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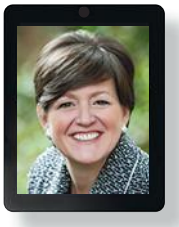

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Business & Commercial Aviation

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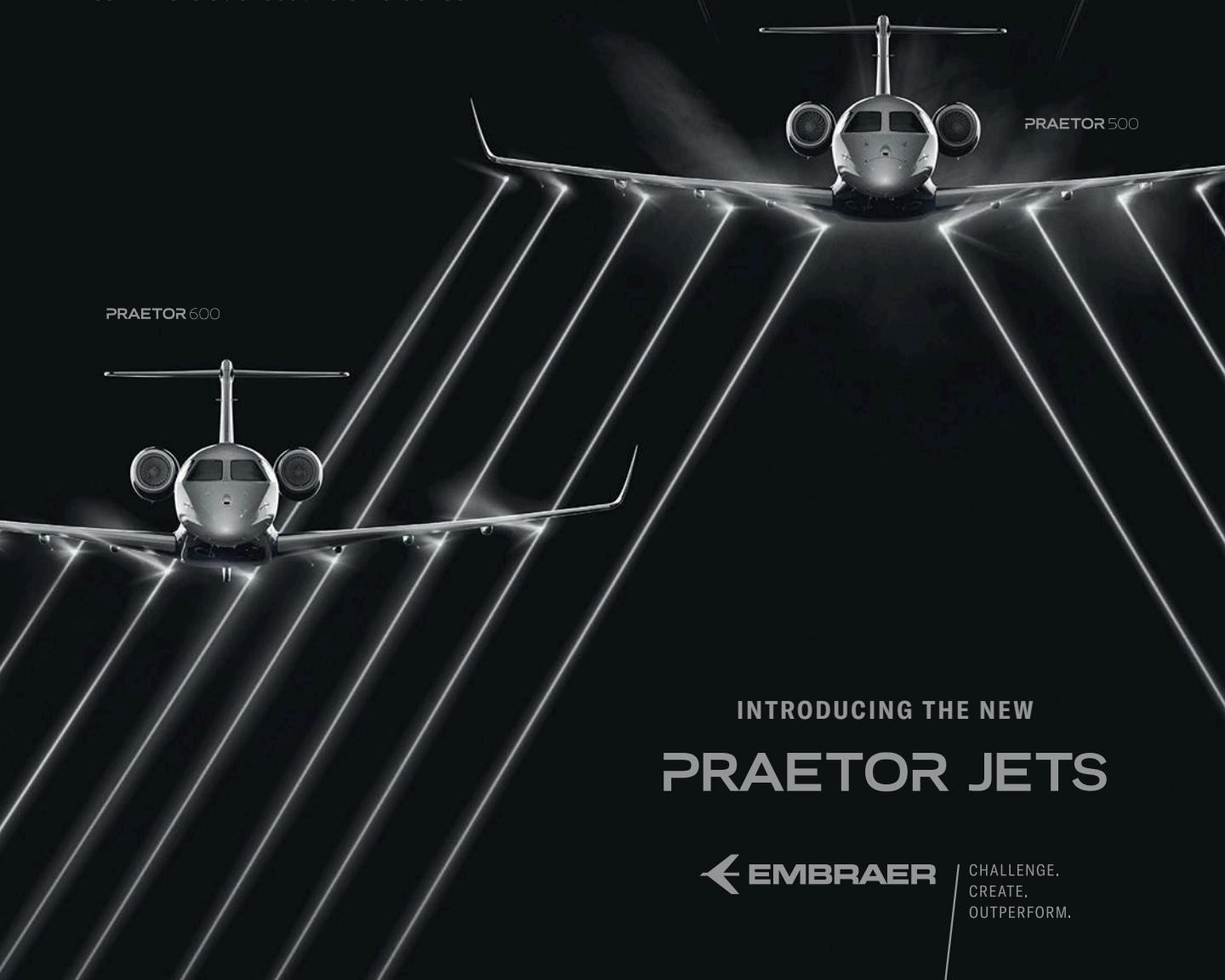

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Help Wanted

The aviation pipeline's flow **has slowed too long**

HERE'S A MATTER YOU'VE NEVER CONSIDERED AND A QUESTION you've never asked: Wherefrom will come the next generation of aviation writers?

Admittedly, it's a fairly rarefied concern and one that causes little alarm among the masses. But still, it's out there. In fact, *Flying* magazine's Rob Mark recently posed the question to a few dozen av journalists and got a spirited, supportive response. It seems that most of us have noticed a certain graying of our crowd. That's not to suggest that we all qualify for the AA RP, but there aren't many notetaking neophytes at events where we gather.

When I began my aviation journalism career in my 20s, it seemed like most of my professional colleagues were contemporaries. Well, despite the passage of decades, they still are — at least those continuing to turn out copy. And that gives a lot of us pilot-scribblers pause.

In that regard, our curious little subgroup reflects the bigger problem facing aviation. You've all read and talked about it and it's having quite an impact throughout the aviation industry. The problem, of course, is the current and growing shortage of professional pilots, along with tech support.

The global expansion of scheduled carriers combined with the ongoing and increasing forced retirements of seasoned airline pilots has caused the airlines to act. For a variety of reasons dating back to 9/11 or further, the pilot pipeline thinned as the cost of qualifying for a right seat in an airliner soared. Meanwhile, the military started handing out bonuses to keep its aviators, and those collegians with technical proclivity had lots of inviting career options.

Beyond that, I think in the public's mind, aviation not only lost its swagger, it pretty much vanished from consideration. For most people, an airplane trip is an unpleasant exercise involving physical discomfort, mental anxiety, serial frustration and expense — something to endure for the reward of getting to Point B safely. The travelers barely see an airplane. Rather, they're shuffled through a claustrophobic gantry and into a long tube cramped with narrow seats, only a relative few of which even have windows.

Actually, the very idea of "aviating" is downplayed. Years ago, I wrote articles for an airline seatback magazine and its editors made clear to me that stories about aviation were unwelcome. I'm still unsure whom the subject upset — the passengers or the airline's managers — but I was allowed only to work at the edges.

And unfortunately, a visit to many general aviation airports has become unfriendly as well. Visitors are ignored or viewed with suspicion. Meanwhile, locked doors, high fences and security cameras don't imbue one with a sense of warm welcome. An airplane? Don't you dare go near one!

As a result of the forgoing, and since the airlines obviously need pilots to fly paying passengers and derive profit therefrom, they are reeling in business aviation pilots with promises of high pay, guaranteed time off and rapid promotion. It's working, and business aircraft operators — charter and aircraft management companies in particular — are getting squeezed. Meanwhile, as notes Sheryl Barden in this month's Fast Five (page 18), some business aviation veterans are pushing their current employers to the limits, with long-term consequences unknown.

One temporary fix would be to extend the mandatory retirement age for airline pilots. But ultimately the industry overall needs more pilots entering the system, possibly even more reliance on automation and perhaps accelerated training programs. All those things are being addressed now in a variety of ways and will pay out over time.

EXTREME-PHOTOGRAPHER/ISTOCK

Ah, but what of the missing coolness factor? I saw the promise of its eventual reinstatement in recent visits to the Hiller Aviation Museum in San Carlos, California, and 2,500 mi. to the east at the Triple Tree Aerodrome in upstate South Carolina. In both places children are truly welcomed and encouraged to participate in aviation, from creating and flying paper helicopters at the former, to operating radio control aircraft at the latter. The resulting laughter and excitement are infectious and the root source, marvelously, is aviation.

I salute the leaders and volunteers behind such institutions — and, thankfully there are many — since now more than ever it is such places that serve as aviation's incubator. This is where the wonder is instilled, with swagger to follow.

And just maybe among those giggling, gaming, pointing, climbing and running tykes there will be a few who might one day like to write about the experience. Which, for me, is so satisfying still. **BCA**

Readers' Feedback

Thanks for Looking Back

Thanks for the Retrospective: The "Greenhouse Patter" reprint in the December issue. In 1965, I was 15 years old and about to solo on my 16th birthday so I hadn't read this one. I had my private at 17 and went off to Parks College. While there, I earned my commercial and CFI at 18 and shortly after that, my instrument, multiengine and seaplane ratings, and an A&P certificate.

It wasn't until after four years in the U.S. Air Force, first as a CH3 crew chief then as a flight engineer/winch operator that I knew about and started reading the Torch Lewis columns. He sure had lots of great stuff and wisdom!

Torch's "The Early Days" column in *BCA*'s December 1965 issue reminds me of my son when he was about ten. He and his sister were used to riding around in the corporate King Air 200 and Learjet 35A that I flew. One day he asked me when I would take him for a ride in a real airplane. I asked, "What do you mean?" He said, "You know, a Cessna 150 or something like that!"

Thanks for the memories.

Larry Zetterlind
Chief Pilot Hartzell (Retired)
Hartzell Propeller
Piqua, Ohio

Ole' Torch Still Remembered

I enjoyed the "Retrospective: Greenhouse Patter" by Ole' Torch (December 2018). That was the first page I turned to every month before I read anything else. He pretty much nailed everything right on the head.

I have a signed copy of his book of compilations that his wife mailed to me after he died. He had signed it and put it aside to be mailed at a later date and obviously forgot about it until his wife found it.

Sure do miss him.

John Forrester
Alexander City, Alabama

Thought-Provoking Article

Congratulations to *BCA* and James Albright on the thought-provoking article on "Premeditated Stupidity" (December 2018). I do not think there is any pilot who can look back on their flying career and not find a single, or multiple, examples of "stupid."

Capt. Albright and I have shared the example of continued normalization of deviance which is a prime example of "Premeditated Stupidity" as relates to the required after engine start flight control check in Gulfstream and other similar aircraft. Recently I observed a GIV from a major Southern California charter company load passengers and baggage, close the door, start engines and call for taxi in world record time. The big item they missed and we witnessed, was the required flight control check. Oh, how some forget the fatal GIV crash at Bedford, Massachusetts (KBED) so easily.

"Premeditated Stupidity" extends to crews who think they are impressing their principal or passengers by getting the aircraft moving post haste. The "need for speed" has killed people.

Our passengers rely on us to operate safely. Just because we may be "stupid" and can be considered for the Darwin Awards, our passengers deserve and demand the normalization of excellence from us.

Nat Iyengar
Captain/G650 Fleet Technical Pilot
Jet Aviation Business Jets
Hong Kong


Retrospective: Greenhouse Patter

The Early Days

Greenhouse Patter

From the Web

Comments about "Checking Your Angst: Dealing With Check-Ride Nerves,Inflight Mistakes," by James Albright, December 2018

Great article.Boiler up! Does the picture labeled "Engineering Mall" get a Q2? Took a picture of the gateway this summer by Cary Quad, next to the Armstrong Hall. Being an EE, I always thought the mall with EE, ME, ChemE was the Engineering Mall. EE being the center of the universe and all.

northriver.nw@frontier.com

"All I'm saying is that it apparently took some time before the seriousness of the incident "sunk in" to all involved."

capngrog *From the Web*

Comments about "Boeing Business Jet," by Fred George, January 2019

Major drawback on the BBJ2 we have flown for the last 17 years is the outdated (structure not avionics) and therefore very noisy cockpit. Cargo door size is often limiting bulky loads.

kurtluder@hispeed.ch

It's a plane that is built to last and fun to fly. Easy to find on the ramp. Worldwide parts and service with the only limit of finding airports that can take the weight. Great personal jet for those downsizing from a Boeing B757 or larger.

northriver.nw@frontier.com

Comment about "Thin Margins in Wintry Takeoffs," by Patrick Veillette, Ph.D., December 2018

Very relevant enough so that my nephew who is a corporate pilot is going to get a copy. Thanks very much.

jovandewoe@gmail.com

Comments about "A Near Catastrophe: Within Feet of Becoming the Worst Air Disaster," by Richard N. Aarons, December 2018

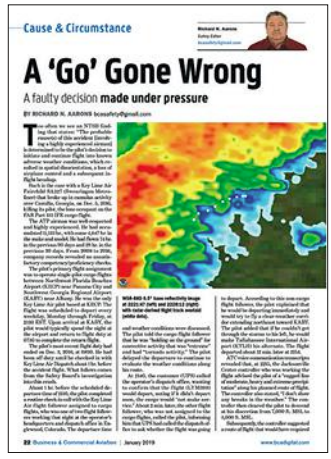
I think that the failure to immediately recognize this near disaster needs some investigation. I understand that all involved (tower and waiting/taxiing crews) were very busy at the time of the overflight incident. However, I would think that someone would have loudly voiced concern over the apparent near disaster. Because of the failure to recognize the serious nature of the incident, critical data (cockpit voice recordings) were lost. At least two crews, UAL1 and PAL115, were "looking out the window" and detected an unusual situation developing. Only the crew of PAL115 took effective action, but apparently neither they, nor the crew of UAL1 notified the tower that something really bad almost happened. Even if the crews of UAL863 and UAL1118 were "heads down" programming/monitoring their "labor saving systems," they certainly should have noticed the full power roar of AC 759 passing close overhead. How about a call from each of the aircraft waiting on Taxiway C to the effect: "Hey that guy (AC759) almost hit us!" This may have prompted the tower staff to have notified their supervisor that something was seriously amiss, with a resultant call to FSDO. All I'm saying is that it apparently took some time before the seriousness of the incident "sunk in" to all involved.

capngrog

For any skygods that may be about you may wish to peruse the observations made of three airlines, one was a major U.S. flag carrier, one was a major U.S. domestic carrier, and one was a major foreign flag carrier.

Not permitted to post links, but search for NASA-TM-2010-216396 "Checklists and Monitoring in the Cockpit: Why Crucial Defenses Sometimes Fail."

Quote, "In the course of sixty airline flights eight hundred ninety-nine deviations were observed (194 in checklist use, 391 in monitoring, and 314 in primary procedures)"


Cause & Circumstance

A 'Go' Gone Wrong

A faulty decision made under pressure

babraham@netspa . . .

Of course we should always strive to tune, and check the ILS frequency for such an approach, and do everything else the crew failed to do, but one late night we just might not do it. . . . But in this day and age I really don't understand why we still are inundated with pages of irrelevant NOTAMS. About 15 years ago I worked for a company that provided "tailored NOTAMS." They had two duty officers starting to work every morning at 0500 going through the actual NOTAMS and qualifying them according to their pertinence to certain types of operations. We would not have to read through NOTAMS about changes in charts for example that already had been incorporated in our route manual. NOTAMS not valid on the day of our flight would not show up either. Today this process probably could be automated, but we keep on getting the pages of NOTAMS, and have about 5 minutes to sift through them.

rene.schreiber@. . .

Also informative wrong surface events: Southwest at Branson, Delta at Rapid City — these had CVRs.

bill@tuccio.com

Unfortunately, Murphy's law combined with human factor will always be lurking in the shadows.

aerobase@yahoo.com

Comments about The Ultimate Narrowbody Citation 560: Encore+," by Fred George, December 2018

We have been operating a 2002 model now for nearly a year, and love it. Mostly a family operation and operate within 600 nm, but payload, range and climb are unbelievable.

mfairless@hotmail

Comments about "Premeditated Stupidity: A Planned Mistake Is Something Worse" by James Albright, December 2018

When learning to fly I was given a few critical instructions. An early one came from the back seat of Citabria N6302 November where I was accused of flying it like an engineer, and I was. The second came from the front seat of a Stearman via a gosport tube when the wizened old instructor said "I can teach a monkey to fly but I can't teach you to think." In both cases the instructors were correct. The first was correct that flying is more than proceeding from one data pint to the next and the other that you have to think. The upshot of this article is that rules are hard won summaries of many experiences and that you have to think ahead about what you are doing. Violate either and you are discarding vital learned experience and avoiding common sense.

marklincoln1@aol.com

With airline background I was always aware that I was thrusted to treat the flying like I was trained! Never go into business for yourself was the most important issue in my career. I did jet upsets, inverted spins in a test pilot school, but never beyond that, perhaps that is the reason I hold the FAA Wright Brothers Master Pilot Award with captain ratings on nine (9) airliners. No better feeling in the world then try to be a professional. Flying the Bush in Alaska during the 1950s was enough exposure to sticking my neck out, why do it when not necessary. Great article!

captaindan6@hotmail.com

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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INTELLIGENCE

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NEWS / ANALYSIS / TRENDS / ISSUES

TEXTRON AVIATION'S FLAGSHIP $26.9 MILLION Citation Longitude super-midsize business jet was granted provisional type certification by the FAA on Dec. 19. According to Brad Thress, Textron Aviation senior vice president of engineering, the provisional approval allows operators to begin flight training in the Longitude, including taking check rides, as they prepare to take delivery. However, until the restriction is lifted, the aircraft may not operate under Reduced Vertical Separation Minimums (RVSM) nor conduct high-elevation takeoffs and landings. In addition, service on the aircraft's electrical wiring interconnect system must be performed by Textron Aviation. The Longitude's flight test program, including functional and reliability testing, was completed in early November, Thress said. Meanwhile, Thress said in December that Textron Aviation "is pushing through the final documents" toward full certification and "We're very, very, very close," adding about 94% of the documents for certification were complete.

A change in regulations created certification challenges for the Longitude. Thress explained, "It is the first all-new Part 25 we've done in many, many years. There were a lot of rule changes between now and then that we've learned an awful lot about." This experience, he believes, will make the company more efficient during the development of the Hemisphere, the company's largest Citation and another clean-sheet design. At issue has been the Longitude's fuel system, which stores Jet-A in the wing with the center portion covered by an aerodynamic fairing, according to an FAA docket. Textron Aviation considers the fuel tank to be in a conventional unheated aluminum wing, which can be shown to meet flammability requirements through qualitative analysis, according to the docket. The FAA disagreed, and Textron is working to accommodate all technical objections. **The Longitude was announced in 2012 and made its first flight on Oct. 8, 2016.** The aircraft will accommodate up to 12 passengers in a flat-floor, 6-ft.-tall cabin. It has a 3,500-nm range and a full fuel payload of 1,600 lb. It is equipped with the Garmin G5000 flight deck, a head-up display and Honeywell HTF7700L turbofan engines with fully integrated autothrottles with envelope protection. In October, NetJets placed an option to purchase up to 175 Longitudes. The agreement includes an option to begin deliveries in the second half of 2019 and additional options over the next 10-15 years.

AS OF FEB. 1, AIRCRAFT OPERATORS HAVE JUST 11 MONTHS remaining to meet the equipage mandate for automatic dependent surveillance – broadcast (ADS-B) Out. Since that deadline was established a decade ago, those hoping it might yet be extended are likely to be disappointed. And if not so equipped, and certified as in compliance, the aircraft essentially cannot be operated in controlled airspace as of Jan. 1, 2020. How many airplanes need to be upgraded? **Paula Derks, president of the Aircraft Electronics Association, recently cited the FAA estimate that more than 100,000 airplanes still need to equip,** and so, "It's going to be a busy year for avionics shops to meet the installation demand." Since the shop backlog is likely to be long, she predicts installations will continue "well into 2020 and even into 2021." As for the looming deadline, Ed Bolen, president and CEO of the NBAA, sees the situation as "a long way to go and a short time to get there" and thus the heightened need for "awareness, understanding, scheduling and capacity."

Jet-A and Avgas Per-Gallon Fuel Prices

January 2019

Jet-A

Region	High	Low	Average
Eastern	$8.50	$4.18	$6.14
New England	$7.46	$3.62	$5.21
Great Lakes	$8.09	$3.65	$5.42
Central	$7.45	$3.27	$4.88
Southern	$8.04	$4.20	$5.95
Southwest	$6.70	$3.00	$5.16
NW Mountain	$7.79	$3.20	$5.24
Western Pacific	$8.06	$3.60	$5.84
Nationwide	**$7.76**	**$3.59**	**$5.48**

Avgas

Region	High	Low	Average
Eastern	$8.70	$4.50	$6.44
New England	$7.45	$4.35	$5.85
Great Lakes	$8.59	$4.85	$6.03
Central	$7.69	$4.39	$5.38
Southern	$8.24	$4.25	$6.09
Southwest	$7.17	$3.91	$5.51
NW Mountain	$6.89	$4.60	$5.69
Western Pacific	$8.52	$4.80	$6.24
Nationwide	**$7.91**	**$4.46**	**$5.90**

The tables above show results of a fuel price survey of U.S. fuel suppliers performed in January 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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Collins and Inmarsat Team Up for Jet ConneX

Collins Aerospace is teaming with Inmarsat to offer Jet ConneX high-speed internet service to business aircraft operators. Under the agreement, Collins said it will work with Inmarsat to improve the inflight experience of Jet ConneX customers with better data transfer between the aircraft and operations teams on the ground. The service will be offered as part of ARINCDirect. Collins is a division of United Technologies Corp., recently created by combining UTC Aerospace Systems and Rockwell Collins.

EASA Certifies Tecnam P2012 Traveller

Tecnam, the Italian aircraft manufacturer, recently received full type certification for the P2012 Traveller from the European Aviation Safety Agency (EASA); FAA certification was expected to follow shortly, with deliveries on track to begin early this year. The project was announced in 2015. The first P2012 prototype made its initial flight in July 2016. Two prototypes flew a total of 600 hr. The first P2012 Traveller high-wing aircraft will be delivered to launch customer Cape Air, a commuter airline based in Hyannis, Massachusetts.

ROLLS-ROYCE IS HOPING TO MAKE ITS MARK ON the electric aircraft speed record with a vision of breaking the 300 mph barrier in 2020. The British engine maker is championing electric flight through developments such as the E-fan demonstrator, working with Airbus and Siemens on a hybrid-electric propulsion system on an Avro RJ100 regional airliner testbed. But the company has also recognized that the general aviation market could allow it to develop electric systems much more quickly than with large-scale commercial or military programs. So, it has embarked on ACCEL — short for Accelerating the Electrification of Flight. The company is working with British electric-motor manufacturer YASA and startup firm Electroflight to adapt a Sharp Nemesis NXT racer to battery power. Nemesis' own specifications claim the aircraft can cruise at 325 mph. Matheu Parr, ACCEL project manager, says Rolls-Royce is focusing on battery, powertrain and motor technologies to beat the current speed record of 210 mph set in 2017 by an electric-powered Extra 330 aerobat modified by Siemens. Flight testing of the electric Nemesis is planned for early 2020. Ultimately, ACCEL envisions using a densely packed lithium-ion battery pack with 6,000 cells capable of delivering 750 kW of power. The batteries will power a trio of YASA-developed lightweight motors, with the propeller shaft running through all three. **— Tony Osborne**

BYE AEROSPACE, WHICH IS DEVELOPING A FAMILY OF ELECTRIC aircraft, received a major investment by the Subaru-SBI Innovation Fund. Though the dollar amount was undisclosed, Bye says the investment will be used to advance the FAA's certification process for the Sun Flyer 2 electric training aircraft, which is expected to be the first electric aircraft to receive FAR Part 23 type certification. "My sincere thanks to the Subaru-SBI Innovation Fund for their vision, their passion for our industry and their belief in electric propulsion," said George Bye, founder and CEO of the eponymous development company. "This is Bye Aerospace's largest individual investment to date." Electric aircraft are receiving broad attention, said Itaru Ueda, manager of the Subaru-SBI Innovation Fund. "We expect the future of small electric airplanes to be led by Bye Aerospace." The fund is used to invest in promising startup companies expected to generate synergies in Subaru's existing and prospective business areas.

