jets, turboprops and piston aircraft. The parts warehouse will be co-located at Essendon Fields Airport with Premiair Aviation Maintenance Pty Ltd, a Textron Aviation Authorized Service Facility. "With Premiair established as our new ASF for Australia, we are enhancing our regional parts availability. This represents another step in our ongoing commitment to Textron Aviation aircraft owners in Australia and across the Asia-Pacific region," said Brad Thress, senior vice president of Parts and Programs at Textron Aviation. Customers, operators, MROs and channel partners will have the option to purchase factory direct parts through Textron Aviation's ecommerce website or local sales and support staff. Parts will be shipped locally from Essendon. The new Australia facility follows the recent expansion of Textron Aviation's Singapore parts warehouse to better serve customers in the Asia-Pacific region.



Textron Aviation, Inc.
Wichita, Kansas
www.txtav.com

7. Rabbit Aviation California FBO to Offer Unleaded Avgas

Rabbit Aviation Services at San Carlos Airport, California, will offer unleaded aviation gasoline, making it the first California airport to do so. The FBO has completed an upgrade of its aviation fuel tank facility and will offer Swift Fuels' unleaded UL94 aviation gasoline for piston aircraft. The fuel was available Sept. 15. Similar fuel expansions are expected soon at FBOs in Texas and Florida, Swift Fuels says. The move comes amid a nationwide transition from 100LL leaded aviation gas to unleaded.

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AVIATION WEEK NETWORK

Swift Fuels produces and sells the only commercially available unleaded avgas in the U.S.

"Nobody likes lead, neither your engine nor the environment," said Dan DeMeo, Rabbit Aviation Services CEO. "General aviation needs a piston fuel for the future and that future doesn't include toxic lead, so why not begin the transition with the highest quality unleaded fuel?" Rabbit Aviation worked with airport management and elected county supervisors to draft the first agreement to supply a lead-free avgas alternative, DeMeo said."We hope this is the first of many such agreements to ensure general aviation has a piston fuel for the future," he said.

"Swift's UL94 solves the issues brought by tetraethyl-lead and ethylene dibromide by radically lowering toxicity and engine corrosion, eliminating lead-fouled spark plugs, and doubling the oil change intervals, versus those required for 100LL."

Rabbit Aviation
www.rabbitksql.com

8. ExecuJet MRO Services Adds Approvals

The Civil Aviation Authority (CAA) of the Cayman Islands has certified ExecuJet MRO Services Malaysia, giving it permission to provide maintenance for Dassault 7X, 8X and 2000 aircraft. It also received approval to provide maintenance on Bombardier and Gulfstream aircraft. The company also received approval to provide maintenance on Bombardier and Gulfstream aircraft at its facility at Subang Airport. ExecuJet MRO Services was acquired by Dassault Aviation in early 2019.

ExecuJet MRO Services
www.execujet-mro.com

9. Elliott Aviation Adds to its STCs

Elliott Aviation received FAA certification for STCs for Mid-Continent Instruments and Avoinics' MD302 Standby Attitude Module as part of its Garmin G5000 avoinics upgrade in the Citation Excel and XLS. The STC also allows for installation of the unit in Primus 1000 equipped Citation Excell and XLS aircraft. The MD302 will be optional in all of Elliott's future Citation excel and XLS Garmin G5000 installations

Elliott Aviation
www.elliottaviation.com

October 1969 News

We have long discussed **approach and departure corridors** at large airports based on aircraft performance and flight plan. Why can't we **put such a concept** into a mandatory procedure? – *BCA*

Edited by Jessica A. Salerno *jessica.salerno@informa.com*

We can't live with the present midair odds or with the system that makes them possible. We have to be willing to swallow some fair and logical restrictions and inconveniences. The bell that tolls for the 83 at Indianapolis tolls loudly for everyone who flies.

Arnie's Forty Now: The guy who turned the game of golf into a multi-million dollar business helped celebrate his fortieth birthday by taking up several aviation editors for a ride in his Learjet 24. Left is pilot Joe Darrell Brown.

Piper and Cub: William Piper now 85, didn't start in the airplane business until after he was 50, but he made up for a late start by his dedication and faith in aviation. William Jr., is president and CEO.

Certification flight testing is well under way for the 22-place Swearingen Metro Air Taxi. The Metro will cost $500,000 sans avionics.

Business aviation marches on Washington for its annual caucus and hardware exhibit. Meetings and exhibits at crowded Hilton and glittering aircraft display at Dulles are a rousing success.

Model cancellations and layoffs began at Beech shortly after its almost 10,000 employees returned to work Sept. 2 ending a 25- day strike. Ended are turbo Baron and Bonanza, Queen Air Model 65 and Super Musketeer. Production on Beech 18 has ended. Layoffs are rumored to be around 3,000 workers.

New Gulfstream II sales include planes for Mobil Oil, Falconbridge Nickel, American Cyanamid, Phillips Eindoven, Martin Marietta, and two for General Motors. **BCA**

THE ARCHIVE

Photographer James Gilbert captured the Skyvan over lower Manhattan as it passed through New York on a North American sales tour this summer. For a profile of the Short Brothers aerial truck, see Richard Aarons' aircraft profile in this issue.

The "Whole Hotdog" is Southwest Airmotive Company, Executive Aircraft Service, Inc. and Service City USA.

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