BELL UNVEILED MAJOR CONFIGURATION DETAILS OF ITS NEXUS on-demand urban air mobility (UAM) concept at the recent Consumer Technology Association's CES 2019 show in Las Vegas. The Nexus will feature six tilting ducted fans and will be sized to carry four passengers and a pilot. Powered by a hybrid-electric propulsion system incorporating batteries and an unspecified Safran turbine engine, the Nexus is designed to "safely and efficiently redefine air travel," according to Michael Thacker, Bell's executive vice president for technology and innovation. Bell is one of five companies teamed with Uber to develop urban air taxi demonstration vehicles for trials in Dallas and Los Angeles as early as 2020. "While we are not sharing specifics on active projects today," says Thacker, "we believe that viable commercial operations are possible in the mid-2020s. He goes on to note that "the challenges facing our population centers are not going away and will not be solved by conventional means. There is a lot of work to be done to create a viable UAM network, but we believe the future is real and possible and coming soon to a city near you." The Nexus is targeted at a range of 150 sm and a cruise speed of around 130 kt. Bell is aiming for a takeoff gross weight of 6,000 lb. and maximum payload capacity of 800-1,000 lb. **— Guy Norris**

ASTM INTERNATIONAL HAS LAUNCHED A NEW CERTIFICATION program for business jet cabin crews by its affiliate, the National Center for Aerospace and Transportation Technologies (NCATT). According to Louisa Fisher, FlightSafety International's manager for cabin safety, the NCATT effort is being administered worldwide by SpaceTEC Partners, a nonprofit, educational group performing workforce validation and headquartered in Titusville, Florida. Fisher was among a group of professionals who proctored the initial beta tests of the written exam. "Of those, approximately 80% passed and will receive certification," she said. **The exam has now been finalized and will be administered beginning later in the first quarter 2019.** The Business Aviation Cabin Crew test requires candidates to demonstrate the knowledge and skills involved in aircraft safety procedures and cabin-service safety, as well as professionalism and discretion. "Since I began training cabin crewmembers, there have been ongoing requests from clients for accreditation," Fisher says. "This new program meets the need for an objective and industry-respected certification that recognizes the training and experience of cabin crewmembers." **The certification complements formal safety training** by demonstrating a crewmember's knowledge and commitment to the profession, said Mike Horan, lead safety flight attendant for the Altria Corp.'s flight department. Those are traits attractive to current and prospective employers. "The certification also serves to create a standard of excellence for professional crewmembers, without respect to where they received training, the size of their flight department, its geographical location or other factors," Horan said. In FAR Part 135 charter and Part 91 corporate aircraft operations, there is no formal regulatory oversight of cabin crewmembers. And with the increasing technologically complex systems found in corporate aircraft today, organizers felt a formal certification effort was needed. The bulk of the testing covers the areas of passenger safety, customer service, cabin systems, security, food handling and cabin safety. The cost of certification is $175. Exams are administered online to registered candidates through the SpaceTEC examination management system, under the supervision of an approved test proctor.

TEXTRON AVIATION IS ENHANCING THE ELECTRONICS on its Cessna and Beechcraft piston aircraft with standard and optional equipment as part of Garmin's G1000 NXi integrated flight deck. This includes the Garmin GMA 1360 audio panel with enhanced audio capabilities and Bluetooth audio link to pair portable electronic devices to the flight deck. Other equipment includes the GFC 700 autopilot with enhanced automatic flight control system (E-AFCS). The equipment is standard on the 2019 production Cessna Skylane and Turbo Stationair HD, along with the Beechcraft Bonanza G36 and Baron G58, and is optional on the Cessna Skyhawk. The Baron G58 also comes equipped with Garmin's new GWX 75 Doppler weather radar. Other optional features for the Cessna and Beech models include the Garmin GSR 56 Iridium satellite receiver.

LONDON BIGGIN HILL AIRPORT REPORTS IT GREW BY 12% in 2018, as compared to what it claims was a 1% decline in business aviation activity at other London airports. It attributed its growth in part to its helicopter shuttle to downtown, extension of its operating hours, competitive handling fees and charges, and the absence of slot restrictions, with much of the activity stemming from the charter market. Robert Walters, the airport's business development director, said, "**Following significant investment in recent years, we have had an extraordinarily successful 2018 and finished the year on a particularly strong note.** During December, we led the London market in terms of charter requests and saw a big increase in large-cabin aircraft movements of more than 25%. He continued, noting, "We have a number of projects coming to fruition during 2019 and we are thrilled to be starting the year on such a positive note."

Gulfstream Sets Speed Record in G650ER

Gulfstream Aerospace set a world speed record in a G650ER on a flight from Teterboro, New Jersey, to Dubai, a distance of 6,142 nm, in 11 hr., 2 min. The flight was completed at an average speed of Mach 0.90. It beat a previous record by 1 hr., 48 min., Gulfstream said. Pending approval by the National Aeronautic Association, this record will be the G650 family's 79th.

Klapmeier to Step Down as Cirrus CEO

Cirrus Aircraft cofounder and CEO Dale Klapmeier plans to relinquish his chief executive post and transition into a senior advisory role during the first half of this year. Meanwhile, an internal and external search is underway by the Duluth, Minnesota-based company. A CEO is expected to be named during that time period. "Transitioning out of day-to-day operations will give me the opportunity to focus on long-term strategic opportunities," Klapmeier said.

AVIAA Signs Supplier Partnership With Jetex

AVIAA, an international group purchasing organization for business aviation, has signed a new preferred supplier partnership with Jetex, a ground handling specialist in the Middle Eastern region. The partnership will save clients on full business aircraft handling through select Jetex FBOs, the company said. The agreement was signed at Jetex's VIP Dubai South facility at Dubai World Central Airport during December's Middle East and North Africa Business Aviation Association (MEBAA) Show.

Baker Aviation to Expand Fort Worth Facilities

Baker Aviation has begun construction on two new hangars at Fort Worth Meacham International Airport, with plans to centralize and expand its operations there. Baker Aviation Maintenance will move its FAR Part 145 repair station from Addison, Texas, to the Fort Worth headquarters. A new 30,500-sq.-ft. maintenance hangar is expected to open by November 2019. Adjacent to the hangar, Baker is constructing a 35,850-sq.-ft. facility for its Part 135 charter and aircraft management business.

ATTENTION TO SAFETY IS TYPICAL AT ANY FBO, but American Aero at Fort Worth Meacham International Airport (KFTW) has taken it to a higher level as the first ever to earn International Standard for Business Aircraft Handling (IS-BAH) Stage 3 certification. The Stage 3 International Business Aviation Council (IBAC) approval issued in October 2018 verifies that safety management activities are fully integrated into an FBO's business, and that a positive safety culture is being sustained. "The IBAC certification reflects that vision and demonstrates our commitment to deliver unparalleled safety and service," commented entrepreneur and philanthropist Robert M. Bass, who founded American Aero in 2012. The attention to safety at the Texas facility also ensures that 22 of the FBO's staff members have completed third-party cardiopulmonary resuscitation (CPR) and first-aid training, and three of them have received emergency medical responder training. Further, the Avfuel tank farm is managed by a National Air Transportation Association Safety 1st-trained line staff. Safety also extends to the concept of environmental responsibility. **Two American Aero buildings are certified under the Leadership in Energy and Environmental Design (LEED) program,** and trained teams ensure that the storm-water pollution prevention program as well as the spill prevention, control and countermeasures are current and compliant. American Aero also engages in the principle of giving back. The facility has been participating in the Marine Corps Reserve Toys for Tots Christmas charity since opening its doors, and in that time has purchased 550 bicycles and helped gather another 1,200 gifts for children. "American Aero FTW has been a tremendous partner in our efforts and we are truly grateful for its support each year," said Toys for Tots Coordinator Marine Staff Sgt. Jason Smith. Further, the FBO has donated more than $100,000 to the Navy SEAL Foundation since 2014. Funds raised are earmarked to support scholarships for Navy SEALs interested in earning a pilot license. **American Aero was also recently accepted as an approved gateway to Ronald Reagan Washington National Airport.** Further, the Signature Select American Aero program offers Signature Status and TailWins benefits and rewards. The touchpoints of service at American Aero include U.S. Customs clearance, free luxury crew cars 24/7, an industrial dishwasher, full audio/visual conference room, 11-acre ramp and personalized concierge service. The new, 8,400-sq.-ft. FBO terminal includes large window panels that automatically adjust the tint through an electrochromic process, ensuring clarity, reducing heat and glare, and cutting energy costs by 20 to 25%. "American Aero is focused on extending the inflight safety envelope to the ground-handling experience," said Vice President Robert Agostino. "Our goal is to continue to provide our clients with unsurpassed service and to maximize safety margins when their aircraft is in use."

TAG AVIATION HAS OFFICIALLY LAUNCHED ITS FIRST FBO IN Asia-Pacific. Located in Macau, the new facility represents the fourth FBO for TAG Aviation globally. "The opening of our Macau FBO expands our global network to Asia and provides TAG Aviation with the operational capabilities to deliver world-class FBO services in the region," said Steven Young, TAG Aviation Holding director and president of TAG Aviation Asia. The Macau FBO provides a comprehensive suite of 24/7 business aviation services including passenger facilitation, VIP and business-executive amenities, on-site customs and immigration clearance, flight planning and chartering, along with aircraft maintenance and servicing capabilities. The Macau facility joins TAG's international network of FBOs based at Farnborough, U.K., and Geneva and Sion, Switzerland.

YINGLING AVIATION HAS ANNOUNCED A 73,000-SQ.-FT. EXPANSION to its facilities at Wichita Dwight D. Eisenhower National Airport (KICT). The expansion brings its footprint to nearly 200,000 sq. ft. The company is building a $3 million, 23,000-sq.-ft. facility for aircraft avionics and maintenance. Construction was scheduled to be completed in late January, said Yingling CEO Lynn Nichols. It also is leasing a 50,000-sq.-ft. facility, to be used for a paint hangar, prep hangar, service, aircraft interiors and offices. The space was formerly the home of Hawker Beechcraft Services. It was vacated after Textron Aviation combined the services with its Textron Aviation Service Center across the runway at KICT. The paint hangar will have capacity for aircraft up to Hawker 800 size. Yingling also is expanding its parking and ramp area. The facility will undergo a major renovation over the next year, in a project expected to cost between $500,000 and $1 million, Nichols said. "The opportunity to offer aircraft paint services has long been on our list of new services to provide, so having these facilities, particularly next door, is a perfect situation for us," Nichols said. "Adding paint will complement our interior, avionics and aircraft maintenance services."

AJWA AVIATION SERVICES, BASED IN RIYADH, SAUDI ARABIA, plans to construct a number of hangars on a secure site at Riyadh Airport as the number of customers grows. Saudi Arabia's harsh weather, including dust and heat, can cause problems for aircraft, Ajwa CEO Abdulmajid Obaid said. Its hangars will help protect the aircraft. A later phase of construction will include heavy maintenance facilities.

JAPANESE STARTUP EUGLENA HAS COMPLETED CONSTRUCTION of the country's first demonstration plant for producing renewable jet and diesel fuel. The refinery, in Tsurumi, Yokohama, is to begin operation in spring 2019. Euglena has partnered with All Nippon Airways to conduct Japan's first biofuel revenue flight in 2020, when Tokyo hosts the Summer Olympic Games. Other partners include automaker Isuzu, which was to begin using the renewable diesel in shuttle buses last month. The demonstration plant will produce renewable fuels from euglena microalgae and waste cooking oil using the Biofuels Isoconversion process licensed from Chevron Lummus Global and Applied Research Associates. **— Graham Warwick**

LEE AEROSPACE HAS ANNOUNCED THE EXPANSION OF ITS FAR Part 145 capabilities and its presence across the U.S. As of late December, the Lee Aerospace Part 145 Repair Station has added capabilities to include composite repairs on specific models for the main entry door assembly of the HondaJet. In addition to the existing certificate rating, which originally focused primarily on transparencies, Lee Aerospace is now expanding into other structural elements of the airframe. "We are well-known in the industry for our inspection, repair and installation of transparencies. However, we have manufactured composite assemblies and major aerostructures at Lee Aerospace for years. Adding this composite capability to our 145 certificate allows us the opportunity to perform repairs on structural assemblies that we know very well on the manufacturing side," said Greg Piland, vice president of aftermarket sales and services. "This expansion is a natural progression for the company." In addition to the new capability, the Lee Aerospace Part 145 Repair Station has added more service technicians on the West Coast. Lee now will be dispatching additional certified technicians out of Provo, Utah, to cover the western regions of the U.S.

TAG Celebrates 15 Years of Maintenance at Farnborough

TAG Aviation Farnborough Maintenance Services (TFMS) has marked the 15th year of maintenance services operations from its base at TAG Farnborough Airport. The milestone coincides with TFMS's release of one of the world's first 48-month base checks on a Bombardier CL350 aircraft. The comprehensive maintenance check included a complete cabin removal and refit.

Naples Full-Service FBO Reveals New Name

The sole full-service FBO at Naples Airport has announced a name change from Naples Airport Authority to Naples Aviation. "We're excited about the new name, along with all of the changes that come with it," said Mike Hushek, Naples Aviation's FBO manager. "We have launched a new website for easier customer use and are offering competitive rates on jet fuel with Avfuel Contract Fuel." With the addition of contract fuel, operators will benefit from better-than-retail rates on jet fuel.

Textron Upgrades Cessna Caravan Flight Deck

Textron Aviation is upgrading the flight deck capabilities to new-production Cessna Caravan and Grand Caravan EX turboprops. The features include new standard and optional equipment as part of Garmin's G1000 NXi next-generation integrated flight deck. New options to the Caravan series include Garmin's Enhanced Automatic Flight Control System. Features include electronic stability and protection, underspeed protection, emergency descent mode, coupled go-around and an auto-level function.

iAero Group Adds Swift Air Charter Business

New aviation rollup iAero Group has signed a definitive agreement to purchase nearby Swift Air, an independent U.S. airline charter business. The acquisition adds to iAero's portfolio of aviation businesses put together since its inception in early 2018, including the engine MRO and leasing company AeroThrust and airframe MRO AeroTech. Miami-based iAero is located on a campus with more than 350,000 sq. ft. of office and MRO space at Miami International Airport. ***— Michael Bruno***

BOMBARDIER AEROSPACE DELIVERED ITS FIRST FLAGSHIP Global 7500 long-range business jet Dec. 20 at a ceremony at its Montreal headquarters. "This revolutionary aircraft is the gateway to a transformed business aviation landscape and a very bright future," said David Coleal, Bombardier Business Aircraft president. Bombardier will lease the Global 7500 from its owner, whose name was not disclosed, to operate it on a demo tour this year. At the tour's completion, the owner will take possession. The $73 million Global 7500 was launched in 2010 as the Global 7000; the name change reflects a 300-nm increase in range during flight testing to 7,700 nm. The aircraft also exceeded its original takeoff and landing performance commitments, including a takeoff distance of 5,800 ft., the company said. The aircraft received type certification by Transport Canada last September and by the FAA in November. It made its first flight on Nov. 4, 2016. The company has said it plans to deliver three to five aircraft during the first half of 2019 and 10 to 15 in the second half. It is sold out through 2021. Bombardier describes the aircraft as "the world's largest, longest range and most luxurious purpose-built business jet," and as the only one in its segment with four living sections, a full-size kitchen and a special crew suite. It comes equipped with the Vision flight deck with fly-by-wire technology and is powered by General Electric Passport engines that give it a top speed of Mach 0.925.

WILLIAM "BILL" JUVONEN, A FORMER U.S. MARINE CORPS PILOT and well-known business aviation executive, passed away at his home in Stamford, Connecticut, on Dec. 22, 2018, after a long illness. He was 81. A native Californian and Stanford University graduate, he earned his Wings of Gold in 1961 and served as a carrier-based fighter and helicopter pilot. During one training mission, his Crusader's wing failed, forcing Juvonen to eject over the desert in Yuma, Arizona. In a review of the incident, his commanding officer wrote, "controlled ejection, material failure, wing broke at fold, excellent job." Upon entering civilian life, Juvonen was recruited by super salesman Jim Taylor to work with him at Pan Am Business Jets, which was then marketing the new Falcon 20. He later moved to Cessna with Taylor to introduce and sell the Citation 500 business jet. After that, he teamed with Taylor yet again at Canadair in launching the Challenger program. All efforts were tremendously successful. Upon the sale of Canadair, he took over marketing at Polaris Aircraft and later was co-founder and chairman of Flight Services Group Inc., a major corporate aircraft operator based in Stratford, Connecticut.

BUSINESS JET DELIVERIES TO THE MIDDLE EAST ARE EXPECTED to total nearly 200 aircraft over the next decade, according to data from the Aviation Week Network, with 12 deliveries in 2019 rising to 20 in 2028. The top deliveries through the 10-year period from 2018 through 2028 are expected to be the Boeing 737 MAX, with 23 deliveries, followed by the Gulfstream G650, with the Bombardier Global 6500, Bombardier Global 7500 and the Gulfstream G600 tied for third place. At the same time, the business jet fleet in the Middle East is expected to grow to nearly 435 aircraft in 2019 and to 580 by 2028, with a compound annual growth rate of 3.3%, according to Aviation Week data. Delivery projections came ahead of the Middle East and North Africa Business Aviation Association (MEBAA) Conference held Dec. 10-12 in Dubai.

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INTERVIEW BY **WILLIAM GARVEY**

Sheryl Barden
President and CEO
Aviation Personnel International (API), San Francisco

The daughter of Jan Barden, who founded the renowned business aviation-oriented placement, recruitment and advisory firm 50 years ago, Sheryl Barden graduated from Penn State University and then made her mark in the paper goods industry, advancing through a variety of executive positions. After earning an MBA at the University of San Francisco, she joined API in 2001 and was named president two years later. She assumed the CEO responsibilities in 2013. In 2017, she was appointed to the NBAA's board of directors and also serves as vice chair of its Associate Member Advisory Council.

TAP HERE in the digital edition of ***BCA*** to hear more from this Interview or go to **aviationweek.com/fastfive**

Questions for Sheryl Barden

1 **You've reviewed countless business aviation resumes. What makes for a good one?**

Barden: If you're looking for a piloting position, it should describe your experience in depth: hours, command time, ratings, aircraft flown, international versus domestic flying. But perhaps even more important is to detail what you've done to deliver the most value to your organization. How did you contribute? Rather than simply noting you were a safety pilot, note that you developed a safety manual or a FOQA [flight operations quality assurance] program with measurable results. Any time your actions saved the company money, or measurably increased safety or efficiency, they need to be highlighted. This is an opportunity to prove your value and that should not be wasted.

2 **Considering that piloting is a technical career, is a bachelor's degree really a necessity anymore?**

Barden: It's an important differentiator in any career field. It's almost become a standard for anyone in business. It shows your dedication to education and to personal development. Are people being hired without one? Yes. Some build their hours first, and then get a degree on line, which is fine. But having a degree is especially important for those hoping to get a leadership position in business aviation. Keep in mind that in business aviation you're working with and serving some highly educated people and they want those around them to come from a similar place.

3 **The projections for growth in both airline travel and business aviation over the next decade and beyond are pretty heady. Do you think they'll prove out?**

Barden: Aviation has always been a cyclical business and I have doubts that things will continue at this pace. Clouds of concern are building in our economy. Dick Van Gemert [former Xerox and KC Aviation executive] is an industry sage who I really look up to. He recently reminded me that history has shown us that aviation leads the downturn and lags in the recovery. I don't think that's changed. He cautioned people should have a Plan B and I think that's good advice.

4 **And yet the combination of operational expansion and the forced retirement of a whole generation of airline pilots seems to have created a giant talent vacuum with all kinds of implications.**

Barden: The pilot shortage is the No. 1 topic in every pilot lounge; it's the subject of the year! And some pilots are afraid they're maybe going to miss the bubble. Charter and smaller fractional companies are really struggling to get and keep talent. There are corporate pilots holding their companies, their principal or the family for whom they work hostage by demanding compensation adjustments every couple of months. Some ugly things are coming out now, and in some places — not all — it's a get-as-much-as-you-can game. And that saddens me since I don't think they're looking at the whole package. We have to find a place where we balance out and are compensated fairly and appropriately. I am not sure where that is.

5 **Isn't trying to improve your circumstances a natural urge?**

Barden: Yes, but I'm concerned that in this frenzy, some are losing their moral compass. And if the demands for compensation are too high, and pilot salaries approach those of their reporting executives, companies will look for other solutions. Keep in mind that the young CEOs don't want to own things and also don't place as high a value on face-to-face meetings. These "millennial values" will certainly have an effect on our world. Back in the Great Recession, pilots coined the phrase "will fly for food." That wasn't so long ago, and while it may be hard to believe today, somewhere down the road that may become a reality again. **BCA**

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Richard N. Aarons
Safety Editor
bcasafety@gmail.com

When Irish Eyes . . .

The importance of **seeing things clearly**

BY **RICHARD N. AARONS** bcasafety@gmail.com

Can you recall the last time you actually extracted your smoke-shield oxygen mask from its compartment and visually checked it over? The current wording of FAR Part 121.333 says you should do exactly that on each preflight cockpit setup.

But, as Ireland's Air Accident Investigation Unit (AAIU) pointed out after a recent incident, "it has become custom and practice" for pilots to check oxygen and microphone functions with the masks in-situ in their stowage boxes beside crew stations rather than to physically remove them for visual inspection.

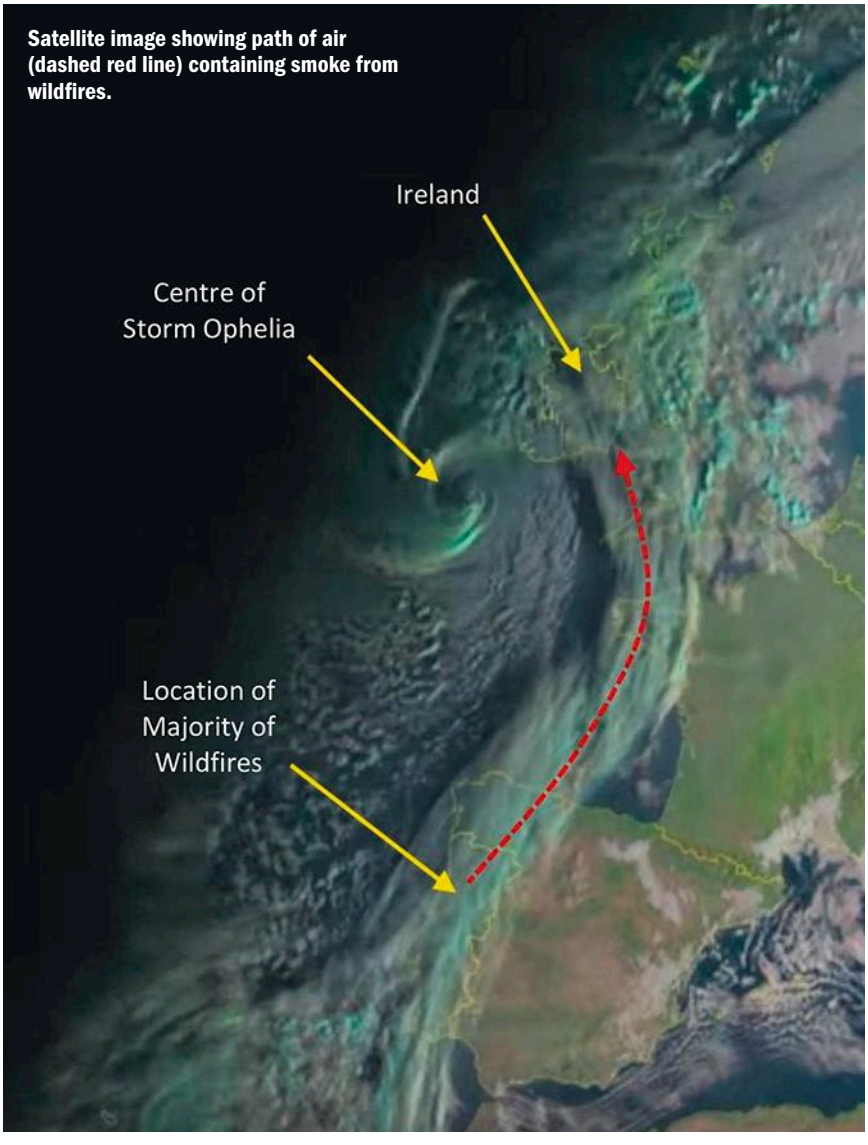
The case in point involved Embraer ERJ-190 air carrier pilots who found themselves with impaired visibility as they peered through scratched and degraded oxygen masks while shooting a CAT II approach. The situation was aggravated by an intermittent microphone failure in the copilot's mask.

The aircraft — the AAIU doesn't identify the carrier — pushed back at 0600 and launched from Cardiff Airport (EGFF) in Wales at 0614 for a scheduled passenger flight to Dublin Airport (EIDW) in Ireland with a crew of five and 75 passengers. The 42-year-old captain was the pilot flying (PF), while the 27-year-old copilot was the pilot monitoring (PM) and performing most of the communications with ATC. The takeoff, climb, en-route and initial descent flight phases were routine.

At 0635, the aircraft entered Dublin airspace and was cleared via a STAR for Runway 10. However, low-visibility weather conditions at Dublin had resulted in delays, and the incident flight was instructed to hold at BABON at FL 090, descending to FL 070. At 0706, ATC cleared the aircraft to leave the holding pattern and continue on the STAR to Runway 10. The flight was in and out of instrument conditions. Weather at Dublin included light rain and drizzle with scattered clouds at 100 ft. and a broken layer at 200 ft. Visibility was 3,500 meters (about 2 sm).

As the aircraft departed the holding pattern, it entered the top of a cloud layer and the flight crew noticed a burning smell, which they described as "sulfurous" and similar to that of "burning wood or paper."

The captain had experienced similar odors before and believed it might be originating from the aircraft oven. He contacted the senior cabin crewmember and asked if "everything was OK" in the cabin. In response he was told that the attendants could detect a burning smell in the rear of the cabin but that the ovens were not the source. The captain informed the copilot that there was a "smell of smoke in the cabin" and both pilots noted that the smell appeared to be getting more intense in the cockpit.



Satellite image showing path of air (dashed red line) containing smoke from wildfires.

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Exterior of pilot's smoke goggles showing scratches.

Copilot's smoke goggles showing obscuring layer on inner surface.

(No crewmember saw smoke at any time during this incident.)

At that point, both pilots donned their oxygen masks and noticed immediately that the face shield lenses were scratched. Indeed, their vision was obscured by the scratches and a "waxy coating." The pilots established communications with each other speaking through the mask microphones.

At 0712, ATC instructed the aircraft to descend to 5,000 ft. The controller heard no response from the aircraft and had to repeat this instruction twice. Shortly thereafter, the captain realized that he had not heard the anticipated copilot's transmissions through his headset, nor did he hear her intercom transmissions. The copilot's oxygen mask microphone seemed to have failed, so the captain confirmed the clearance with ATC.

Due to earlier low-visibility conditions at Dublin, the flight crew had expected and briefed for a CAT II approach to Runway 10. However, due to the communication difficulties and restricted vision caused by the smoke goggles, the captain elected to carry out a CAT I approach.

The captain took over radio communications and, at 0713, declared a PAN-PAN. ATC immediately gave priority to the flight and cleared it directly to GANET, a waypoint on the final approach to Runway 10. However, the flight crew had difficulty programming the FMS to comply with this instruction due to the restricted visibility through the goggles, and asked ATC to provide vectors to the Runway 10 localizer. The approach controller remained in contact with the aircraft throughout the event (rather than handing it off to the tower) until the aircraft had landed. Later, the captain would tell investigators that this action by the approach controller helped reduce cockpit workload.

The captain, frustrated by the poor visibility through the lens of his smoke goggles, briefly removed his mask to check if the smell of smoke was still present. It was, so he put his mask back on.

At 0714, the aircraft was cleared to descend to 4,000 ft. and this was acknowledged by the copilot whose oxygen mask microphone now appeared to be functioning. With the copilot able to resume communication with ATC, the captain took the opportunity to brief the cabin crew, stating that the aircraft was on final approach to Dublin, they would be landing in approximately 8 min., to expect a normal landing, that he had informed ATC of the situation on board, and to await further instructions on landing.

The copilot's oxygen mask microphone functioned normally until 0717, when she attempted unsuccessfully to contact ATC again. From this point, until the aircraft landed, all communications between the aircraft and ATC were carried out by the captain.

The pilots conducted the approach and landing checklists by holding the checklist up, pointing to an item and giving a "thumbs up" signal as a means of confirming the item had been actioned and positively checked as completed. This technique was made necessary by the restricted communications and reduced visibility through the oxygen mask face shields. Using this method, the aircraft was configured early for landing. The captain was able to see the aircraft flight instruments despite the problems with his goggles.

The captain conducted the ILS approach to Runway 10 with the autopilot

engaged. He acquired the runway visual references at approximately 300 ft. AGL, at which point he thumbed-off the autopilot and took over manual control for landing.

The aircraft rolled out at 0723 and was met by the airport fire services after it cleared the active runway. The emergency crew informed the captain that there appeared to be no signs of fire or damage on the exterior of the aircraft.

The flight crew removed their oxygen masks and noted that the smell of smoke had been reduced. The captain then asked the cabin crew for an assessment of conditions in the cabin and was told that the smell of smoke had lessened. With no obvious threat to safety, the flight crew requested taxi clearance to their parking position and disembarked their passengers normally at 0731.

The Smoke

The ERJ crew was not alone with smoke problems that day. The investigators were informed by the U.K. Air Accident Investigation Board (AAIB) that there had been a large number of similar reports that day, from a number of operators, regarding smoke/fumes in aircraft within U.K. airspace — at least 32 events.

The AAIB stated that the smoke/fumes were detected from between 2,000 ft. and FL 200, and that most of the aircraft either returned to land at the point of departure or expedited their existing approaches. Most crews declared either a PAN-PAN or a MAYDAY and the majority of crews went on oxygen. The first event appears to have been around 0622 during departure from Liverpool, climbing through

Accidents in Brief

Compiled by Jessica A. Salerno

Selected accidents and incidents in December and November 2018. The following information from the NTSB is preliminary.

▶ December 13 — At 1044 CST, a Piper PA24-250 (N6785P) crashed during a loss of control on initial climb after takeoff. The airplane was departing on Runway 9 at the Porter County Regional Airport (VPZ), Valparaiso, Indiana. The pilot was killed in the accident and the airplane was destroyed. The airplane was registered to and operated by the pilot as a personal flight. It was VFR for the flight, which was not on a flight plan. The flight was originating at the time of the accident for an unknown destination.

Witnesses reported seeing the accident airplane taking off from Runway 9 at VPZ and when the airplane was a few hundred feet above the runway the right wing dropped and the airplane entered a spin to the right and hit the ground.

A surveillance video from a camera mounted on a building near the accident captured the final portion of the accident sequence. The airplane can be seen entering the frame of the video and then the right-wing drops, and the airplane enters a spin to the right. The airplane completed one revolution in the spin before impacting the ground in a near vertical attitude.

The Piper hit the ground about 3,700 ft. east of the approach end of Runway 9 and 250 ft. south of the runway centerline. The airplane was facing east and had crushing of the forward fuselage and the leading edges of both wings.

The airplane had four fuel tanks. Each wing had a rubber bladder type main fuel tank within the wing structure, and a tip mounted tank. All four fuel tanks were ruptured, and no fuel remained in any tank. It was raining during the initial on-scene examination and no fuel odor was detected. The fuel selector valve was found positioned to the right fuel tank and the handle was in the detent for that position. The two electric fuel pumps were removed from the airframe and both electric fuel pumps pumped a liquid when electrical power was supplied to them.

▶ December 13 — About 1318 EST, a Czech Sport Aircraft PiperSport (N145MM) was heavily damaged during a forced landing following a total loss of engine power while on approach to Punta Gorda Airport (PGD), Punta Gorda, Florida. The sport pilot received minor injuries. It was VFR for the personal flight that departed Winter Haven's Gilbert Airport (GIF), Winter Haven, Florida, about 1330.

According to the pilot, the accident occurred on the second flight of the day. He departed PGD about 1015 with 29 gal. of 100LL aviation fuel on board and flew about 40 min. to GIF uneventfully, where he had lunch. He departed GIF about 1330 for the return flight to PGD. About 4 mi. from the airport, at 1,000 ft., he was cleared to land on Runway 15. While on an extended base leg of the traffic pattern, he turned on the electric fuel pump as prescribed in the descent checklist. As soon as he activated the switch, the engine lost all power. He switched fuel tanks and attempted to restart the engine but was unsuccessful. Unable to reach the airport and at an altitude too low to deploy the airframe parachute, he selected a small field for a forced landing and advised the PGD control tower of his intentions. During landing, the airplane struck a fence and a utility pole.

Examination of the wreckage by an FAA inspector revealed that all major components of the airplane were present at the accident site. The right wing was substantially damaged outboard of the wing root, and section outboard of the flap was completely separated. The left wing was substantially damaged aft of the spar and forward of the flap at the wing root, and along the entire chord outboard of the aileron. Fuel was present in both the left and right fuel tanks.

The airplane was equipped with electronic primary and multifunction flight displays capable of recording flight and engine data. According to aircraft maintenance records, the most recent condition inspection was performed on November 8, 2018, at a total time of 552 hr., which was about 8 flight hours prior to the accident.

The pilot reported approximately 2,500 hr. of total flight experience.

▶ December 4 — About 1055 EST, a Lancair LC41 (N618G) was substantially damaged during a forced landing following a loss of engine power Moscow, Pennsylvania. The private pilot was not injured. It was VFR for the personal flight

FL 130; the aircraft returned to land. There were clusters of affected aircraft in the Channel Islands, Liverpool, Manchester and, later in the day, at London.

It turned out that up to 8,000 wildfires were burning between Oct. 13 and 18 across northern Portugal and northwestern Spain. Hurricane Ophelia was passing by offshore, fanning the fires and pushing the smoke northward along with its own path.

Ireland's weather service said later that "the sheer scale of the wildfires in that area meant that the air quickly became highly concentrated with dense smoke. With this being the source area for the air mass over Dublin at 0700z and the strong winds dragging this air quickly northward, it is perhaps unsurprising that the smoke was dense enough to register in the cockpits of commercial aircraft flying at the time."

"As a result," said the Irish air safety investigators, "it is clear that the detection of smoke on numerous commercial aircraft on that date can be attributed to the rapid advection of air laden with particulates from Iberian wildfires northward over Ireland and the U.K. by Ophelia." Satellite imagery from EUMETSAT verified this theory.

The Irish investigators pointed out that ICAO standards and recommendations for SIGMETs list thunderstorms, cyclones, severe turbulence, severe icing, severe mountain waves, dust or sand storms, and volcanic ash — but there is no requirement to include the presence of large quantities of smoke in the atmosphere. Subsequently, the Irish AAIU recommended that ICAO include heavy atmospheric smoke in its SIGMET standards.

Oxygen Mask Smoke Shields

Following the event, an AAIU technical team examined the subject ERJ's masks. Visibility through the lenses of both pilots' masks was found to be severely restricted by scratches on the outer surface and an obscuring layer on the inner surface. (The copilot's mask microphone tested operational using the aircraft's intercom.)

The Maintenance Planning Document (MPD) issued by Embraer calls for two mask checks: an Operational Check, and a Detailed Visual Inspection Check. The inspection interval for both checks was every 3,750 flight hours. The last inspection was performed on the incident airplane's masks on Dec. 18, 2016. The aircraft had flown 1,936 hr. since that inspection. The operator has since decided to check and clean the masks every 750 hr.

The operator carried out a fleet inspection of all ERJ 170-200 STD and ERJ 190-200 LR masks. Of the 57 masks checked, 17 were found serviceable, 36 required "cleaning to remove deposits on the surface of the lens, and four required both cleaning to remove deposits, and polishing to remove scratches to the surface of the lens."

(The operator also told the AAIU that one other flight crew had experienced smoke in the cockpit on the same day as the subject event, had donned their oxygen masks, and had experienced intermittent microphone performance with one of the oxygen masks.)

The airline advised the AAIU that, "following a fleet-wide inspection, the majority of masks showed a buildup of dust, or debris, which necessitated

Accidents in Brief

that was operating on an IFR flight plan. The Lancair departed Wings Field Airport (LOM), Philadelphia, Pennsylvania, about 1035, destined for Greater Binghamton Airport (BGM), Binghamton, New York.

The pilot stated about 20 min. after departure the airplane shuttered. He adjusted the engine power and the airplane shook again. He advised the ATC he was having engine trouble and was given a heading to Wilkes-Barre/Scranton International Airport (AVP), Wilkes-Barre/Scranton, Pennsylvania. The engine continued to shake, the pilot reported that there was smoke in the cockpit. About a minute later the engine lost power completely and he performed a forced landing to a field.

An FAA inspector examined the airplane and noted there was substantial damage to the left wing and multiple holes in the top of the engine crankcase. The four-seat, low-wing, fixed landing gear equipped airplane was manufactured in 2004. It was powered by a Continental TSIO-550, 310-hp engine.

The pilot held a private pilot certificate with a rating for airplane single-engine land and instrument airplane. His most recent FAA third-class medical certificate was issued on March 7, 2018. At that time, he reported a total flight experience of 1,430 hr.

At 1054, the weather conditions reported at AVP, about 6 mi. west of the accident site included, wind from 320 deg. at 13 kt., visibility 10 sm, few clouds at 3,000 ft., broken at 3,900 ft., temperature 1C, dew point -7C, and an altimeter setting of 30.11 in. of mercury. The wreckage was retained for further examination.

▶ **November 29 — About 1421 EST, a** Piper PA-30 airplane (N7751Y) impacted terrain following a loss of control shortly after takeoff from the Marion Municipal Airport (MZZ), Marion, Indiana. The airline transport pilot, who was the sole occupant, was killed and the airplane was destroyed. The airplane was registered to and operated by a private individual as an FAR Part 91 personal flight. It was VFR and there was no flight plan filed. The local flight was originating at the time of the accident.

According to witness information, the airplane departed Runway 22, climbed to about 500 ft. AGL, and began a left turn. During the left turn, the airplane "nose dived" in a downward spiral toward the terrain. The airplane crashed and a post-impact fire ensued.

According to local authorities and witness information, the pilot, who was also an airframe and powerplant mechanic, had been troubleshooting an unspecified problem with the left engine. One witness described the accident flight as "test flight."

The airplane wreckage was located in a soft and wet harvested soybean field about 1/4 mi. south of MZZ. Post-accident examination of the airplane showed the fuselage, empennage and inboard sections of both wings were consumed by post-impact fire. The left engine and propeller assembly remained

cleaning of the lenses. The inspection did not identify any specific cause of the contamination, and it was considered just time-related insofar as the buildup was concerned."

The manufacturer of the oxygen mask told the AAIU that the mask lenses were affected by "blooming." This is a condition in which additives in the lens base material (polymer) have migrated and collected on the surface of the lens, thereby causing a reduction in visual clarity. The effect had been reported by other operators, and the manufacturer issued information and training videos for proper cleaning methods to mitigate the problem. "For new production masks built from October 2017, we have implemented an ultrasonic cleaning for the lenses during our production process. This step is intended to eliminate the blooming," said the manufacturer.

Probable Cause

The AAIU found the probable cause of this incident was the "smell of smoke in the aircraft, necessitating the donning of oxygen masks by the flight crew, which compromised crew performance due to communications difficulties and obstructed visibility through the mask lenses."

Contributing causes were:

(1) Smoke from wildfires on the Iberian Peninsula drawn toward Ireland and the U.K.

(2) Lack of a formal method to notify flight crew of such atmospheric conditions.

(3) Propensity of the surface of oxygen mask lenses to suffer "blooming."

(4) Inspection frequency insufficient to detect blooming and environmental contamination on the surface of mask lenses.

The AAIU recommended that ICAO consider the inclusion, as appropriate, in its SIGMET requirements the provision of information to flight crews on the presence of smoke in the atmosphere from ground fires.

The investigators also recommended that the FAA review the FARs relating to preflight inspection of flight-crew oxygen equipment, to ensure that they address the use of stowed oxygen masks.

What's to Be Done?

With all that said, it might be a good practice to drag your goggle-equipped oxygen mask out of its box once in a while to check it over. Indeed, that check might become part of your checklist someday. After all, as stated in Part 121 (Operating Requirements: Domestic, Flag and Supplemental Operations), Section 121.333, Supplemental Oxygen, Paragraph (c), Use of Oxygen Masks by Flight Crewmembers, Sub-paragraph (4):

"Before the takeoff of a flight, each flight crewmember shall personally preflight his oxygen equipment to ensure that the oxygen mask is functioning, fitted properly and connected to appropriate supply terminals, and that the oxygen supply and pressure are adequate for use."

When asked about this reg, according to the AAIU, the FAA said that the regulation "may potentially mean that prior to each flight a flight crewmember would physically inspect a mask, by placing it on their face to check fit and function. Thus, by default, visibility through integrated goggles, if fitted, would also be checked." Seems like a good idea. **BCA**

partially attached to the airframe. One propeller blade showed no damage, and one propeller blade was straight and bent aft. The right engine remained partially attached to the airframe, and the right propeller assembly was separated from the engine, aft of the crankshaft flange. One blade was twisted and bent forward, and one blade was twisted and bent aft.

▶ **November 26 — About 1950 MST, a** Mooney M20C airplane (N113TA) impacted terrain about 1/3-mi. south of the Santa Fe Municipal Airport (SAF), Santa Fe, New Mexico. The pilot was fatally injured. The airplane was destroyed by impact forces and a post-impact fire. The airplane was registered to Nelson Flying Service and operated by the pilot as a Part 91 positioning flight. Night VFR conditions prevailed. There was no flight plan filed for the flight that originated from the Phoenix Goodyear Airport (GYR), Goodyear, Arizona about 1500 and was destined for the Colorado Plains Airport (AKO), Akron, Colorado.

A friend reported that the pilot had recently purchased the airplane and was planning to relocate it to AKO in order to have an annual inspection completed.

Employees of the Lux Air Jet Center at GYR reported that the pilot had completed some maintenance on the airplane during the preceding few weeks. However, they had not provided any maintenance services to the pilot and, to their knowledge, there had been no other third-party maintenance work done on the airplane. The airplane was fueled about one month before the accident flight at the request of the pilot.

A witness stated that he observed the airplane twice shortly before the accident. Initially, he heard the airplane but did not see it. He was only able to locate it from the ambient lighting surrounding the airport because there were "no lights whatsoever on the airplane." The airplane appeared to be on an "abbreviated" left downwind for Runway 20 at SAF. In both instances, the airplane turned and crossed over the approach end of the runway before he lost sight of it. His perception was that the pilot was not trying to land at that time, rather he may have been trying to attract the attention of the tower controller. The airplane appeared to be in a "clean" configuration, with the landing gear and wing flaps retracted. The engine sounded as if it was at a "medium" power setting and he did not suspect any issues with the engine. Shortly after losing sight of the airplane the second time, he heard sirens related to the emergency response to the accident.

The airplane impacted a shallow ravine south of the airport. The fuselage and empennage were consumed by a post-impact fire. The wings were located in position relative to the fuselage and exhibited leading-edge crushing damage along the entire span of both wings. The inboard portions of the wings were damaged by the post-impact fire. The engine and propeller were located with the wreckage.

At 1953, the recorded weather conditions at SAF included a clear sky and wind from 360 deg. at 4 kt. Sunset occurred at 1652 on the day of the accident, with civil twilight ending at 1719. The moon set at 1015 and did not rise again until 2034. **BCA**

Paranoid Pilots Club

A few techniques from a charter member

JAMES ALBRIGHT

A pilot's last chance inspection before engine start.

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

"Sometimes paranoia's just having all the facts."

— William S. Burroughs

Let me admit up front that I am paranoid about all things aviation. For some reason, I have no problem making assumptions and trusting others when away from airplanes, but the minute aviation is involved, I turn into another person. I know all of this because there are pilots who don't have the same level of mistrust and are only too eager to let me know that I have a serious trust problem.

As far as I can see, we pilots fit into two groups. Half of us are compelled to double-check things that have already been checked. We need to see technology safeguards in action under various circumstances to learn to start to relax. We hear about another pilot's misfortune and immediately think, "That could have been me!" And the other half? They are the ones not caring a whit until they are bitten by a mistake and have to resort to the lamest excuse of them all: "There are those who have and those who will."

Some of these mountains disguised as mole hills seem to be of such a random (or rare) occurrence that you are tempted to dismiss them as "one of those things." When someone more paranoid than you suggests a technique to avoid recurrence, your first reaction may be to dismiss the whole idea. "It will never happen again" may morph into "it hardly ever happens." Then one day, if you are the one bitten, it will suddenly hit you: "That was a pretty good idea after all."

So, here are a few examples of my paranoia and case studies where a little of that condition would have saved lives, or at the very least, would have spared the aircraft from significant damage. But good paranoia extends beyond specific case studies and techniques. If you learn to harness your inner paranoid pilot, you too can spot opportunities to prevent the next big mistake from biting you or your peers.

Paranoid About Fuel

In all my years of flying I have only twice felt unsure about having enough fuel to make it to Point B after thinking I had enough when leaving Point A. The first time was in an Air Force T-37B leaving McGuire Air Force Base, New Jersey for what used to be Loring Air Force Base, Maine. Air traffic control held us down at 6,000 ft. as our hungry J69 engines devoured what little fuel we had at twice our planned rate. The second time was in an Air Force Boeing 707 flying from Honolulu to Anchorage, Alaska (PANC). At the proverbial equal time point, one of our largest fuel tanks started to vent into the aft cabin and out the tail of the airplane.

In the first case, I was clearly an idiot for not declaring an emergency and reversing course. In the second, I was a victim of circumstance. We landed safely both times, but the lesson was

PORTUGAL ACCIDENT INVESTIGATION FINAL REPORT

Air Transat 236's cracked fuel pipe

the same: You need to worry about having enough gas from the moment the fuel truck arrives until the engines are shut down at your destination.

The captain of Air Transat Flight 236 back on Aug. 24, 2001, could have benefited from this kind of paranoia. While he is looked upon as a hero in some aviation circles, there is no escaping the conclusion of the Portugal Aircraft Accident Board: He failed to recognize a fuel leak situation and turned his Airbus into a glider.

The flight was scheduled to fly from Toronto-Pearson International Airport, Canada (CYYZ) to Lisboa-Portela de Sacavém Airport, Portugal (LPPT). The aircraft was loaded with 47.9 metric tons of fuel, including a 5.5-metric ton-reserve. But the crew ran out of gas and flew a flawless dead stick landing into Lajes Airport, Azores (LPLA).

This story is filled with complications, as these stories often are. It began with a right engine change a week prior to the incident flight, but the new engine was slightly modified and called for a post-modification hydraulic pump. Evidence indicates that since the new type of pump wasn't available, a screwdriver or other blunt instrument was used to wedge the existing pump's hydraulic lines into place with just barely adequate clearance from adjacent fuel lines. But these lines tend to flex once pressurized and they contacted and started to fatigue prematurely. About 4 hr. after takeoff, passing 30 deg. west longitude, the fuel line finally fractured.

The aircraft's warning system notified the crew that they had a fuel imbalance, with the left wing becoming too heavy. The crew ran the fuel imbalance checklist from memory by opening the crossflow valve, turning off the fuel pumps on the right side, and allowing the heavy left wing to feed the light right wing. Although they realized their total fuel was dropping below flight plan predictions, they did not consider the possibility of a fuel leak. Once the total fuel fell below that required to complete the flight to Portugal, they elected to divert to Lajes.

Since there was no external sign of a fuel loss from the wings, the crew continued to believe the warnings were false. It appears that the fuel leaking from the right engine was vaporizing into the engine's exhaust, unseen from the cabin. About 150 mi. from Lajes, the right engine flamed out, followed by the left engine when they still had 65 nm to go. The captain very ably glided the airplane to the runway, flew a 360-deg. turn to lose altitude, and crossed the threshold at 200 kt. The aircraft came to a stop 7,600 ft. down the 10,000-ft. runway. There were a few minor and serious injuries, but no fatalities.

The captain received the Air Line Pilots Association Superior Airmanship Award the next year. I agree that his airmanship following the loss of both engines was indeed superior. But I think his poor airmanship prior to the fuel imbalance caused the event in the first place. Had the crew referred to their fuel imbalance procedure, they would have been led to the fuel leak checklist. That checklist would have had them shut down the right engine and stopped the fuel leak. You may think that I am guilty of "Monday morning quarterbacking," but those are the facts as presented by the accident board.

Putting the question of blame aside, I think a simple technique can help you avoid a similar fate to this and other fuel shortage problems. All that is required is a ballpark estimate of how much fuel you need to start a flight, and how much you need to complete the flight at any point while aloft.

You should have an idea of how much fuel your airplane burns per hour on average. You may need to adjust the burn rate with the passing hours, but you should come up with a simple metric that can be easily memorized and applied. If the rule of thumb is too complicated, it is more likely to be forgotten or applied incorrectly.

In the Boeing 747-200s that I used to fly, we tended to burn an average of 26,000 lb. of fuel per hour. If we were flying a 5-hr. leg, for example, we needed at least 130,000 lb. This is fuel loading with the accuracy of a sledgehammer, but it is good enough to realize that 100,000 lb. of fuel in the tanks isn't enough. In my current aircraft, a Gulfstream G450, I plan on 4,000 lb. the first hour, 3,500 lb. the second, and 3,000 lb. from then on. Once again, I would never plan my fuel loads with such a crude estimate, but it helps me apply a reasonableness check.

I once fell into a common trap of those who fly the same trip, over and over. I was used to arriving at Teterboro Airport, New Jersey (KTEB), and asking for the minimum amount of fuel to waive handling fees. For my aircraft at our favorite FBO, that meant 560 gal., more than enough to make it home to Hanscom Field, Bedford, Massachusetts (KBED). One day we broke the pattern with a second leg to Mexico City. As the fuel truck driver gave me the "I'm done, are we done?" thumbs up, I looked at the fuel gauges and realized 10,000 lb. of total

ROLAND WINKLER

Gulfstream G450 N667HS

fuel wasn't enough to fly the 5-hr. trip ahead.

The technique can be extended to hourly checkpoints during flight. We often do this during oceanic flights when comparing total fuel to our master documents. Of course, we have more divert options when flying domestically, but the technique is equally valid. Flying from coast-to-coast in the U.S. with 3 hr. to go, an airplane that burns 3,000 lb. an hour with only 6,000 lb. on board will probably come up short

Paranoid About Gear Pins

When I was a new hire in a Gulfstream GV flight department, I retained my practice of always showing the other pilot the gear pins after I had pulled them. We had three pilots in the flight department and I was junior in seniority. The other two pilots said it was unnecessary to show the gear pins as "we" would never forget them. They allowed me to continue my practice but refused to join in. This went on for two years until they departed one day with the gear pins installed. To their credit, they ran the proper checklists, landed, pulled the pins, and continued.

You cannot pull the pins on a GV-series aircraft after attempting to raise the gear handle without running a checklist to reset the electronic gear selector valve. The gear handle on this airplane is nothing more than an electrical switch connected to a black box that controls the hydraulics. If the process is interrupted by forgotten gear pins, a checklist is needed to bring everything back in sync with the gear handle. It is definitely counterintuitive to any pilot used to a conventional landing gear system. But not every GV-series crew is sufficiently paranoid about this.

On April 11, 2017, the crew of Gulfstream G450 N667HS returned to land at Salzburg Airport, Austria (LOWS) after declaring a PAN. It appears the crew took off with the landing gear downlock pins installed, raised the gear handle to the UP position, and then returned the handle to the DOWN position, landed, and pulled the pins. On just about any other airplane, the story would have ended there. But because they failed to accomplish the checklist needed to reset the selector valve, things became complicated. After the pins were removed and hydraulic pressure reapplied when the pilots attempted to close the open gear doors, the landing gear retract circuits were activated. The nose landing gear retracted, causing the nose to fall on to the pavement. Since the main landing gear had a higher proportion of weight and a different mechanical downlock system, the mains remained extended. The aircraft was damaged significantly.

Gulfstream G450 gear pins in their storage block.

JAMES ALBRIGHT (2)

Gulfstream gear pin holder installed between the gustlock and flap handles.

Even on an aircraft with a more conventional downlock system, pilots forgetting the gear pins prior to takeoff can suffer major embarrassment if the aircraft is too heavy to return for landing without spending hours burning holes in the sky to reduce weight. At the very least, pilots lose significant "pilot style points" when having to return to remove the forgotten pins.

There are many "don't forget the pins" techniques, often employed by pilots who have forgotten theirs and are determined not to repeat. My technique is about as simple as most but requires the ritualization of a few extra steps. Our aircraft came with a metal storage block used to keep the pins neatly organized that many pilots could dismiss as an odd piece of bling with a strange notch cut into it. But there is an ingenious purpose behind the notch because in some Gulfstream aircraft it is designed to fit between the cockpit's gustlock and flap handles. If installed

properly, it prevents the flaps from being extended beyond the 0 deg. (UP) position with the gust lock deployed.

The gear pin holder isn't of much use, however, unless it is used ritually. If you get into the habit of ensuring the gear pin holder only has two conditions, it will prevent you from ever forgetting to remove the gear pin holders before flight. First, if the pins are removed, they must be in the pin holder and stored. Most Gulfstream crews, for example, store the pins in a compartment in the main entry door stairs. Second, if the pins are installed in the landing gear downlocks, the pin holder must be in the cockpit. You can place the pin holder on the gust lock handle, as designed, or on top of the fuel control "run" switches.

Even if you don't have such a pin holder designed for this dual purpose, you can achieve the same ends by having a gear pin bag that also has only two states. The bag is either holding the pins and stored or covering the throttles as a reminder.

Another invaluable technique for this situation is the "last chance check." The last chance is a staple of fighter aviation. The fighter taxies to the end of the runway with all its ordnance and guns "safetied." A ground weapons specialist "unsafeties" the weapons and looks the airplane over. It is the last chance to make sure everything is good to go. You can do this too. I never close the cabin door until ready to start engines. At that point, my last act before closing the door is to walk to the nose of the aircraft, kneel down so as to have a complete view underneath the airplane, and scan from wingtip to wingtip. I've never forgotten the gear pins to this point, but I have caught chocks and an open fuel door. The last chance check can make up for a multitude of sins. But like most techniques of this type, you have to use it all of the time for it to work.

Paranoid About Cabin Altitude

If you are in the business of high-altitude flight, you probably regularly practice a decompression in a simulator with the aim of descending rapidly to breathable atmosphere. In fact, your initial aircraft type certification probably requires the maneuver. I have been practicing the maneuver in all sorts of aircraft simulators and have had it happen to me in real airplanes twice. There was no mistaking the event in the airplane and the simulator training proved invaluable. But what about a pressurization scenario of a more insidious nature?

NTSB

Cessna 421C N48DL, moments before submerging in the Gulf of Mexico.

I know of at least five aircraft that have been lost with all souls on board due to a failure to pressurize or a slow loss of pressurization. The greatest loss of life was with Helios Airways Flight 522, a Boeing 737, on Aug. 14, 2005. All six crewmembers and 115 passengers were killed.

The airplane was written-up on the flight before the accident for sounds of a pressurization leak around a service door. A mechanic signed off the airplane after applying the troubleshooting procedure from memory. He set the pressurization system to its manual mode and used an external air source to ensure the cabin pressure differential could be brought to its maximum limit.

This ad hoc procedure failed on two counts. First, the fact the cabin could maintain maximum pressure with the external air source did not rule out a leak. Second, he failed to return the pressurization system switch to its automatic mode, as the troubleshooting checklist would have directed. He returned the aircraft to service with the pressurization switch set to a manual mode. The crew failed to catch the misset switch, took off and misinterpreted the cabin altitude warning horn during the climb. (The warning horn had two modes. On the ground, the warning horn meant an improper takeoff configuration. Inflight, it was used to alert the crew of a high cabin altitude.) Everyone on board eventually passed out and perished once the airplane ran out of gas and crashed.

As tragic as was that loss, a more typical example of slow-onset hypoxia occurred on April 19, 2012, involving Cessna 421C N48DL. The case is more typical because the airplane was lost at sea and we will never know what caused its failure to pressurize or its gradual loss of pressurization. The aircraft departed Slidell Airport, Louisiana (KASD) for Sarasota, Florida (KSRQ) with only the pilot on board. Everything appeared normal when he contacted ATC at FL 270. But problems became apparent 20 min. later when he started to deviate from course and altitude. When efforts to contact him failed, the North American Aerospace Defense Command launched fighters to intercept. The fighter pilots reported the Cessna twin was circling in a left-hand turn at a slow speed, the windows were frosted over, and the pilot was slumped over in his seat. The aircraft continued to circle for 3 hr. before crashing into the Gulf of Mexico.

In these and other hypoxia case studies the classic pressurization and hypoxia lessons are immediately apparent. Fuselage pressure leaks should be addressed immediately and repaired following the manufacturer's recommended maintenance procedures. Oxygen supply and delivery equipment must be thoroughly checked during each and every preflight. When troubleshooting a pressurization problem, donning oxygen quickly will not only improve your mental capabilities, it can keep you in the game if things go wrong quickly or insidiously.

But the problem with slow-onset hypoxia is that by the time you have been affected, you may not have the mental ability or physical dexterity to react properly. What about technological solutions? In many such cases, warning systems either failed or were misinterpreted. Even when working correctly, the warning sometimes comes too late. Typical cabin pressure alerts trigger at 10,000 ft. cabin altitude. But if the pressure was just below that point for an extended period, you may not have the mental alertness to react correctly. Some pilots fly with oximeters to measure blood oxygen saturation levels. These are effective but require the pilot to have the presence of mind to use them at the right time. What about checklists?

The checklist in the Cessna 421C Pilot's Operating Handbook is typical of many aircraft when it comes to pressurization systems. It instructs pilots to set the system in the climb and reset it during cruise, but not to check how well it is working otherwise. Many business jets have a "Pressurization system . . . . check" step in the climb checklist, but little is written about when to check

A Gulfstream G450 cabin altitude gauge in a climb, passing 10,000 ft. aircraft altitude.

it or, in fact, what to check. I can offer a technique to reliably prevent a pilot's failure to notice their aircraft has failed to pressurize before it's too late.

If presented with a "climb checklist" sandwiched between a "takeoff checklist" and a "cruise checklist," pilots are given wide latitude as to when the checklist steps are accomplished. Some pilots will be tempted to accomplish the climb checklist immediately, just to get it out of the way. Having spent many years on jump seats observing other crews, I think this might be the most common approach. If the pressurization system is checked at a low altitude, the cabin altitude may not have budged at all and the check becomes almost useless. Another technique is to wait until passing transition altitude, typically 18,000 ft. This lumps other checklist items together for convenience. If the cabin is struggling to keep up with the climb, waiting this long may keep the cabin pressure numbers below alert limits but not low enough to prevent mental incapacitation.

I recommend you always check your pressurization system at 10,000 ft. aircraft (not cabin) altitude. If the airplane failed to pressurize during a normal climb, you should still be mentally aware enough to react accordingly. This answers the question of when to check, but many pilots check the wrong thing and what they have checked doesn't give them the information needed to realize there is a problem.

We pilots often gravitate toward technical numbers because they reassure us that there is science behind all that we do. When checking cabin pressure, it can be comforting to report, "we have a Delta-P of 3.0." If you are passing 10,000 ft. aircraft altitude, is a differential pressure (Delta-P) of 3.0 lb. per sq. in. the right answer? It could be for your airplane, but it certainly is not for mine. But even if it is the right answer in this instance, do you intuitively understand how to deal with a Delta-P slightly higher or lower?

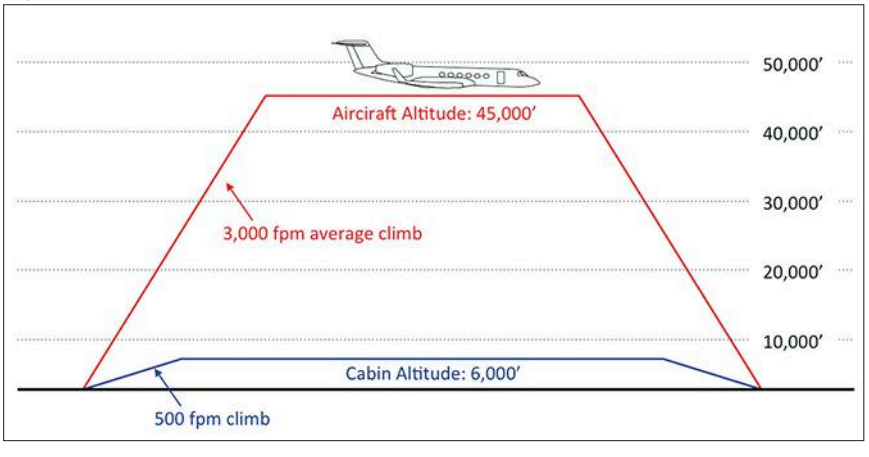
I recommend that you always check your cabin altitude in terms of the number of feet of altitude; announce this out loud to place this information into your subconscious so you can log away the correct range of answers. Chances are, however, that you don't know the correct answer unless you've specifically looked for it. So, let's take a quiz. Let's say you are climbing to an altitude in the middle-to-upper range of your airplane's capability. If you haven't been delayed in the climb by ATC more than a minute or two, what should your cabin altitude be when passing 10,000 ft.? For my aircraft, the answer is right around 500 ft. Does that number seem impossibly low?

My aircraft can average 3,000 fpm in a climb to 45,000 ft. and the climb rate in the first 10,000 ft. can be double or triple that. I can make it to 10,000 ft. in a minute or two. Most aircraft, mine included, will pressurize at a rate of 500 fpm. So, I should rarely see more than 1,000 ft. cabin altitude at 10,000 ft. aircraft altitude unless I've been held at a lower altitude for an extended period.

You should also check your cabin altitude once you level off at cruise. My aircraft has a maximum cabin altitude of 6,000 ft., even when cruising at 45,000 ft. Hence, I should never see more than that. If your cabin is pressurizing but a leak is causing it to slowly depressurize, the rate could be so insidious that the cabin pressurization is OK once you level off but will eventually climb above your maximum allowed altitude. By the time that happens, it may be too late for you to recognize it. In my case, if I level off and see a 7,000-ft. cabin altitude (1,000 feet below the system's warning threshold), I will know I have a problem even though the aircraft warning systems remain blissfully happy.

You should learn your aircraft's normal cabin altitude during a climb when passing 10,000 ft. aircraft altitude. You should already know your aircraft's maximum cabin altitude. If you check your cabin altitude when passing 10,000 ft. aircraft altitude and at level off, you should never be surprised by a failure to pressurize or a fuselage leak.

A generic aircraft pressurization schedule



Paranoid About Vertical Speed or Pitch Hold Mode in a Climb

Another hazard of high-altitude flight is the need to maintain a smooth, adequate climb even as the air thins and the temperature drops, rises and drops again. Most autopilots feature a vertical mode that places a priority on keeping a

target speed that should keep you comfortably above the stall angle of attack (AOA). Known as "flight level change," "speed hold" or something similar, the mode is preferred because it keeps engine thrust at the maximum permitted while varying pitch to hold that precious airspeed or Mach number. But whatever the mode is called, it is not always as smooth as we like. For that we often revert to another mode, usually called "vertical speed mode."

Vertical speed mode holds the erratic pitch changes to a minimum but requires the pilots to constantly monitor the climb rate against airspeed and thrust levels. As long as the engines are below the maximum permitted thrust level, the vertical climb rate and airspeed are maintained. But if the thrust required exceeds the thrust available, the autopilot still holds the vertical speed and the forward speed (airspeed or Mach number) suffers. This is a recipe for an aerodynamic stall.

Some airplanes may have similar issues with a "pitch hold" mode that can engage when the pilot fails to select a vertical autopilot mode or fails to realize the autopilot has done this by default. If the autopilot is doing nothing more than maintaining a certain pitch angle in a climb, the aircraft will eventually run out of airspeed as the air thins and thrust available decreases below thrust required.

You might argue that your stall warning or barrier system will keep you out of trouble. You might also argue that your instrument crosscheck will keep on top of things. In 1979, an Aeromexico crew flying a DC-10 almost lost their aircraft because they didn't understand their autopilot didn't care about airspeed when it was engaged without a vertical mode. It resorted to vertical speed mode in the climb and the aircraft stalled. The crew confused the stick shaker for an engine problem, shut down the center engine and then witnessed their airplane lose over 10,000 ft. before recovering. Incredibly, they restarted the engine and proceeded to fly across the Atlantic.

In 2013, a Cessna CJ2+ pilot almost lost his airplane because the vertical speed mode decided holding the climb rate was more important than keeping the airplane flying. The stall barrier system was defeated by a small sliver of ice in the single AOA probe. He claims his attention was diverted for only a few seconds. The aircraft stalled and the ensuing recovery included five 360-deg. rolls, enough G forces to bend the wings, and a loss of 10,000 ft. This pilot is lucky to be alive.

It is tempting to say these were pilots of inferior stock because they failed to recognize the obvious signs of a stall. But what are those obvious signs? We all know intuitively that the wings buffet and the nose drops. But is that really true? Very few of us ever get the chance to actually stall a high-performance aircraft. Our primary flight training is usually in a low-performance, single-engine prop aircraft designed to teach the wing buffet and nose drop. It is a good lesson in that it educates us that we need to break the stall AOA. But in some ways these lessons are counterproductive. Do you always get the wing buffet? Does the nose always drop?

Low-performance aircraft and some higher performance aircraft of earlier generations gave early stall warnings because their wings did not hang onto the airflow at high AOA. The flow separated early and created an aerodynamic buffeting on the wing that was often felt in the tailplane, giving the pilot tactile feedback in the pitch controls. This buffet can be completely absent in some high-performance aircraft, hence the need for stick shakers, nudgers, pushers or a combination of stall warning devices. So, you may not always get adequate warning if these systems are inoperative or you fail to interpret them correctly. But surely you would never fail to recognize the sudden nose drop!

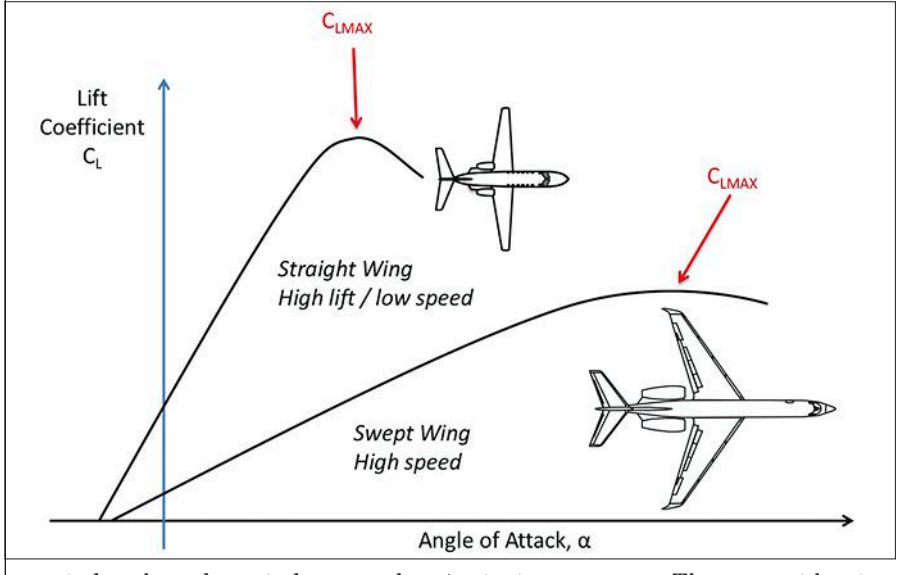
The beauty of the sudden nose drop after an aerodynamic stall is that it leads the pilot into making the correct initial response: an aggressive decrease in AOA. But basic flight training also leads us to expect this aircraft behavior for all aircraft, especially if we've never experienced a full aerodynamic stall in any other aircraft. In our minds, we've seen stalls in the simulator in our high-performance jets. But that is rarely true. Stalling a large jet can be dangerous and the regulations rarely permit it. In most cases, we are taught to recover from the initial signs of a stall. That could be naturally occurring buffet but it is more likely to be a stick shaker, pusher or nudger.

Many aircraft with straight wings and conventionally mounted tails do indeed exhibit the expected sudden nose drop. Their lift curves rise quickly, peak and drop quickly. Air separating from the wing can hit the tail, provide the pilot with tactile feedback in the controls, and then lose lift quickly. The nose drops and the pilot is given a head start on recovery. There are at least three types of aircraft that may deviate from this beneficial pattern.

Most notably, a swept-wing airplane has a lift curve that rises more gradually. After its curve peaks, it tapers off slowly while still producing lift. The supersonic T-38, for example, has razor-thin wings with a high degree of wing sweep. While its wings buffet heavily as it approaches the critical AOA, the nose never drops. The only real signs of the stall are the wing buffet and an altimeter heading down as the nose stays up.

Airplanes with T-tails may also stall without the nose drop we are expecting.

The effect of wing sweep on lift curves



As the AOA increases, the stabilizer might remain above the turbulent airflow from the wings, even at the stall AOA. If the tail hasn't yet stalled, the nose will remain up even as the airplane heads down. In the previously cited CJ2+ case study, for example, the nose remained up during the stall until the airplane snapped into the first of five complete rolls. This isn't true of all T-tail aircraft, but it is in many.

A third factor that might mitigate any nose-dropping tendency is wing design. Even airplanes with straight wings can be so well designed that their stall patterns mimic the gradual loss of lift seen in swept-wing airplanes. The lesson from all three examples is a hard one to digest. Even if your aircraft has a straight wing with a conventional tail, you cannot be sure it will stall the way you have been taught. But even if you have practiced stalls in your aircraft, you cannot be sure it will stall the same way if loaded differently or in different conditions. You need to be paranoid of an aerodynamic stall, and that means you have to be paranoid about the vertical mode of your autopilot.

JAMES ALBRIGHT

The watchband technique when using vertical speed mode in a climb

There is no getting around vertical speed mode in many high-altitude aircraft. Autopilots aren't smart enough to prioritize smooth pitch control and minimum airspeeds, so it is up to us to do that. But in a climb that can take 20 min. or more, we can forget that our vertical mode is not in a "set and forget" mode. This is much like a fuel imbalance problem, where crossflow valves are open and boost pumps are shut off. Distraction or forgetfulness can lead to disaster. I have a technique that can save you in either situation.

If I am in vertical speed mode during a climb, I take my watch off and hold it in my hand as a reminder something isn't right. I focus on the speed and if someone wants my attention, I go back to the speed hold mode. I hate having the watch in my hand; it gets in my way and after a while the metal band starts to irritate my skin. Having the watch in my hand tells me something isn't right, and I am anxious to fix what isn't right and get the watch back on my wrist where it belongs.

I use the same technique when cross-feeding fuel. Over the years, I have seen many techniques for remembering fuel crossflow procedures are in effect and I've seen most of them fail. Some pilots will place a laminated checklist between the throttle stems. Others place a fuel synoptic on a display. I used to think an egg timer was foolproof until the pilot left the cockpit during the preflight and got busy in the cabin. Just about every technique fails when the pilot gets distracted. My technique can fail too, but it is less likely to. Ever since I added this technique, I've never forgotten to return the fuel panel to normal or that my autopilot no longer has stall prevention as a top priority.

Harnessing Your Inner Paranoid Pilot

Lest you think I am only paranoid about these four things, rest assured my paranoia extends much further. You can develop a positive paranoia to prevent all sorts of problems in your specific operation.

(1) Know your airplane and procedures. The best defense against ignorance is knowledge. While you may not agree that many of the problems you are paranoid about reflect ignorance, if there is a solution to be had, then you are at least ignorant of that solution.

(2) Do not accept the "We've always done it this way" defense. The way we've always done it could very well be the best way to do things in a previous time, previous airplane or previous environment. Things change. But it could also be that some flawed condition we had to accept in the past is no longer unsolvable.

(3) Research solutions. Sometimes a problem seems to be built into the situation; no solution is possible because the problem is unsolvable. Or, as is often the case, an early solution is offered and we pat ourselves on the back and say we've done all we can.

(4) Consider when a "one-time event" is actually a systemic problem. So, how do you know you have a problem that needs solving as opposed to an event that will only happen on the rarest of occasions. That is, of course, a judgment call. But the answer might just require a simple question: "Could this happen again?"

(5) Devise Error Traps. If you find yourself with a problem that could happen again, it is time to come up with a solution. Consider asking fellow aviators flying the same equipment or opening it up to the community as a whole. Someone may have already solved your problem. Or you can adapt someone else's solution to fit your problem. But it might be up to you to invent the solution yourself.

We often think of people afflicted with paranoia as psychological basket cases, too afraid to leave the house for fear of what might happen to them should they be caught unaware without their tinfoil hats. But our kind of paranoia can be a life saver if properly deployed and acted upon.

Taking the time for a "last chance" external inspection can seem a nuisance the 100th time it fails to reveal anything forgotten. But the 101st time awaits you. Becoming a paranoid aviator complicates normal everyday life. But these added complications avoid those other complications you would rather be without. **BCA**

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Oxygen Mask Failures

A pressurization or smoke emergency **is not the time** to discover that your **oxygen masks don't work**

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

A flight crew's timely response to a loss of cabin pressurization or to smoke or fumes is critical and certainly not the timeto discover that your supplemental oxygen system isn't working.

This *BCA* author conducted a search of 100 recent NASA Aviation Safety Reporting System (ASRS) records that were submitted in 2016 and 2017 involving incidents in which oxygen masks were employed. Of the total, 71 involved a loss of pressurization or suspected smoke or fumes. The good news is that in these instances, the supplemental oxygen systems worked correctly, allowing the flight crews to breathe as they got the aircraft and their passengers safely on the ground.

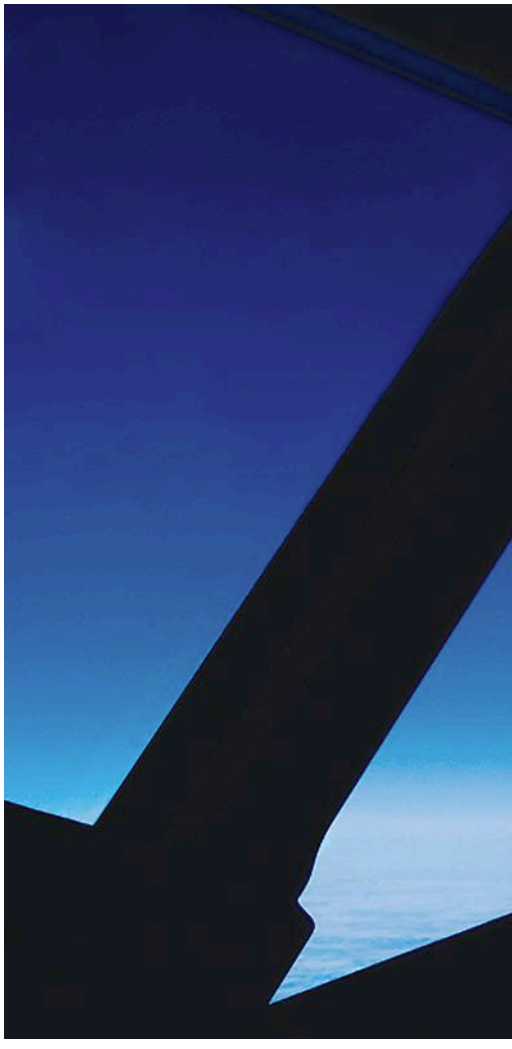
However, the other 29 instances should cause concern as they bring attention to the serious risk posed for a flight crew being without supplemental oxygen as well as other serious problems with mask use when needed. One might think that supplemental O_2 systems are relatively simple, comprising few moving parts, and thus not prone to mechanical failures. Such systems should have 100% reliability, since they can be physiologically vital when put to use. However, the ASRS reports reveal a disturbing number of instances that challenge this perception.

Eight of the reports involved flight crews whose oxygen masks or hoses physically failed. "In cruise flight, I went to put on quick-donning mask as first officer was going to leave the flight deck for physiological needs. I pulled the mask out of the box and it came apart in my hands. It was useless had there been an emergency. Where the hose attaches with the microphone to the main rubber face area was broken and dangling. The full mask section was intact but the hose/microphone area was detached and hanging by a wire, no ability to breathe oxygen from the mask." (NASA ASRS Report 1498858, November 2017)

A disintegrating mask is shocking enough, but let's puts this into further perspective. These incidents could have turned into possible crew incapacitation and hull loss scenarios had the pressurization system malfunctioned or smoke/fumes started in the cockpit. A review of the ASRS system found other instances in which critical components failed. (See "Weak Points" sidebar.)

And another. "While out on the lavatory break, I heard a loud whoosh noise from up in the flight deck. This noise caught my attention so I immediately called up to the flight deck to request entry back in. When I got back into my seat the captain was holding the oxygen hose and his mask together in his hands while we could hear a hissing sound. The captain explained that the oxygen hose for his crew mask would not stay attached to the mask. . . . I then took hold of the mask and the oxygen hose and attempted to hold them together to save as much crew oxygen as we could. . . .The captain made several attempts at re-securing the oxygen hose to the mask but did not succeed. . . . Due to the positive pressure of oxygen coming from the hose, we were both unsuccessful at securing the oxygen hose. After several minutes we became unable to even hold the oxygen hose to the mask. At this point there was nothing to even slow the flow of the crew oxygen and we began to lose crew oxygen at an extremely fast rate." (NASA ASRS Report 1462284, July 2017)

Similar reports revealed a cascading set of errors due to multitasking as the flight crews immediately started unplanned priority descents while troubleshooting the oxygen problem. These crews were stymied trying to find sections in their QRH addressing oxygen mask malfunctions or oxygen tube leaks, while confronting an abnormal failure that they'd never experienced in their simulator sessions. Furthermore, the decision making for an unplanned



rerouting is considerable. With flight at a lower altitude, the increased rate of fuel consumption becomes a significant concern. Getting information for possible alternatives is not easy to do while in flight. Finding airports with suitable weather, approach minimums and runway lengths requires attention and focus. Runway surface conditions and applicable NOTAMs are equally deserving of careful attention. Under these multitasking conditions, it is understandable that flight crews forget to do the descent checklist or approach checklists.

A couple of the flight crews remembered after the incident that their aircraft had a walk-around oxygen bottle that would have been useful as a backup. Understandably in the stress of the situation that option had not seemed obvious at the time. Their ASRS reports serve as a valuable set of lessons for the rest of us.

Even though the aircraft pressurization systems remained working in these reported instances, a malfunction of the supplemental oxygen system warrants taking immediate action since it puts the aircraft in a precarious condition. One errant spark in a cockpit filling with 100% oxygen, or smoke and fumes, or a loss of pressurization could result in the loss of that aircraft and its occupants. Under such circumstances, the pilots need to descend to a physiologically survivable environment without delay.

An electrical spark in the presence of the supplemental oxygen system turned the flight deck of an EgyptAir Boeing 777-200 into a conflagration on July 29, 2011, at Cairo International Airport (CAI). The captain attempted to extinguish the fire with the cockpit fire extinguisher but was unsuccessful. Fortunately, the aircraft was on the ground at the time. The captain ordered an emergency evacuation and all passengers and crewmembers were able to escape without serious injury.

Due to the growing fire in the cockpit the first officer was unable to use a radio to summon emergency services. So, after exiting the Boeing he stopped a car on a service road to call the fire department. In case you were wondering, yes, the F/O had performed a test of the oxygen mask's function during the standard preflight checklist. This took place approximately 30 min. before the fire erupted.

The cause of the ignition was later determined to have been an electrical fault in the F/O's supplemental oxygen port. This resulted in electrical heating of the flexible hoses in the flight crew oxygen system, and the fire was subsequently fueled by a constant flow of oxygen. The cockpit was extensively damaged, and two holes were burned

ISTOCK PHOTO

through the exterior skin under the F/O's windows. The 777 was damaged beyond repair and written off.

During the investigation it was determined that the wiring to the F/O's oxygen mask light plate had a missing wire clamp, the wiring was not sleeved, and a large loop of unsupported wire was found. Boeing issued a Service Bulletin in October 2011 recommending the inspection of the oxygen light plate wiring and, if necessary, installation of sleeving and replacement of damaged wires.

The NTSB is concerned that pilots using oxygen mask/goggle sets on FAR Part 121, 135 and 91 Subpart K flights may not be adequately trained to operate them if a smoke, fire or fumes event occurs. This should also concern flight crews of Part 91 aircraft.

On Sept. 3, 2010, a UPS Boeing 747 departed Dubai International Airport (DXB) on a cargo flight to Cologne, Germany (CGN). Twenty minutes into the flight, at approximately 32,000 ft., the crew advised ATC that there was an indication of an onboard fire and declared an emergency. Both pilots had donned their oxygen masks approximately 90 sec. after the fire bell sounded. Less than 90 sec. later, the fire caused severe damage to the flight

The Right Button Positions

Oxygen flow to each individual mask is controlled by a regulator mounted on the mask. Masks commonly have two regulator switches.

The first switch, labeled "Normal or 100%," controls whether the mask delivers a mix of pure oxygen and ambient air, depending upon the cabin pressure altitude. This is the "diluter-demand" mode and would normally be used during phases of flight when the FARs require a flight crewmember to be using supplemental oxygen during high-altitude flight. The switch can change the delivery to 100% oxygen regardless of cabin altitude. Diluter-demand oxygen masks supply oxygen or an ambient air/oxygen mix only when the user inhales through the mask.

The second switch is "Press-to-Test/Emergency." When set to Emergency, the wearer receives a constant overpressure of pure oxygen.

A thorough preflight of the supplemental oxygen system is necessary to make certain the system is in the "ready to go" position should it suddenly be needed. Unfortunately, if a line in a checklist says, "Oxygen masks . . . . tested," it provides insufficient detail on the specific items that must be checked. Should your aircraft flight manual not provide a detailed description of the preflight check, consider these following steps:

▶ Remove the mask from the holder. It should have been stored properly so that squeezing the two red harness inflation levers allow the mask to be quickly removed from the storage box.

▶ Make certain that the tubes forming the harness going around your head fully inflate. An inspection of a Bombardier CL600-2D15 led to Service Difficulty Report #20161020005 with Transport Canada because inspection found the harness assembly was 12 years old and blown. The manufacturer recommends replacing the inflatable harness assembly every six years. Upon further inspection, evidence of improper/substandard maintenance was noted.

▶ Select EMER and listen for the flow. As the ASRS reports reviewed for this article indicated, some pilots noticed that despite the initial flow of high-pressure oxygen, the oxygen pressure gauge quickly showed a decline. These pilots were aware that a few seconds of flow didn't guarantee that the supplemental oxygen bottle valve was open.

▶ CVR analysis from the UPS accident concluded that the captain's mask was set to 100% while the F/O's mask was set to "Normal." Neither mask appeared to be in the "Emergency" mode. The NTSB subsequently issued Safety Recommendation A-11-091, "Require that operators' smoke, fire or fumes checklists include, as the first step, that flight crewmembers don their oxygen masks and verify that the regulator is set to 100%." After ascertaining that there is oxygen flow in your mask, then make certain the oxygen switch is placed in the 100% position to ensure it is instantly ready in case of an emergency.

▶ It has been discovered that when flight crews use the mask in the "normal" mode to comply with the mandatory usage of the oxygen system during high-altitude flight, pilots are returning it to its receptacle with the selector valve still in the "normal" mode. That switch should be returned to the "100% oxygen" mode in preparation for an emergency.

The following is an example of how one can preflight a mask's microphone and connection to the speakers on an aircraft such as a Cessna Citation 550 or 560 series. (Your system may differ.):

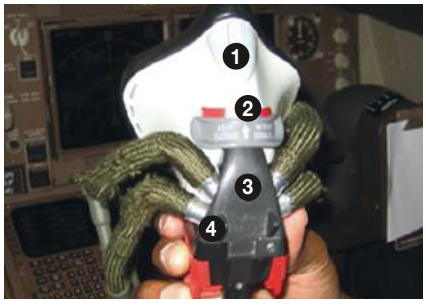
▶ Select mic switch on armrest to MIC OXY MASK.

▶ Select interphone (outboard position) on the yoke-mounted microphone switch and turn speaker volume on audio panel up to at least one-half maximum volume.

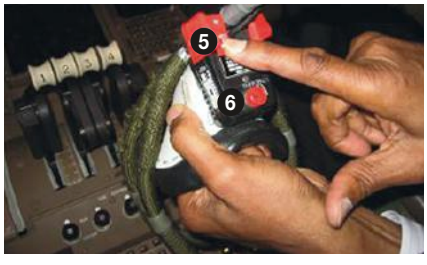
▶ Speak into the mask. If sound is heard from the cockpit speakers then the mask's microphone and communication cords are operational.

▶ If you intend to use headsets during flight then turn speaker volume to off. Select MIC Headset on microphone selector switch.

▶ Lastly, properly stow the mask in its holder. **BCA**



1. Oxygen Mask
2. Goggle Vent
3. Internal Microphone
4. Oxygen Regulator



5. Normal/100% Selector
6. Press-to-test /Emergency Knob

control system and filled the cockpit with continuous smoke.

During the emergency descent the cabin reached a pressure altitude of 21,000 ft., followed almost immediately by the rapid failure of the captain's oxygen supply without any indication of trouble. He said, "I got no oxygen. I can't breathe."

Unbeknownst to the flight pilots, the fire had severely damaged many significant systems on the aircraft, including the crew supplementary oxygen system supply. The damage caused a cessation of oxygen flow to the captain's mask and reduced capacity for the remainder of the flight to the F/O's mask. The captain left his seat to obtain the portable oxygen bottle but did not return due to incapacitation from toxic gases. The F/O could not view outside the cockpit, or see the primary flight displays. The aircraft subsequently entered an uncontrolled descent into terrain, 9 nm southwest of DXB. Both pilots died in the crash.

During the investigation, investigators received comments from several UPS line pilots regarding pilot training on the use of the oxygen mask and goggle sets. They reported receiving little hands-on instruction for the actual use of the set and smoke vent, and what they did receive occurred during initial training for the aircraft in the form of computer-based text and images. They also stated that they were never taught about the relationship between the emergency selector on the regulator and the need to simultaneously open the smoke vent to clear contaminants from inside the goggles or how to locate the switches on the oxygen regulator after the oxygen mask was donned. Further, they were never required to practice these actions in the presence of an instructor or check airman.

During an inflight smoke, fire or fumes event, the flight crew has limited time to complete checklist items, attempt to suppress or extinguish the fire, and divert the airplane to a successful landing. Oxygen mask and goggle sets must be donned quickly and with the correct regulator settings so that fire suppression/extinguishing procedures can begin as soon as possible. Any delay in setting the switches could increase the risk of flight crew incapacitation and delay the start of the smoke, fire or fumes checklist.

Other accident investigations and numerous ASRS reports also reveal flight crew difficulties with communications while oxygen masks were donned, validating the NTSB's concern and likely indicating that this is a widespread problem. For example, on July 20, 2009, United Airlines Flight 949 departed London Heathrow Airport (LHR) for Chicago O'Hare International Airport (KORD). At 37,000 ft. and about 200 mi. south-southwest of Keflavik, Iceland, the flight crew encountered smoke in the cockpit and diverted to Keflavik International Airport (KEF). During the event, the flight crewmembers donned their oxygen sets and attempted, with difficulty, to establish and maintain crew communications.

According to pilot statements provided to the Icelandic Aircraft Accident Investigation Board, the captain stated, "We struggled with the audio panels to communicate with the masks on." He therefore removed the oxygen mask to communicate with the F/O and relief pilot in the cockpit. The F/O said, "The entire process of donning goggles, the use of the oxygen mask, pushing all the different buttons and toggles to communicate with all the people involved was very frustrating at times. Between the goggles scratching my glasses and the smoke film in front of them too, it was hard to see at times. Too many items have to come together for this setup to work." And the pilot added that "crew communications with oxygen masks on was non-effective and increased crew workload significantly. It was made worse with three crewmembers plus ATC all trying to communicate."

In response to these events the NTSB issued Safety Recommendation A-11-089, to require airline, charter and fractional operators "to include, during initial and recurrent training, aircraft-specific training on establishing and maintaining internal cockpit communications when the oxygen masks are donned."

Ten of the 100 ASRS reports involved flight crews detecting deficiencies with the masks or oxygen system pressure during preflight. For example, one reporter stated, "After arriving to the aircraft, we began our preflight duties and flows. Upon checking my oxygen mask, I ran the oxygen via the

Temperature Effects on Oxygen Cylinder Pressure

When performing a preflight, it is important to review the temperature compensation chart next to the oxygen cylinder to make certain you have a full supply of oxygen when needed. Temperature has a significant effect on the pressure of a gas stored in a cylinder. The oxygen pressure noticed during preflight on a hot ramp will decrease significantly during flight at cold, high altitudes.

So, fill the cylinders to the maximum pressure listed for the prevailing ambient temperature, but when it's hot outside, the cylinders can be filled to a higher pressure than cold days. This is allowable because of the significant decrease in pressure at altitude. However, when filling cylinders on a cold day, compensation for temperature and pressure changes dictates that cylinders be filled to less than the maximum rated capacity to allow for pressure increases as the temperature rises.

Strict adherence to the temperature/pressure compensation chart values is mandatory to ensure safe storage of aircraft oxygen. **BCA**

Weak Points That Are Failing

How could oxygen masks and lines "wear out" even though they aren't exposed to normal "wear and tear" forces? The most common components which fail are around valves, fittings, and connections involving rubber seals, tubing and hoses. Other possible failure modes in oxygen system components include "dry rot" which occurs when rubber or plastic surfaces are exposed for long periods to alternative heating and cooling temperature swings in dry air (which is an apt description of an aircraft cockpit.) Moisture within the rubber or plastic is wicked away, degrading its flexibility and elasticity over time. Cracking, tearing, and breakage are common indications of dry rot.

The Australian Civil Aviation Safety Authority issued Airworthiness Bulletin 35-004 (Nov. 29, 2012) noting service difficulty trends with oxygen systems service during maintenance identified by the CASA's Service Difficult Report database. The trends are comparable with SDR's from the U.S. FAA and Transport. SDR's identified difficulties with these components:

- Lines and fittings disconnected or blanked during inspections.
- Worn or damaged components and fittings.
- Kinked oxygen lines and hoses.
- Passenger service unit (PSU) doors not closed properly.
- PSU doors glued at hinges.
- Unserviceable oxygen masks.
- Incorrectly packed oxygen masks.
- Discharged oxygen generators.
- Overstrained oxygen hoses.
- Oxygen fill line nuts cracked.
- Cracked in-line oxygen flow indicators.
- Missing information on part number identification labels.
- Contaminated oxygen masks.
- Contaminated oxygen fittings.
- Incorrect oxygen cylinder configuration.
- Bent oxygen generator firing pins.
- Leaking pilot oxygen regulators.

test button for 5 sec. and made sure the microphone worked. However, I immediately saw the O_2 psi go from 1,600 to 100 instantly and stay there . . . . I suspected the valve on the bottle itself was in the off position. I told the captain and he agreed. We made an electronic logbook write-up and backed it up with a call to maintenance. They came to the plane and the mechanic was shocked." (NASA ASRS Report 1486360, October 2017)

Several design issues came to light during the investigation of the Learjet accident that killed golfer Payne Stewart in 1999. It turned out that in the Model 35/36, the oxygen bottle regulator/shutoff valve is located in the nose cone of the airplane and therefore inaccessible to flight crewmembers during flight. It was further discovered that pilots may have difficulty visually verifying the position of this valve during a preflight inspection because of the way it's installed in the airplane. The Safety Board noted that it is critical that the valve position indicators are clearly visible and easily understandable during preflight.

Oxygen bottle supply pressure is indicated on a gauge in the cockpit of the Learjet 35/36. Since a visual check of the oxygen bottle supply may not provide information about the position of the oxygen bottle regulator/shutoff valve, the pilots' only sure indication in the cockpit that the oxygen bottle regulator/shutoff valve is in the OFF position would be the failure of the oxygen mask to deliver oxygen.

A half dozen of the ASRS reports indicated difficulties with stowing oxygen masks after completing preflight checks. The pressure-demand masks must be properly stowed in their containers to qualify as quick-donning equipment. Each mask has two red harness inflation levers that, when squeezed, allow the mask to be removed from the storage box. Releasing the levers after placing the mask over the head fits it securely to the head and face. Yes, it can be a pain stowing the oxygen mask, but doing so correctly could help safely resolve a dangerous situation.

A few of the reports indicated concerns that frequent preflight inspections are causing undetected wear and tear on the mask and hose connections. The pilots expressed concern that some mask designs are not sturdy enough for repeated extraction and restowing. These reports were submitted by regional airline crews whose aircraft can be operated by a dozen different pilots within a handful of days, each necessitating a full inspection of the oxygen system during an aircraft acceptance check. In addition, the ASRS submitters were concerned that many of the facemasks are getting scratched to the point that they would be difficult to see through in a real event. (See "When Irish Eyes . . . ," *Cause & Circumstance,* page 28.)

Incidentally, if your aircraft cabin has become cold-soaked, it may be necessary to warm the cabin sufficiently to ensure the proper deployment and operation of passenger oxygen masks. The Cessna Encore manual, for example, stipulates that cabin temperature must be held at or above 32F for a minimum of 15 min. prior to takeoff after a prolonged ground cold soak.

It is vital that all flight crewmembers personally preflight their oxygen equipment to ensure that the mask is functioning, fitted properly and connected to appropriate supply terminals, that the oxygen supply and pressure are adequate, and that the oxygen buttons are selected for optimum performance in case of emergency.

All pilots of high-performance aircraft should receive appropriate, hands-on instruction regarding the use of oxygen mask/goggle sets, including the regulator's emergency selector and smoke goggle venting, and practice communications using the mask microphones during initial and recurrent training.

Knowing how to do that could save your life. **BCA**

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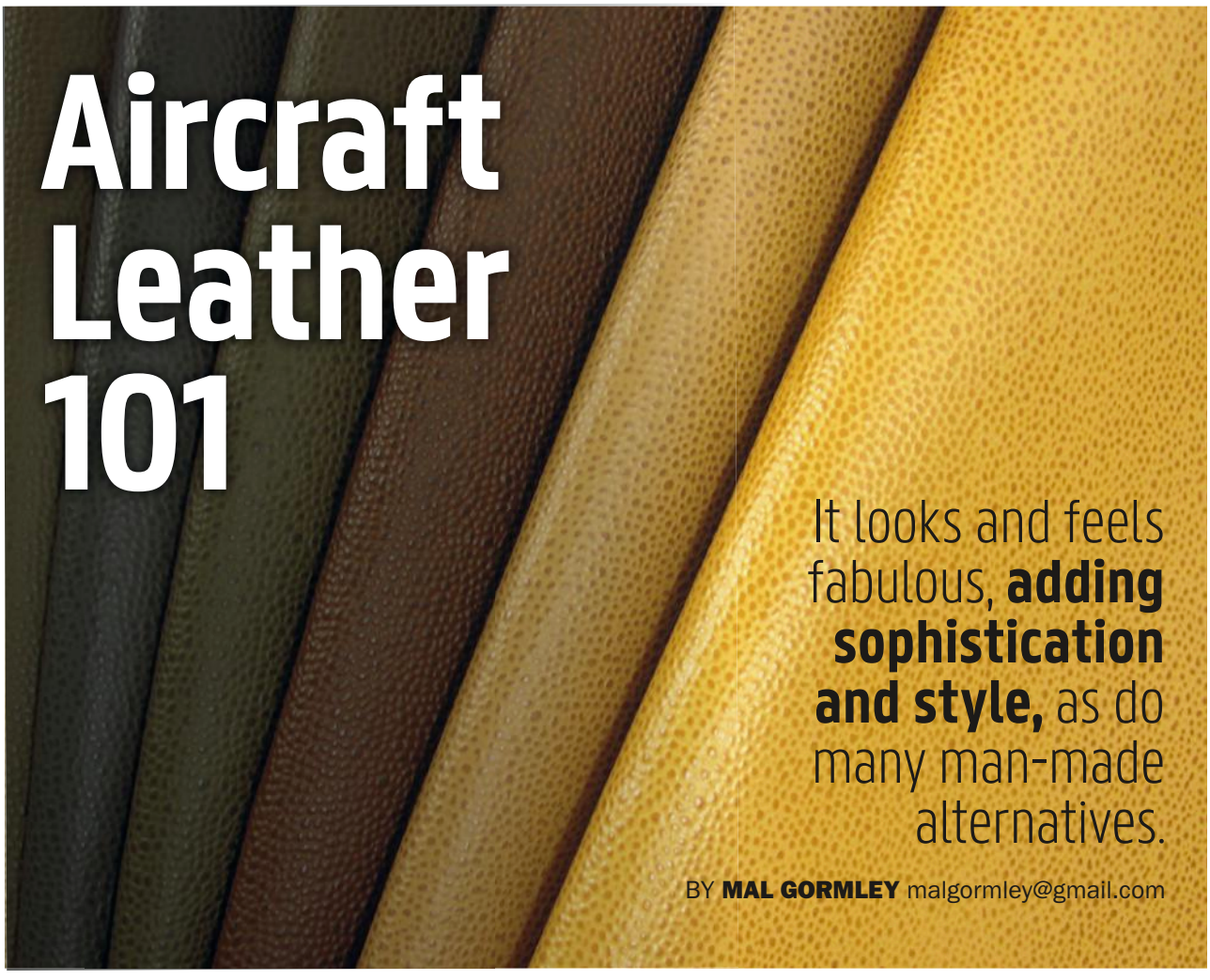
Aircraft Leather 101



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It looks and feels fabulous, **adding sophistication and style,** as do many man-made alternatives.

BY **MAL GORMLEY** malgormley@gmail.com

If you're considering a new interior for an existing or yet-to-be built aircraft, you'll need to familiarize yourself with the options, terminology, cultural considerations and care of the materials used in its cabin and flight deck upholstery and trim. This article focuses on leather due to its near universal popularity, but it also touches on other materials often found in today's business aircraft.

Naturally, most of us think of leather and other fabrics as individual or bench seating upholstery, but leather can be applied to crew seats, table tops, lavatory seating areas, dado panels and even the headlining.

According to the interior shops and suppliers consulted for this report, genuine leather remains the preferred product for seating upholstery, while textiles are usually specified for headliners and sidewalls. Creative combinations of products can be used on seating inserts and elsewhere.

Airframe and cabin furniture manufacturers and completion centers typically have specialists, if not entire departments, dedicated to selecting, preparing and installing the materials that go into an aircraft. Give these folks as much attention as you do to those handling your aircraft's avionics, cabin connectivity, engines and maintenance. It will be time well-spent because the interior represents such a significant part of overall aircraft value. Aviation industry gatherings are the best places to see the latest and greatest leather and fabric products. Many vendors can provide samples or you can order samples from manufacturers and completion centers.

Leather Lingo

Since Paleolithic times leather has been a durable, pliable and flexible material used for an unending list of applications. It's created by tanning animal rawhides, mostly cattle hide, but other hide sources include horses, sheep, goats, pigs, snakes, water buffalo, alligators and other more exotic creatures such as stingrays.

More durable leathers are employed for high-wear areas such as armrests and floor tiles as opposed to softer, more supple leathers for seating areas. Some customers request unfinished or naked leather to achieve a specific look or mood, knowing that the overall durability and performance may not be the same as other selections specifically designed for those purposes.

Tanning is the process that stabilizes the proteins of the rawhide so it does not putrefy, making it suitable for a wide variety of end applications. For some leathers, tanners apply a surface coating, called "finishing." Tanning processes largely differ in which chemicals are used in the tanning liquor.

The oldest known type uses tannins extracted from vegetable matter, such as tree bark. It produces a supple

TOWNSEND LEATHER

leather that's brown in color, with the exact shade depending on the mix of materials and the color of the skin. However, vegetable-tanned leather is not stable in water and tends to discolor. Indeed, if left to soak and then dry, it can shrink and become harder, making it more useful for shoemaking and bookbinding.

Chrome-tanned leather is produced using chromium salts. It is also known as "wet blue" for the pale blue color of the undyed leather. Chrome tanning is best suited for large-scale industrial use and is the most common method employed today. Its resulting product is considered suppler and more pliable than vegetable-tanned leather and does not discolor or lose shape as drastically in water.

Chamois leather is a form of aldehyde tanning that produces a porous and highly water-absorbent material. Chamois leather is made using marine oils (traditionally cod oil) that oxidize to produce the aldehydes that tan the leather.

Brain-tanned leathers are made by a labor-intensive process that uses emulsified oils, often those of animal brains such as deer, cattle and buffalo. They are known for their exceptional softness and washability.

Finishing operations can include oiling, brushing, buffing, coating, polishing, embossing, glazing or tumbling, among others. Leather can be oiled to improve its water resistance. Frequent oiling of leather, with mink oil, neatsfoot oil or a similar oil keeps it supple and improves its lifespan dramatically.

Creative combinations of leather and man-made fabrics can be used on seating inserts, crew seats, table tops, lavatory seating areas, dado panels and even the headlining.

Cost

Comparing the expense of leather with other upholsteries used in aircraft isn't easy, as explained by Marc A. Cognetti, director of marketing for Fultonville, New York-based Perrone Aerospace, which offers a wide range of leather choices. "Leather that has special customized finishes such as metallics, and pearlizations, as well as custom embossings and hand-tipping, tend to be on the higher end of the price scale," he said. "Although there have been several advancements in the quality and style of textiles, leather, generally speaking, still tends to be the premium luxury product, thus bearing a higher price point. However, in some cases when compared to very small runs of high-end textiles, leather can be similar [in price] or even less expensive."

Furthermore as Sean Dorgan, president of The Leather Institute, based in Red Bank, New Jersey, noted, "It really isn't about cost here — leather breathes and maintains a very comfortable temperature between the passenger and the surface of the seat."

Alternatives

Remember the old DuPont slogan, "Better Living Through Chemistry?" There's no question that man-made fabrics provide remarkable new options to aircraft interior designers and refitters.

Polyurethane (PU) vinyl, "faux leather," "pleather" and "leatherette," as well as Naugahyde, made from polyvinyl chloride (PVC) plastic coating, are composite materials made of one or more layers of vinyl and a woven or non-woven textile backing.

PU and PVC fabrics provide a realistic imitation of leather when it comes to its softness. On the whole, they're generally cheaper and certainly more animal-friendly than leather. They're also durable, easier to maintain and rarely crack with use or fade under sunlight. On balance, however, PU fabrics can be more easily torn than real leather and are not biodegradable — it takes several centuries to decompose, which is problematic in a world already choking on plastic.

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Questions

How can you tell if it's genuine leather? Touch it. Depending on the quality, the real McCoy can feel coarse or smooth, or anywhere in between. Leather is also flexible and soft. If the item in question feels really smooth or has a similar feel to plastic, it is likely not genuine. Drop a small amount of water on the material — real leather absorbs moisture quickly.

How do you spot flaws? What is considered a flaw can be very subjective. Some operators want the leather to be in its most natural state and allow for a certain level of acceptable "inclusions." These can include scars, brands or even bug bites, which actually contribute to the inherent characteristics of the material. It is the role of the leather craftsman to interpret the vision of the client and create "perfection out of nature."

Does real leather crack and peel? Leather itself does not crack or peel under normal conditions, but an applied finish or colorant upon its surface may. This generally can be fixed with a leather repair kit.

Do synthetic leathers peel? They are not prone to crack or peel like leather and can withstand scratches and scrapes that would mar genuine leather. Also, they won't fade as easily in ultraviolet (UV) light and are stain resistant. Unlike genuine leather, synthetics do not retain moisture, so faux leather items will not become warped or cracked.

Seeing quality. There's a nice, short video on C&L Aviation Group's website (**https://cla.aero/**) called "Mistakes to Look for in Your Aircraft's Custom Interior," and it's worth viewing. **BCA**

High-end textiles, such as Alcantara, a microfiber covering material manufactured and marketed by Alcantara S.p.A, are also becoming more common on accent pieces such as sofas and divans.

Naugahyde is an American brand of artificial leather, invented in 1914 at the U.S. Rubber plant in Naugatuck, Connecticut. (Full disclosure: My grandfather used to make the stuff.) It is a composite of a knit fabric backing and expanded PVC plastic.

TEC-Leather, from Switzerland's Lantal Textiles., and Germany's Trevira fabrics are also available options. Lantal recently provided fabrics for seats and other applications for Swiss International Air Lines' new Airbus A330-300 long-haul fleet, and Trevira is used in a variety of transportation applications and meets international aviation fire-retardant standards.

Leather in itself is not a readily burnable substance, but to provide an added safety margin, additional fire- and smoke-resistant protection for it is required. In order to achieve consistency in finished products, the entire manufacturing process, from tannage through finishing, incorporates fire-resistant treatments. Certified leather and man-made fabrics are required to pass 12- and 60-sec. burn tests depending upon their application.

Impacts

Although artificial fabrics have their environmental downsides, leather is not without its drawbacks. Leather also has environmental impacts, most notably due to the tanning process. Chromium and other heavy metals including glutaraldehyde and oxazolidine compounds, formic acid, mercury, formaldehyde and solvents are among the chemicals that are employed by leather producers. Formaldehyde is being phased out due to its danger to workers and the sensitivity of many people to it.

There's also the carbon footprint and methane produced in cattle rearing, as well as air pollution due to the transformation process (hydrogen sulfide during dehairing, ammonia during deliming and solvent vapors). One ton of hide generally produces 20 to 80 cubic meters of wastewater, high levels of fat and other solid wastes, and notable pathogen contamination. Producers often add pesticides to protect hides during transport.

With solid wastes representing up to 70% of the wet weight of the original hides, the tanning process represents a considerable strain on water treatment installations. And leather takes 25 to 40 years to biodegrade.

TOWNSEND LEATHER

In regions where religious ethical practices predominate, strict restrictions on certain materials may impact passengers' travel on your aircraft. Leather, in particular, is an especially sensitive area. Do some pre-purchase research and discussion with the cabin completion shop to be sure.

Cultural Sensitivities

As already noted, almost everyone likes leather. But especially in regions where religions and their ethical practices predominate, strict restrictions on certain materials may impact passengers' travel on your aircraft. Leather, in particular, is an especially sensitive area.

In some countries, leather vendors may be required to clarify the kinds of leather used in their products. For example, leather shoes may bear a label that identifies the animal source of the leather. This helps Muslims to avoid accidentally purchasing pigskin, or Hindi to avoid cattle leather. Many vegetarian Hindi eschew any kind of leather. Judaism forbids the comfort of wearing leather shoes on Yom Kippur, Tisha B'Av and during mourning. Shatnez, a cloth containing both wool and linen, is prohibited as well, except under certain circumstances. Such taboos increase the demand for religiously neutral leathers such as those from ostrich and deer. There are many other possibly obscure restrictions in other faiths.

Similarly, some environmentally minded folks may be put off either by leather or their man-made alternatives, or both, for a variety of reasons. So, the subject of fabric restrictions is thus complex, and operators who wish to avoid upsetting such passengers should do some pre-purchase research and discussion with the cabin completion shop.

How to Keep Cowhide Clean

The natural fibers of leather break down with the passage of time. Some leathers are vulnerable to a thing called red rot, which causes powdering of the surface and a change in consistency. Damage from that condition is aggravated by high temperatures and

relative humidity. Although it is chemically irreversible, treatments can add handling strength and prevent the disintegration of red rotted leather.

Conversely, exposure to long periods of low relative humidity, that is below 40%, can cause leather to become desiccated, irreversibly changing its fibrous structure. Chemical damage can also result from exposure to environmental factors, including ultraviolet light, ozone and airborne acid pollutants. Both oxidation and chemical damage occur faster at higher temperatures.

Almost all leather has some sort of protective finish on it, whether it's polyurethane or another material. In time, this coating deteriorates. However, the underlying leather itself is usually preserved. Leather and fabric specialty services we contacted use time-tested cleaning and prep procedures on the existing finish before applying a new finish. The result: The leather is restored to its original condition, it looks brand new, and it is protected from further wear and tear.

The Leather Institute's Dorgan cautions that many people use improper cleaners on their leather simply because there is so much misinformation on how to take care of it. "Use the right products and leather is very easy to take care of," he said. "Conversely, if you clean with an improper cleaner you can ruin your leather in one cleaning."

Spills, burns and punctures happen, along with normal wear and (hopefully not) tear.

If your aircraft is new or newly refurbished, be sure to get together with your vendors' fabric experts for the lowdown on maintaining the original color and luster of leather and other fabrics in the cabin. Learn which cleaners to use and what to do if there's more than just a minor issue. Keep all fabric warranty documents with the rest of your aircraft's documents and provide the flight crew with specific instructions regarding treating leather and fabric damage. Maybe even add a page or two to the AFM.

Each fabric has its own story of how it was made; therefore it also has its own specific suggested cleaning guidelines. Each stain, especially in the case of leather, is unique and may require very specific advice, but generally speaking, it is important to keep treatments simple.

The first step to treating a spill is to blot up the material — don't wipe or scrub it. Apply treatments as directed by the manufacturer and always test cleaners in a hidden area first.

Mistreated leather dries, cracks and ages badly. But even the most pampered leather gets dirty, and it takes a special product to remove soil and stains without harming it. A quick online search for "aircraft leather cleaner" will return more than a dozen products that promise to restore, moisturize, condition and protect leathers and vinyl on aircraft and other vehicles, while repelling dust and dirt without leaving oily residues. You can even use the stuff on your shoes while you're at it.

A program of scheduled aircraft leather cleaning and conditioning that includes onboard corrective procedures for stains, abrasions or scuffs can keep your interior fresh looking and add to the aircraft's resale value. The frequency of maintenance depends largely on the size of the interior and the amount of traffic. Usage differs widely from aircraft to aircraft, even within the cabin itself, and the types of operations it's used for — such as small corporate team trips versus sports team or entertainer charters.

Considering the cost of reupholstering and downtime involved, it can pay to implement a maintenance program to extend the life of your aircraft's leathers. Such a service is offered by a number of interior shops including The Leather Institute; the Appearance Group of Wichita; Johnstown, New York-based Townsend Leather; and others. Your aircraft's manufacturer may also refer you to a particular shop or offer it as part of its own customer services.

Your interior shop should be able to provide material-specific cleaning resources and advice. More

Grades

▶ Leather grades can seem cryptic at first, but basically, they differ only by their handling and the chemical procedures applied to the material.

▶ Alcantara is a covering microfiber material manufactured and marketed by Alcantara S.p.A. The material was developed in the early 1970s. Around 1972, a joint venture between Italian chemical company ENI and Japanese company Toray formed Alcantara in order to manufacture and distribute the material. The company is now owned by Toray and Mitsui.

▶ Bonded leather, also called reconstituted leather, is a material that uses leather scraps that are shredded and bonded together with polyurethane or latex onto a fiber mesh. The amount of leather fibers in the mix varies from 10% to 90%.

▶ Full-grain leather contains the entire grain layer, without any removal of the surface. Rather than wearing out, it develops a patina during its useful lifetime. It is usually considered the highest quality leather and is most often used for furniture and footwear.

▶ Corrected grain leather is subjected to buffing or sanding finishing treatments to create a more uniform appearance to remove flaws in the grain, then dyeing and embossing the surface.

▶ Nubuck is top-grain leather that has been sanded or buffed on the grain side to give a slight nap of short protein fibers, producing a velvet-like surface.

▶ Patent leather is leather that has been given a high-gloss finish by the addition of a coating.

▶ Split leather is created from the corium underlayer left once the top-grain has been separated from the hide, known as the drop split. Splits are often used to create suede. Split leather can also have a polyurethane or vinyl layer applied to the surface that is embossed to give it the appearance of a grain, known as bicast leather, which is slightly stiffer than top-grain leather but has a more consistent texture.

▶ Top-grain leather includes the outer layer of the hide, known as the grain, which features finer, more densely packed fibers, resulting in strength and durability. **BCA**

PERONE AEROSPACE

Comparing the expense of leather with other upholsteries used in aircraft isn't easy. Special customized finishes or exotic leathers tend to be more costly.

aviation-specific leather cleaning and conditioning products can be found at Washwax.com, SkyGeek.com, Aircraftspruce.com, Amazon.com and elsewhere. Our search on YouTube for "cleaning aircraft leather" returned "How to Clean Leather and Vinyl Aircraft, Car and RV," along with "#Aircraft #Interior #Leather #Seat #Cleaner #ETS," and many other aircraft cleaning how-to's.

When asked if he's encountered any cleaning misconceptions about materials, Perrone's Cognetti said, "A common misconception is that a performance material such as our Alcantara is difficult to clean and maintain. Some of the unique characteristics of Alcantara include its nap, which differentiates it from lower-end faux suede materials that need to be brushed continually in order to not show the direction impact of the nap. Also, past experience with lower-end faux suede materials is that they are difficult to clean. We offer a proprietary cleaner endorsed by the manufacturer that has proven in trials and in service to effectively clean most common dirt and stains."

At some point it may be time to retire tired leather and other fabrics, but don't overlook restoration and regular maintenance services provided by cabin specialty shops. After years of useful service, your worn or stained upholstery may still be in good condition. Upholstery — and leather in particular — can be revived to like-new condition through a refinishing program that applies new color and top coats to it.

PERONE AEROSPACE

U.S.operators and designers tend to be more conservative in their color and style selections than elsewhere.

Be Bold

Aircraft interiors often seem similar to one another, which is surprising, given the often imaginative paint and design schemes applied to the outside. Suppliers offer a startling variety of colors, textures, patterns, metallics, embossings, imprints and custom designs.

But perhaps there are cultural reasons. U.S. operators tend to be more conservative in their color and style, while operators and designers in Europe and Asia appear to take more risks when it comes to incorporating flashier colors and designs. For charter or fractional aircraft, interiors must be appealing to a broader audience. Says Dorgan, "It also comes down to maintenance. The more ornate an interior, the more you have to do in terms of upkeep."

So, if you have access to an interior designer, consider eliciting suggestions for making your cabin look more visually stimulating without being overly flashy. Make a statement with your interior! **BCA**

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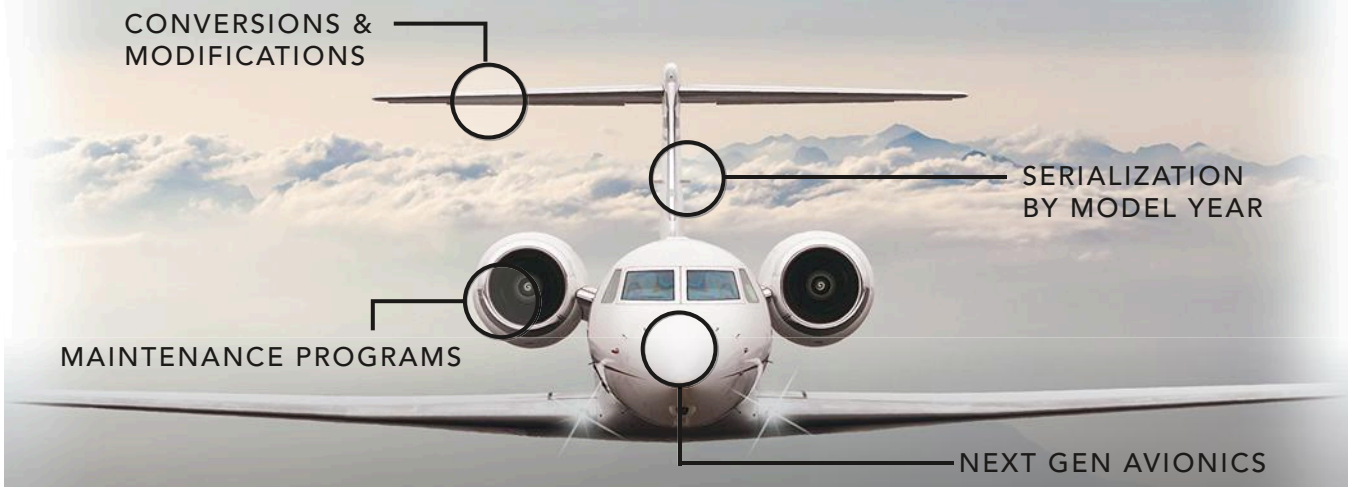

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Operating in Argentina

It's been a **long, hard journey** for Argentina, but **prosperity**

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

Here's a factoid for you: The name of the largest Spanish-speaking country in the Americas — Argentina — is not Spanish but Italian, probably accorded by Genovese navigators aboard Spanish ships in the 16th century when South America was being explored and exploited for its gold and silver riches. The name, by the way, means "made of silver" or "silver-colored."

Today, the gold and silver in Argentina are less in the ground or fashioned into Indian artifacts but implicit in the business activities harbored by Argentina's cities, principally Buenos Aires and Cordoba. So not surprisingly, these are the magnet destinations of the majority of business aviation flights to Argentina, while a lesser number head to the huge country's many scenic wonders like Iguaçu Falls in the north, the El Calafate glaciers in the southwest or Tierra del Fuego at the southernmost tip, or "Cone," of the South American continent. The former — attraction to the "magnets" — was most recently seen when Buenos Aires hosted the G20 summit of major world economies from Nov. 30 to Dec. 1, 2018, the first such conclave to be held in South America.

With an area of 1,073,500 sq. mi. (2,780,400 sq. km), Argentina ranks as the continent's second-largest country (behind Brazil), the fourth largest in all the Americas, and the eighth largest in the world. It consists of 23 provinces and one autonomous city — Buenos Aires — which also serves as the nation's capital. ("Autonomous" in this context means that Argentina and Buenos Aires each abide by their own constitution, while both are united under a federal government system.) Population in 2018 was 44,694,198 people, with one-third concentrated in Buenos Aires and its environs.

Argentina claims a piece of Antarctica and sovereignty over South Georgia, South Sandwich and the Falkland Islands, the last three over which Argentina and the U.K. fought a nasty little war in 1982. While Argentina surrendered at the end of the 74-day conflict, it continues to maintain its claim on the territories.

The country's roots are planted deep in the 16th century and the Spanish colonization of the southern third of the continent. What is today Argentina emerged from the Viceroyalty of the Rio de la Plata following a declaration of independence in 1810 and an extended civil war that raged until 1861. The new entity organized itself as a federation of provinces with Buenos Aires as capital. Relative stability and peace endured until the 1930s as multiple waves of immigration from Europe built a rich and varied culture that became famous for its art, music and architecture. (Between 1880 and 1930, more than seven million European immigrants are believed to have arrived in Argentina.) This initially led to a high level of prosperity, elevating Argentina to one of the wealthiest nations in the world by the early 20th century.

But during the Great Depression of the 1930s, Argentina fell into political instability characterized by several presidential coups and resultant economic decline. During World War II, Argentina initially remained neutral, but when a military coup toppled the government, the country declared war on the Axis powers. Following the war, a government official named Juan Peron was jailed by the military administration due to his popularity among common people, but after a massive public demonstration, Peron was released and, with the backing of millions of working-class citizens, went on to run for president on a populist platform, winning the 1946 national election.

Thus commenced the tumultuous Peronist Era of Argentine history. Peron inspired a movement that saw widespread nationalization of industry, improved working conditions and rising wages, and nearly full employment. His immensely popular wife, Eva (or Evita), who rose from a humble childhood among the working class, ultimately shared power with Peron and convinced the national legislature to introduce women's

One-third of Argentina's population, or around 14 million people, resides in its capital Buenos Aires and environs.

HOLGS/ISTOCK PHOTO

appears to be at hand.

suffrage in the late 1940s and social assistance to the poorest members of the society. She intended to run for vice president, but declining health from cancer prevented this, and she died in 1952.

Enter, the 'Dirty War'

Meanwhile, Juan Peron won reelection in 1951 with even greater support than the vote five years earlier. But anti-Peronist forces within the military conspired against him, and in 1955, Navy aircraft bombed the principal plaza in Buenos Aires in an ill-fated attempt to assassinate Peron — although the attack did kill 364 innocent people. That same year, a subsequent coup deposed Peron, and he sought exile in Spain. Political turbulence continued to afflict the country through the 1950s and '60s characterized by multiple coups and warring among political factions. This led ultimately to a military dictatorship and the infamous "Operation Condor" that carried out the so-called "Dirty War" of the 1970s and early '80s.

Involving state-sponsored terrorism against political dissidents and anyone judged to be socialist, including Peronists and Marxists (who operated their own lethal guerrilla paramilitaries), trade unionists, students and journalists, the Dirty War is credited with the estimated deaths and "disappearances" of as many as 30,000 people and incarceration of thousands more in concentration camps throughout the nation. The country seemed to turn against itself, faction against faction, with costly massacres commonplace. The turmoil saw the return of Juan Peron from Spain, who in 1973 was again elevated to the presidency with his third wife, Isabel, elected vice president.

With Peron's death the following year, Isabel ascended to the presidency and immediately empowered the military and police to annihilate all forms of left-wing subversion. Yet, she, too, was ousted in 1975 by a junta of the armed forces. And so it went until Argentina's invasion of the Falklands and the subsequent war with the U.K., resulting in the government's surrender in 1982. Following mass rioting in Buenos Aires due to the humiliation of the Falklands capitulation, the military junta was forced to step down, ending the Dirty War.

While a transition to democratic rule ensued, Argentina's economy — after nearly two decades of war and internal terrorism — had been decimated. It had gone from one of the world's most prosperous countries to one of the most impoverished with little prospect for foreign investment in an economy that was inflicted with hyperinflation. The new administration of Raul Alfonsin commenced human rights prosecution of junta and other armed leaders, but the military interceded and restricted indictments to just the top leadership. Unable to reverse inflation, Alfonsin was forced out in 1989, and Peronist Carlos Menem won presidential election.

Menem introduced business deregulation, privatization, a fixed exchange rate and dismantling of some protectionist barriers, which temporarily normalized the economy. But in 1995, with Menem in a second term, recession and growing unemployment took hold with a return to economic decline. By the end of the decade, a massive capital flight resulted in the government freezing bank accounts and further political turmoil. This led to the Argentine Congress appointing Eduardo Duhalde acting president, whose first act was to abrogate Menem's fixed exchange rate, causing many citizens to lose their savings.

The economic crisis began to recede in 2002, but when a pair of "piqueteros" (street protestors) were assassinated, threatening a return to mass violence, acting president Duhalde stepped aside and called for an official election for chief executive that resulted in the choice of Nestor Kirchner. Continuing some of the policies of his predecessor, Kirchner introduced measures that ended the economic crisis, finally putting Argentina on the path to stability. The country ultimately attained fiscal and trade surpluses and a significant increase in its gross domestic

product (GDP). Under Kirchner, Argentina restructured its defaulted debt and paid off International Monetary Fund debts. Additionally, Kirchner purged the military of officers suspected of human rights abuses and resumed prosecution of the juntas and paramilitaries involved in internal terrorism and the disappearances of dissidents and those deemed undesirable by totalitarian forces.

Kirchner served one term and was succeeded in the presidency by his wife, Senator Christina Fernandez de Kirchner, in 2007. Her administration was characterized by a resurgent foreign policy that saw good relations with other South American countries but tension with the U.K. (not surprisingly) and the U.S. After two terms, she was succeeded in 2015 by Mauricio Macri, who continues to serve as this is written. Macri is distinguished as the first democratically elected non-radical or Peronist president in Argentina since 1916. His administration has introduced austerity measures to address inflation and public deficits, but despite these complications, Argentina's relatively recent stability has allowed a high-technology sector to flourish, and the World Bank has designated the country a high-income economy in the current fiscal year.

Today, Argentina benefits from rich natural resources, a literate population, an export-oriented agricultural sector and a diversified industrial base. The irony of Argentina's history is that, while it was one of the world's wealthiest countries during the 19th century, the political turbulence, social disorder, civil war and resultant economic crises, public debt, hyperinflation and capital flight that characterized most of the 20th century nearly impoverished it by the beginning of the current century.

In 2017, after almost two decades of stability, Argentina's economy emerged from recession with a GDP growth of nearly 3%. In terms of real U.S. dollars, GDP was $922.1 billion, ranking it 28th in the world. Exports stood at $58.45 billion, and industrial production growth was 2.7%. Its industries include food processing, motor vehicle manufacturing, mining, consumer durables, textiles, chemicals, petroleum, metallurgy, steel and printing. Agriculture thrives, producing some of the best beef and Malbec wine on the planet, the latter from vineyards in the Andean foothills on rootstock imported from France in the 19th century.

Also in 2017, the government passed pension, tax and fiscal reforms, and after years of isolation, it took on international leadership roles, including hosting the World Economic Forum on Latin America, the World Trade Organization Ministerial Conference and, most recently, presidency of the G20. Judging from the accepted indices of measurement, Argentina appears to finally be taking its place in the world as a productive, responsible democracy with a reasonable standard of living for its people. And this has stimulated a healthy business climate attracting international private aviation.

Aviation Infrastructure Lagging

Aviation within Argentina is growing, with six registered air carriers and an increasing number of reciprocal agreements among foreign airlines, especially low-cost carriers, to bring service into the country. Infrastructure, however, lags behind other first-world countries. For example, surveillance radar is available only in the vicinity of Buenos Aires and Cordoba, so as one operator put it to *BCA,* "you go procedural over much of the country and give position reports as you would in oceanic airspace."

In the northeastern section of the country some airways have been shut down due to aging navaids. However, an effort to upgrade them is reportedly in progress, spurred by the

EZEIZA MINISTRO PISTARINI INTERNATIONAL

Terminal of Buenos Aires' principal airport, Ezeiza Ministro Pistarini International. Out of view above-right is the General Aviation Terminal, a 15-min. taxi from the active runway, where visiting business aviation aircraft are parked and occupants processed by customs.

incoming carriers like Norwegian Air. Several attempts have been made in the past to modernize the ATC system, but funds appropriated for the purpose disappeared due to corruption and the political instability described earlier. To date, there are no plans to upgrade the system to Automatic Dependent Surveillance-Broadcast (ADS-B) as many other countries in the world have undertaken.

Of the 1,138 airports in Argentina, 161 have paved runways: four more than 10,000 ft. long, 29 between 8,000 and 10,000 ft., 65 between 8,000 ft. and 5,000 ft., and 53 between 3,000 ft. and 5,000 ft. Visitors from North America and the U.K. should be aware that not every airport in Argentina has a tower manned by English-speaking controllers. Argentina's Aviation Information Publication (AIP) currently lists only 23 airports with multilingual control towers.

"If you go elsewhere," Tim Bartholomew, international trip support manager at Collins Aerospace Arinc Direct, told *BCA,* "you will need a Spanish speaker in the cockpit — whether a crewmember or a guest navigator — and this applies to both arriving and departing." And if coming into the country internationally, operators will also need an "Inter," or International Arrival and Departure Permit, to access these Spanish-speaking-only fields. However, the 23 fields with English-speaking towers are exempt from this requirement.

The operator or handler will file a "petition" with Argentina's civil aviation authority, the Administracion Nacional de Aviacion Civil (ANAC), to operate into one of these fields, with the understanding that not all airports qualify for it, depending on manpower available. ANAC will then inform the petitioner whether access will be possible. In the petition, the operator must request the services of other agencies that it will need, such as customs, immigration, quarantine, agriculture, etc. But with the Inter, with all the trip information submitted, it will always be on a case-by-case basis whether the petitioner's request will be approved.

(ANAC is a relatively new government agency, having been formed out of discontent with how the Argentine military had been regulating civil aviation and the country's ATC system. But no sooner than ATC was moved into the private sector, its controllers — now civil servants — began to strike for higher wages with frequent European-style disruption in

EZEIZA INTERNATIONAL

Ezeiza International's General Aviation Terminal, dubbed the "FBO VIP Club" (even though it's not a traditional FBO), is located on the "Industrial Ramp" accessed by Taxiway Juliet. It is claimed currently to be the only GAT in Argentina, now that its counterpart at Aeroparque Jorge Newbery has been turned over to the military.

air transportation. Consequently, in 2016, the government contracted with Empresa Argentina de Navegacion Aerea, or EANA, a private company a la Nav Canada or Mexico's SENEAM, to administer ATC services. On the military fields, ATC continues to be provided by the Argentine military.)

The vast majority of flights worked by Jeppesen last year went into Buenos Aires; second was Iguaçu up north; third was Cordoba in the center of the country; and fourth was El Calafate in the south. Operators planning trips to Argentina should also be aware of another unique requirement per ANAC. This is the "PIC Authorization Letter," typed under company letterhead and notarized, authorizing the captain to act as pilot in command while in the country and which has to be signed and dated by someone other than the active crew.

Pablo Penalva captains a Bombardier Global 6000 for J.W. Childs & Associates, serves as regional lead for South America on the NBAA International Operators Committee, and is president and co-owner of Aersot Flight Support in Buenos Aires. Referencing the PIC letter, he says, "This is a new requirement. The letter must be an original, not a copy, and you have to have it on the plane." The requirement, effective April 2018, is "about security," Penalva explained, and came in response to the theft of an aircraft from a field in Northern Argentina in 2017, probably by a narcotics cartel. (There have been other thefts, as well, mostly of piston twins.)

Other required documents carried on the aircraft include the "big three": the certificates of airworthiness, registration and insurance. While not required in Argentina, it's always a good idea to ensure flight crew are carrying pilot and medical certificates that are appropriate and up to date. Make copies of them to carry aboard the aircraft, just in case the originals are lost. And as Penalva emphasized, "your documents must be perfect. In general, make sure there are no typos in any of your documents, especially the General Declaration, to avoid delays and having to do them over. You will always have to present basic docs for the aircraft at airport ops. Sometimes they will want originals, not copies."

For passengers and crew, no visas are required for stays up to 90 days. Jody Tanner-Perkins, an international trip specialist at Jeppesen, pointed out that for FAR Part 91 operations, no landing permits are required in Argentina. "Concerning fees," she said, "there is a reciprocity fee for Canadians and Australians but not for U.S. citizens." Argentina is expected to become part of the U.S. visa waiver program this year.

Fight Planning for Argentina

Filing flight plans in any location, Tanner-Perkins continued, must be done manually and operators must have their flight plans stamped by the filing office at the departing airport. Another requirement is that the operator's name and contact information must be entered in the filing notes of the plan, probably as a backup for assessing fees. Once filed, she said, "There is a 30-min. lifespan after which the plan is delayed and must be reactivated by the operator's handling service agent." One other caveat: Flights between Argentina and the Falkland Islands are not approved.

Penalva added that at Buenos Aires' Ezeiza Ministro Pistarini International Airport (SAEZ) "you can file as late as 45 min. prior, but we recommend 2 hr. [In October 2018], a temporary NOTAM was issued requiring 3 hr. because they forgot to pay the internet bill at the GAT [General Aviation Terminal], and [an operator] couldn't process computerized flight plans, and everything reverted to manual. By the way, they will not accept [a fight plan] unless the correct SID is filed for the direction you're leaving." Altimetry in Argentina is QNH and the country adheres to ICAO Pans Ops procedural standards.

Remember those 23 airports that offer English-speaking tower controllers? They're the same — and the only ones out of 50 — that also provide customs processing on request. Some may require 48 hr. or more advance notice; operators are advised to have their handlers make the arrangements, as they will more than likely have agents on the ground in these locations. According to Penalva, the only fields where customs is staffed 24/7 and that don't require prior notice are Ezeiza in Buenos Aires and Cordoba (SACO).

Advice from Penalva includes taking a tow bar. "No general aviation tow bars are available throughout the country," he says, "so take a tow bar 'head' in the plane." Also, he adds, "There are few catering companies based on the airports, so use catering from your hotel or a restaurant or through the handling agency." Finally, after you land, there is usually an ag or health inspector about, so they may require that perishable items brought into the country be sealed. This varies from airport to airport. Waste must be double bagged. "You must use Inter Cargo's ramp equipment," he continued, "and they will handle waste." Inter Cargo, a private contractor, has a hammerlock on ground handling throughout Argentina and much of South America.

Flight planning from North America to Argentina begins with routing. "Today's long-range international aircraft can get to Buenos Aires nonstop from most areas in the U.S.," Collins Aerospace's Bartholomew said. "Fuel stops are not a concern for them." But crews of smaller aircraft have to think about tech stops. "Typically, departing from the East Coast to Buenos Aires, one of the preferred fuel stops is Barbados in the Caribbean, about halfway from Teterboro."

From the West Coast, preferred routing is down the west side of Central and South America. "There are good stops there like San Jose, Coast Rica; Panama City in Panama; Guayaquil, Ecuador; and Lima, Peru," Bartholomew pointed out. "Every location has its concerns or advantages. For example, San Jose, Costa Rica, is mountainous, so you have to be concerned about taking off with a full load of fuel and climbing out. In Panama, it's frequent thunderstorms. In your routing from the West Coast, stay west of the Andes, because if you get too close, you will get lifting and thunderstorms. Coming down from the East Coast, you have to consider the Amazon Basin, famous for its thunderstorms. Overflight permits will be required for either routing, so you have to plan for that, too. Into Buenos Aires, itself, no landing permits are required."

Bob Howie, who flies Gulfstreams and Hawkers for a Texas-based air charter company when he isn't running his drone company (and writing about it for *BCA*), claims flying in Argentina has improved "greatly" since 2004. "I flew to Cordoba that year," he said, "and they would clear you without a lot of radar coverage, give you a direct-to and an altitude, and the problem was that it might take you into a mountain if you weren't paying attention to MEAs. You had to be on your toes back then to make sure that where they wanted to send you was somewhere you wanted to go."

But today, it's almost like flying in the U.S., Howie said. "From an operational standpoint, the people are famously helpful, from the handlers to everyone else. And it's easy to file. In Argentina everyone speaks perfect English. It's far beyond the Juan Peron and Pan Am days. It's not hard to fly there; they know what they're doing."

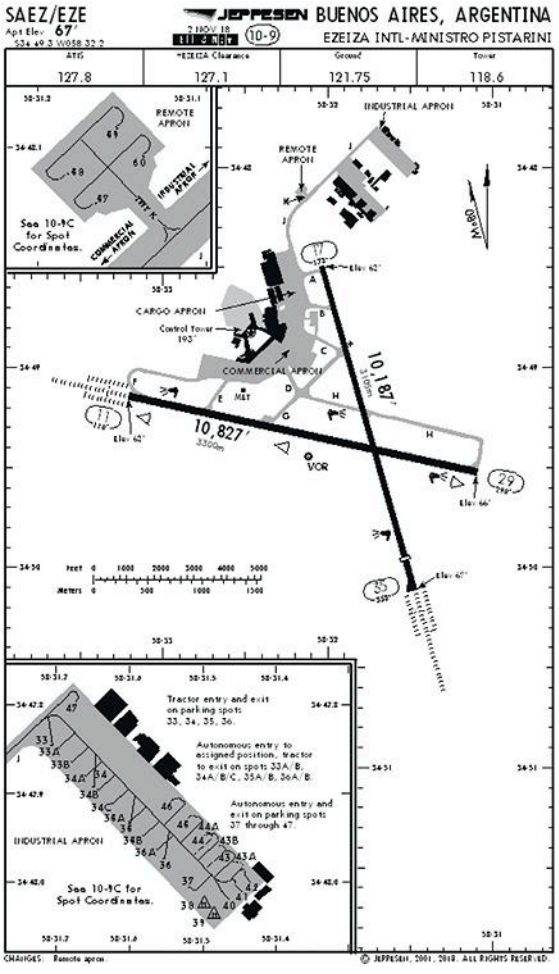
International Flight Planning 101

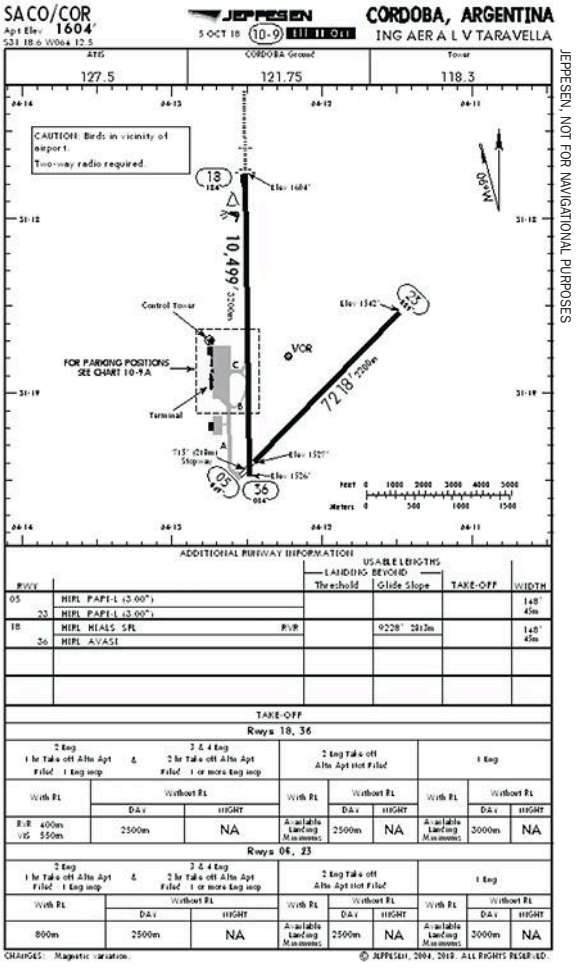
Howie's check-pilot advice to newbies heading to South America is to revisit International Flight Planning 101. "Before you go, sit down and check everything out — permits, routings, everything. Do your due diligence. Down there, if you make a lot of changes — if you don't 'plan your plan' — you will come home with $16,000 in navigation charges for your trip! Make sure when you're getting ready to go that what you have on paper in front of you is what you intended to do — that the flight plan is what you expected it to be, that your handling is scheduled, that you have your documents in order including your passport. Don't laugh, they get forgotten.

"Then," he continued, "when you load your flight plan into the FMS, it'll be correct and confirmed. They can reroute you in flight, but it will take more time than you're used to [in the U.S.]. Make sure you have the permits for overflights. Make sure you're paid up with SENEAM [Mexican ANSP] and COCESNA [Central American ANSP] and other nav providers. Flying is discipline and risk management."

The most popular business aviation destination in Argentina is, of course, Buenos Aires, the capital and business center of the country. Ninety percent of flights dispatched to Argentina go to the sprawling metropolis of 13.5 million people situated on the Rio de la Plata Estuary. The second most popular business destination is Cordoba, about 175 nm northwest of Buenos Aires, roughly in the center of the continent at 31 deg. south latitude.

It could be said that, if Argentina had a soul, it would be Buenos Aires. The city's journey from its founding in 1536 by the Spanish conquistador Pedro de Mendoza and the Catholic Church has not been an easy one, but today this lusty multicultural megalopolis endures and prospers as the political, financial and cultural nucleus of Argentina. Some regard it as a little slice of Europe in the Southern Hemisphere — "The Paris of the Pampas" — a legacy of the Spanish, Italian and German immigrants who flocked there over the centuries and left their imprimatur on Buenos Aires' art, architecture, music, theater, literature and cuisine — all of which has fused with the country's indigenous native American culture to produce a





JEPPESEN. NOT FOR NAVIGATIONAL PURPOSES

SLOOT/ISTOCK PHOTO

Ramp at Aeroparque Jorge Newbery Airport in Buenos Aires. Once the favored arrival destination for business aircraft due to its close proximity to downtown, the field has been closed to general aviation since the G20 conference in December 2018, except for pre-arranged government or VIP flights.

passionate amalgam best appreciated in Argentina's signature dance, the tango. For if anything characterizes the Argentinean temperament, it's passion.

Buenos Aires encompasses five airports, all joint civil and military. The fields that lean heaviest toward civil operations are Ezeiza Ministro Pistarini International, Aeroparque Jorge Newbery (SABE) and San Fernando (SADF). The remaining two military fields are Moron (SADM) and El Palomar (SADP), which under some circumstances, can be accessed by business aviation. However, certain limitations can make such use impractical, as we'll see below.

Until recently, the preferred airport for business aviation was Aeroparque Jorge Newbery, the city's original field named after a famous Argentinean aviator, popular because it is closest to downtown Buenos Aires. But Aeroparque has become the most congested airfield in the country, since it has had to accommodate a burgeoning amount of commercial traffic.

"President Mauricio Macri has opened up the skies to a lot of new low-cost airlines," Penalva explained. Furthermore, since the G20 conference last year, the field has been closed to general aviation — with some exceptions — and the Argentine military has taken over the General Aviation Terminal (GAT) on the southwest side of the field. A NOTAM was issued in December announcing the ban plus flow control in and out of the airport, "and so SABE isn't so attractive anymore," Penalva said. "Now there are gate holds due to flow control. You have to call for engine start, and you'll get a 45-min. gate hold."

The older military terminal at Aeroparque is scheduled to be combined with the passenger terminal. "If you are officially based on the field," Penalva said, "you can have access, but if you are an outsider, you will be turned away unless operating as an approved VIP flight." The close-in airport has historically been a venue for air transportation of government officials and other VIPs. Although SABE operates round the clock, a part of the reason for the ban is a lack of parking there.

"You used to need an Inter permit for Aeroparque," Penalva lamented, "but when the military took over the GAT in October 2018 and after the G20 conference, they are not granting those permits anymore. Also, congestion on the field is out of hand. We tried [at Arsot] to get people in, but since there was no longer a GAT with all the support it offered, access is no longer possible for routine business aviation flights. Now they will not issue clearances at all."

Just in case you are able to obtain a PPR (Prior Permission Required) approval, Penalva continued, "you need to know that they often work on the runway at night." And even for PPR general aviation operations on the field, there are GA bans between 1000 to 1300 and 2100 to 2359 local. "If you get approved for a diplomatic clearance, you will park on the southwest side of the field, and then you and your passengers will have to be vanned to the east side, around the 7,000-ft. runway, to clear the passengers at the terminal, and that takes 30 min., another 10 for the clearance, and then 20 min. into town. So, after all that, you've lost the advantage of using SABE. So you're better off going to Ezeiza, anyway."

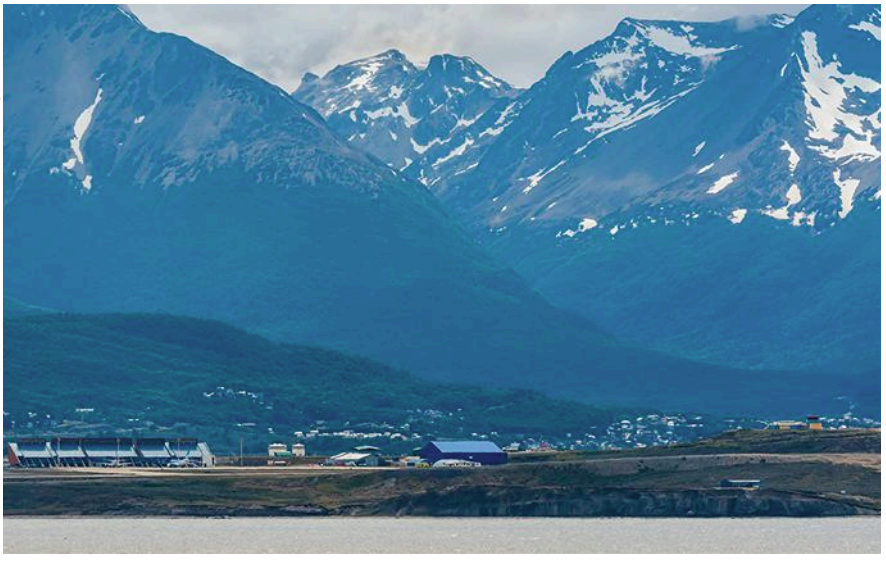
If for any reason you get a PPR approval for Aeroparque, that single runway is actually 6,890 ft. long by 131 ft. wide and made of concrete with a PCN of 050RBWT. It is ILS equipped, and field elevation is 18 ft.

Fortunately, according to Penalva, the main international airport, Ezeiza Ministero Pistarini, "has gotten better." It currently boasts the only GAT in the country, named "FBO VIP Club," and is operated by the Aeropuertos Argentina 2000 consortium, which owns the airport. The GAT is located at the most northern apron of the airport — also known as the "Industrial Ramp" — at the end of Taxiway Juliet. And it's a long taxi — at least 15 min. — from the active, Penalva said, adding, "After the cargo ramp, be aware that you cannot turn around and go back." (It seems a widebody jetliner tried to do that last year and wound up stuck across the taxiway with its nosewheel in the dirt. It took a while to have the errant airliner towed back into position, and during that time, all the traffic behind it had to wait.)

"The Industrial Ramp is used for multiple purposes," Penalva said, "including parking airliners for brief stays. So there's lots of towing in and out. It's the only place you can operate on the field if you are general aviation. The Catch-22 is you never know who's being towed in and out of there." Once the operator gets there, ground support will direct the aircraft to parking on the southeastern side of the ramp, most commonly at stands 43 through 46.

Taking the Aircraft Apart

"At Ezeiza, customs agents accompanied by a police inspector have to be present when the door comes down," Penalva said. "And they tell the captain when passengers can deplane. Corporate aviation is about managing expectations, so inform your passengers what to expect beforehand. Now customs and cops want to thoroughly inspect the plane. Then you have to



VALE_T/ISTOCK PHOTO

Malvinas Argentinas Ushuaia International Airport (SAWH) is located on the island of Tierra del Fuego at the southern tip of Argentina and South America. At 54.50S, it is the world's southernmost international airport and largely a tourist destination for transfer to cruise ships headed to Antarctica.

remove everything on the airplane except ship stores." Luggage is taken to the GAT and scanned — and in some cases, depending on the mood of customs agents, it may be opened and inspected on the ramp in the presence of the crew and passengers. After that, Jeppesen's Bartholomew added, the aircraft is locked, the door sealed by the inspectors, "and no one is allowed access to it."

(Why put visiting operators through this? It seems that customs and Ezeiza airport authorities have become "obsessed" with general aviation regarding transportation of illegal drugs, Penalva explained, having several years ago discovered narcotics onboard a transient Challenger 600, and have been known to practically take visiting aircraft apart with time-consuming and intrusive drug-screening inspections.)

"The inspectors have to get there from the main terminal, so this can take up to 2 hr.," Penalva said. "Handlers can reduce that time by setting it all up beforehand. If you need to get something off the aircraft or fuel before you leave, this is the only place in the country where you have to process an authorization letter stamped and approved by the chief of the airport police — only during work hours and not on weekends — to allow you ramp-side and onto the airplane. Have the handler arrange this before the trip."

After the ramp inspection and sealing of the aircraft, passengers and crew are vanned to the GAT, a 5-min. ride. "A G650 or Global operator will be assessed $3,500 just to walk through that facility, but you will get nothing else for that fee," Penalva groused. "Other fees will include landing, parking [at approximately $20/hr.], passenger departure tax, nav, customs, immigration — it can total as much as $10,000 before you get out of there." Jeppesen assessed the GAT fees as approximately $2,500-$2,800 for a large aircraft per day, plus a tax of $49 per international passenger and a CIQ charge of $10 per person. These fees vary at other airports.

Bartholomew also had some thoughts about fueling and parking at Ezeiza: "The airport is friendly to business aviation, but you will have to compete for the fuel trucks with the airlines. Pick your fuel provider wisely, and accommodate the time necessary to get fueled, but better yet, try to arrange for fuel on arrival. Parking is not an issue — there are nine spots there and special arrangements can be made if they are full for other locations on the airport. Get your request in early. With a big event like the G20, they may be full and particular about who they let into the airport for security reasons — that is, you might have to be an invitee to get in."

There are three fuel suppliers on the airport: YPF, Pan Am Energy (formerly Axion) and Shell. "With YPF," Penalva said, "expect indefinite delays, as they cater to the airlines' fuel needs. But a lot of the releases come through YPF; to avoid delays, it's recommended to uplift only between noon and 1500 and midnight and 0430 local."

Time windows are much better with the others, provided the handler has a good relationship with them. "It's recommended to fuel on arrival unless you're staying for a while, and weight on the LG is an issue. Make sure the crewmember who will open the airplane for fueling is properly identified in the letter with the proper passport number and that there are no mistakes."

Howie had this to say about fueling at Ezeiza: "Fuel was never a problem for us because we had releases. At the Buenos Aires airports, you must fuel from the airline fuel trucks. If you're tempted to fuel up after arrival, consider whether you want to have 8,000 lb. of fuel on your landing gear for the layover. Give yourself a lot of lead time — 3 hr. recommended — before departure and use the handler to have a fuel truck there at a preset time. Using this strategy, we never had an issue with fueling."

Oh, and one more detail for Ezeiza: Crews cannot open the door of the aircraft for departure without a customs inspector present to break the seals. The field has two runways: 11/29, 10,827 ft. long by 197 ft. wide, asphalt, PCN 082RBWT, and 17/35, 10,187 ft. by 148 ft., asphalt, PCN 070RBWT. Both are ILS-equipped. Field elevation is 67 ft.

Not for the Heavy Iron

San Fernando Airport is limited to aircraft with a 30-ton MTOW or less, and that eliminates larger Gulfstreams and Globals but is still acceptable for smaller business jets. It has one runway: 5/23, 6,253 ft. by 90 ft., asphalt, PCN 018FCXU with a displaced threshold on the 23 end. Elevation is 10 ft., and only a VOR/DME is available on the field. "You should request PPR if you're planning more than a 2-hr. stay, as it is congested," Penalva said. "Make sure parking is available." With prior arrangements, customs can be set up for international arrivals and departures.

The main ramp is by the tower and next to a small terminal, and some controllers speak English. After passengers deplane for a short walk to the terminal, the aircraft then has to be towed to "private parking," which is essentially on the ramps of based-aircraft hangars. The field is in a good part of town near businesses and about a 45-min. commute into downtown Buenos Aires.

"On an international departure, you fuel and service the

aircraft at remote parking, then move the aircraft to the apron adjacent to the terminal and the tower to board passengers and clear customs," Penalva continued. "Then you have to 'choreograph' your departure with your principal, as they will only allow the airplane to remain on the apron near the terminal for 30 min., no alternatives — they count down by the minute. Blow that, and they move you back to the remote parking area, and you have to start all over again."

The two military fields mentioned earlier, Moron and El Palomar, offer some relief if parking is not available at the big three civil/military airports. But there are limitations: Tower controllers speak only Spanish, considerable vectoring is required to get into the fields, there is no water or lav service available at either one, and both are located in rough parts of town.

Furthermore and most important, neither air base is a port of entry (POE), which is to say there are no customs services available. Thus, international arrivals would be required to land at either Ezeiza or San Fernando first to clear customs, reposition to either Moron or El Palomar, then repeat the process back to one of the POEs in order to depart the country. Finally, El Palomar has also become a destination for the bevy of new low-cost carriers invited into Argentina, so it's become fairly congested.

Ground handling is always a consideration in international ops, and Bartholomew shared some thoughts about it in Argentina. As noted earlier, Inter Cargo runs ground handling at just about every airport, and the company will handle the actual movement of the aircraft. "Have a handling agent coordinate it," Bartholomew recommended, "as the Inter Cargo people don't speak a lot of English."

Security at the Buenos Aires airports is good — they are, after all, military bases as well as civil aerodromes. They are all fenced with 24-hr. police patrols. Nevertheless, additional security is available through the Policia Aeronautica Nacional (PAN). But according to Jeppesen flight planners, there is really no need for additional security.

And keep a close watch on the weather in the Rio de la Plata region, Bartholomew advises. "In the wintertime, dense fog can settle in at Buenos Aires from April to August, so don't plan an arrival for very early morning. Usually, it burns off at 1000 hours." Convection characterizes the summer weather, including some powerful storms that have become more common in central Argentina. Also, in the south of the country, the winds pick up in the winter from west to east, plus there is an increase in winds off the Andes. So, unless you're planning to do some ridge soaring in a sailplane, you might want to avoid the strong mountain waves in your business jet.

Take Extra Fuel

Given the Rio de la Plata summertime weather, it may be advisable to carry lots of reserve fuel just in case a diversion may be necessary — or you need to drop your passengers and reposition to another airport due to parking limitations or other restrictions. Recommended diversions are Montevideo, Uruguay (SUMU), just across the Estuary from Buenos Aires; Cordoba, at least an hour away from Buenos Aires by jet; and Rosario (SAAR), about 40 min. out from the capital city. Penalva advised, "Be aware that if the weather is crappy in Buenos Aires, it's generally the same in Uruguay. So, where will you go? The point is to carry extra fuel so that, if the situation changes, you have enough fuel to make it to Uruguay or one of the other alternates. And be sure to have the handler standing by wherever you're going."

But let's assume you can get on the ground in Buenos Aires, endure all the CIQ requirements, and head downtown. "If everything is correct," Penalva, who grew up in Argentina, said, "it is a fairly quick arrival clearance, followed by about 45 min. into the heart of the downtown. Buenos Aires is very congested, lots of demonstrations and strikes, very entertaining, and a pain in the butt."

Citizens of South America's second-largest metropolitan area after São Paulo, Brazil, are called portenos ("people of the port") and are able to elect their mayors, who previously were appointed by the republic's president. The city, noted for its stunning European architecture, boasts the highest concentration of theaters in the world and many museums. Its Teatro Colon, completed in 1908, continues to host world-class opera. This is a city literally imbued with art and culture.

And unadulterated Texan Bob Howie points out that "The Puerto Madero district has a modern Hilton and wall-to-wall restaurants in converted warehouses that serve incredible food. Argentine beef is among the best in the world." On the street in Buenos Aires, visitors should exercise the usual cautions necessary to remain safe in a large city with a lot of poverty. During Argentina's monetary collapse early in the new century, street crime was rife. However, recent visitors say that, as the economy has improved, crime has been significantly reduced.

The second-most-popular business destination in Argentina is Cordoba, far inland from Buenos Aires. Its primary airport is Ambrosio L.V. Taravella International (SACO), which has two runways: 18/36, 10,410 ft. long by 148 ft. wide, concrete, PCN 069RBWT, and 5/23, 8,085 ft. by 148 ft., asphalt, PCN 056FCWT. Runway 18/36 has an ILS, and field elevation is a relatively high 1,604 ft. At the beginning of the year, Runway 18/36 was shut down for resurfacing, and with the airport restricted to one runway, general aviation was banned from 1000 to 1300 hr. and 1830 to 2300 hr. local.

There are no noise restrictions at SACO, no PPR and no slot control. CIQ is not 24/7, however, and has to be requested if outside of normal operating hours. Finally, after complaints from visiting operators about catering on the airport, Jeppesen has recommended that operators seek it from downtown hotels.

A Glacial Reward

Finally, Penalva provided some details on one of the most-popular tourist destinations in Argentina, El Calafate in southwestern Argentina, 1,100 nm south southwest of Buenos Aires. Its domestic airport, SAWC, has a single runway: 7/25, measuring 8,366 ft. by 148 ft. and made of concrete. The field's elevation is 669 ft. While 7/25 is not equipped with an ILS, the field does have a VOR/DME and an NDB.

SAWC requires the Inter permit, PPR from the airport for parking, pilots fluent in Spanish or a pilot/interpreter, and finally, permission from customs and immigration to provide service, as an agent must be brought in from 500 km away. El Calafate is busy in the South American wintertime due to tourism, the draw being the region's spectacular glaciers. "Arriving domestically, you only need the PPR and a Spanish-speaking pilot," Penalva said. "The minute a principal wants to make a change, it's a pain to have everything redone, and often they will not approve it in the first place. In which case, go with the original approved plan or operate into of one of the 23 approved airports to clear and then reposition domestically to SAWC."

Operating in Argentina can test a visiting flight crew's patience and expertise, but the rewards the country offers more than compensate for the effort. And when contemplating that, consider what its citizens have had to endure. **BCA**

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AVIATION WEEK NETWORK

Vision Jet 2.0

Cirrus makes it fly **higher, farther and quieter**

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

The Cirrus SF50 Vision Jet only has been in production for 15 months and already the planemaker is announcing a Generation 2 version, starting at s.n. 94 this year. The G2 includes a series of substantive improvements that add as much as 100 nm to range, boost tanks-full payload and make the interior more commodious for passengers. The G2's price is $250,000 higher than the original, so the new base model lists for $2.38 million. Fully equipped with popular options, it goes for $2.75 million. It's still the lowest priced turbofan aircraft on the market and its performance, payload and range capabilities are proportionate to its price.

The new model features the Perspective Touch+ cockpit, powered by Garmin G3000 avionics, that has twice the processing power, new RVSM-capable air data computers, a Flight Stream 510 WiFi and Bluetooth datalink, and an optional autothrottle system that works with the autopilot coupled. The G2 can be flown to FL 310, a 3,000-ft. altitude boost, and its pressurization has been increased from 6.4 psi to 7.1 to preserve an 8,000-ft. cabin altitude at the maximum cruising altitude.

The G2's interior cossets passengers with considerably lower cabin sound levels, the same large windows as the original model and newly available, optional executive class center section seating. The upgraded layout includes wider and plusher chairs, a center console with fold-out work tables and storage compartments and optional fold-down IFE video screen in the overhead panel.

The pilot and passenger chairs now have "kangaroo pouch," front side pockets to hold personal items. When the wider executive class chairs and center console are installed, access to the rearmost three seats is blocked, so they may not be occupied. The rear seats, though, may be removed

CIRRUS

FRED GEORGE (2)

Photographic proof of performance claims. FL 310, 309 KTAS at ISA+5C on 37% thrust. EFIS screens are the sharpest in the aviation industry, symbol colors are unambiguous, synthetic vision is standard.

to provide more carry-on luggage space for four occupants.

The new airplane has lost nothing of the original model's best qualities. It still has the smallest footprint of any production turbofan aircraft, scarcely larger than a Beech Baron. So, I will fit into most 40 ft. by 40 ft. piston twin hangars. For its relatively small exterior size, the Vision Jet has a generously proportioned cabin. The cabin floor is flat and maximum width is 5.1 ft., the same as in the Phenom 100.

With such plumpness, it's easy to understand why the aircraft's top cruise speed is just over 300 KTAS. It also has a 250 KIAS VMO and Mach 0.53 MMO due primarily to its high-lift wing.

The 300-lb. capacity aft external baggage compartment has been reshaped to provide more usable volume for long items, including golf club bags and skis. But the elongated part of the baggage compartment has a 40-lb. weight limit. The executive configuration center console may be easily removed and stored in the baggage compartment when the rear three seats are used.

The cabin door is located well aft of the cockpit, affording easy access to the second and third row passenger seats. But the pilot's chair slides all the way back on its tracks to the door sill, allowing easy access for opening and closing the upper and lower doors by the pilot. It then slides up to the cockpit in the proper position for flying the aircraft.

The Vision Jet has the best cockpit visibility of any light jet we've flown, having a virtually unequalled field of view outside the cockpit. It has an ergonomic cockpit layout and handling qualities that will make Cirrus SR20/22 pilots, accustomed to Perspective+ flight decks, feel right at home.

The G2 is the only turbofan aircraft in production to be equipped with a parachute. The Cirrus Airframe Parachute System (CAPS), much the same as with the firm's single-engine piston aircraft, is intended to be used in the event of engine failure when a safe forced landing cannot be made, in the judgment of the pilot. It's also available in the event of pilot incapacitation.

A Brief Review of Structure and Systems

The G2 uses low-pressure, low-temperature cure carbon fiber sandwich construction in most major airframe parts, including hand layup of outer pre-preg carbon fiber plies. Those are sandwiched around honeycomb core material that is then vacuum bagged and cured in low-temperature ovens.

The exception is the wing spar. It's made of pure pre-preg carbon fiber plies cured in a high-pressure, high-temperature autoclave for high strength. It's a "black aluminum" structure, typical of that is used on the Boeing 787 or Airbus A350.

High-lift airfoils are used for the wing, emphasizing enhanced low-speed performance over top end speed. VMO is 250 KIAS and MMO is Mach 0.53, more in line with turboprops than jets. Wing loading is low at 30.7 lb./sq. ft., which is great for runway performance. The tradeoff is a harsher ride in turbulence at typical cruise altitudes.

While airframe parts are mostly composite, the primary flight control surfaces and trailing edge flaps are aluminum. High-strength metal alloys also are used for landing gear, seat tracks and concentrated stress areas.

The flight controls are mechanically actuated using push-pull rods and bell cranks. Left and right sidesticks are linked to the ailerons and ruddervators on the V-tail, respectively, for roll and pitch control. Rudder pedals provide yaw control through the ruddervators. Yaw and pitch inputs to the ruddervators are mechanically mixed by linkages.

Four-way conical hat-style switches atop the sidesticks provide inputs for electrical roll and pitch trim tabs. A pitch trim wheel in the center console provides an alternate means of actuating the pitch trim tabs. There is no yaw trim.

Twin ventral fins below the dorsal V-tail have electric servo tabs that provide automatic yaw stability augmentation at 200 ft. AGL and below. Above that altitude, autopilot servos linked to the ruddervators provide automatic yaw damping.

The electrically actuated flaps extended to 50% or 15 deg. for takeoff or landing, and 100% or 39 deg. for landing. Gear down/flaps down stall speed at MTOW is 67 KIAS. V_{SO} is 64 KIAS at the 5,550 lb. max landing weight, so V_{REF} at 1.3 V_{SO} is 83 KIAS or lower, in the same range as that of the SR22. Such low landing speeds eliminate the need for ground spoilers and anti-skid brakes.

An electric motor hydraulic pump (power pack) provides power for landing gear extension and retraction. In the event of a powerpack failure, the gear may be mechanically unlocked with a handle in the cockpit and allowed to free fall until fully extended.

The main landing gear have long travel, trailing link struts for soft landings. High-capacity Beringer brakes provide considerably better stopping power and heat dissipation than the discs on early SR20/SR22 aircraft. The brakes are manual and actuated through the rudder pedals. The parking brake traps pressure in the brake lines to hold the aircraft still.

The 28 VDC electrical system has an engine-driven 270-amp starter generator and a 24 volt battery, accessible through the floor of the aft baggage compartment. It powers the main busses, along with the essential and emergency busses when needed. An engine-driven 76-amp alternator normally powers the essential bus and emergency bus. The alternator produces slightly higher voltage than the starter/generator so that one-way flow diodes in the system prevent the main bus from powering the essential and emergency busses during normal operation. The diode and voltage differential design eliminates the need for bus tie relays. The main and emergency batteries together can provide at least 60 minutes of emergency bus power.

Left and right wet wing tanks, refilled through over-wing ports, each hold 148 ga. (992 lb.) of fuel. Gravity feeds fuel into left and right collector tanks. A jet pump normally feeds fuel from the collectors to the engine fuel system. An automatic electric boost pump supplies fuel for starting, redundant supply during takeoff and when jet pump output pressure is too low. The system normally alternates between drawing from the left and right tanks at 2 gal. or one-minute intervals. The pilot also can manually select left or right tank if needed. A fuel/oil heat exchange eliminates the need for anti-icing fuel additives.

Pressurization mostly is automatic with the air data system sensing departure field elevation for takeoff and the avionics system furnishing destination field elevation for landing. A vapor cycle machine in the aircraft nose provides air conditioning with front and rear evaporators delivering copious cooling air flow through large automotive-style vents. Conditioned, cooled air also is used for windshield defogging.

There's engine bleed air for engine inlet anti-ice heating and for pneumatic boot operation on the leading edges of the wings and V-tail. Electrical heat protects the pitot probes and angle of attack vane. TKS fluid is used for windshield deicing.

All exterior and interior lighting features LED. The interior lighting package is impressive, with individual lights for each crewmember and passenger, instrument, circuit breaker and overhead panel illumination, crew task, foot well and storage pocket lights and convenience lighting activated by opening the cabin door. Exterior lights include navigation, strobe and landing lights, leading edge ice detection lights and 15-minute convenience lights on the underside of the fuselage and each wing to ease pre-flight and passenger boarding tasks in the dark.

Two seats in mid-cabin plus three seats aft. Executive seating option provides center console between larger, mid-cabin chairs.

A pneumatic fire detection loop provides engine and nacelle fire and overheat detection. Dual high-rate halon bottles provide engine fire extinguishing. A guarded switch on the overhead panel closes a fuel firewall shutoff valve to the engine and arms both fire bottles. Push-to-discharge buttons adjacent to the guarded switch trigger the fire bottles. After that, plan on an engine-out glide to landing or CAPS deployment.

A portable Halon 1211 fire extinguisher in the cockpit is available to extinguish cabin fires.

Let's Go Flying

Matt Bergwall, the firm's director for the Vision Jet product line, invited us to fly the G2 version late last year. Preflighting the aircraft is simple, with easy access to most systems. Locking jet fuel and TKS fluid caps assure the pilot controls what goes into the tanks. One exception is checking engine oil.

The aircraft has clamshell upper and lower doors with fold-down air stairs for easy boarding behind the pilot seats.

All but tall pilots may need a short step stool to see the engine oil level through the spring-loaded access door in the top nacelle. The aircraft also would benefit if there were an LED light inside the nacelle to illuminate the engine oil level sight gauge. This would eliminate the need to use a flashlight on preflight to check the gauge.

When we opened the aircraft's clamshell doors, we were immediately impressed with the interior upgrades, including the optional mid-cabin executive chairs and center console. The cabin has the ambience of a luxury automobile, making it far more inviting than many entry-level turbine airplanes we've flown. The position and size of the cabin doors also make for easy ingress and egress. Sliding the pilot seat back staggers it from the copilot's chair, affording effortless access.

The improved acoustical insulation package is thicker and denser than that of the original version, cutting cabin noise levels by 3 dB, half the sound pressure of the original model. Better insulation adds 10 lb. of empty weight, but that's fully offset by removal of an anti-ice bleed air heat exchanger, aero fences inboard of the ailerons and boundary layer energizers ahead of the ailerons.

Upgrading from twin lead acid to a pair of Mid Continent True Blue lithium ion batteries reduces empty weight by more than 60 lb. Just as importantly to pilots, they have considerably more stamina for supporting avionics functions prior to engine start. The addition of Flight Stream 510 enables pilots to plan a flight using Foreflight or Garmin Pilot on a tablet computer, then transfer it to the aircraft avionics system once battery power is switched on. The cockpit has left- and right-side USB charging ports, supporting EFBs and thus permitting paperless flight deck operations.

USB charging ports allow personal electronic devices to be linked to the optional inflight entertainment system.

The flight deck layout follows the pattern of Cirrus piston engine aircraft. The dual, large-format display screens are angled toward the pilot for easy viewing. Three, landscape configuration touchscreen controls are mounted below the display screens. We appreciate being able to use one for PFD functions, another for MFD functions and the third for radio control.

A bolster panel below the triple touchscreens has dedicated sections for electrical system, exterior lights, environmental and ice protection switches. Notably, Vision Jet is one of the few current production turbofan aircraft we've flown that has a switch that must be turned on to the "bleed air" position prior to flight to pressurize the cabin. In most other aircraft, this function is automatic, usually tied to throttle lever position and/or weight off wheels sensing.

In contrast to most other Garmin-equipped cockpits, the auto-pilot and auto-throttle controls are mounted high in the center console rather than being housed in a glareshield control panel.

Starting the aircraft's single 1,846-lb. thrust Williams International FJ33-5 turbofan is effortless. Turn the engine control knob to run and press the start button. The FADEC handles all the other functions, including switching on the fuel boost pump.

Chockful of options, the aircraft's empty weight was 3,646 lb. With two aboard and 1,787 lb. of fuel, ramp weight was 5,833 lb. Computed takeoff weight was 5,800 lb. Departing Runway 11 at Roberts Field (KRDM) in Redmond, Oregon, elevation 3,080 ft. at 7C, using flaps 50%, computed takeoff distance was 3,400 ft. Available runway was 7,006 ft.

Bergwall reviewed the engine failure on takeoff procedures: 1: Below 1,000 ft. AGL, establish best glide speed and land straight ahead, avoiding obstacles. 2: Between 1,000 ft. and 2,000 ft., slow to less than 135 KIAS and pull the CAPS handle and parachute to the surface. The aircraft has 26G seats to protect occupants, greatly improving survival odds following a forced or parachute landing. 3: Above 2,000 ft., the pilot establishes a 115 KIAS best glide speed and searches for a suitable landing area. The aircraft,

in spite of its stubby proportions, has a respectable 14.7:1 glide ratio. 4: Lose an engine at FL 310 and you can glide 75 nm to a sea level airport.

There was a 10 kt. to 15 kt. quartering tailwind as taxied to the runway from Redmond's Leading Edge Jet Center. The aircraft is the only civil turbofan aircraft we've flown with a free castering nosewheel. The design is the same as with Cirrus' piston engine aircraft. Differential braking during taxi provides most of the directional control. The V-tail and ruddervators provide very little directional control, especially with a quartering tailwind. The aircraft could benefit from the addition of a positive nosewheel steering system, in our opinion.

Cleared for takeoff on Runway 11, the aircraft accelerated about the same as an Eclipse 500. The aircraft's main landing gear are well aft of the center of gravity, so it takes a healthy pull back on the sidestick to unstick the aircraft at the 90 KIAS rotation speed. After weight is off the wheels, back pressure on the sidestick can be reduced.

We retracted the landing gear with a positive rate of climb and then the flaps at 115 KIAS. We engaged the auto-pilot at 3,500 ft. MSL — 400+ ft. above the runway — so that we also could use the autothrottle. The Garmin system back drives the throttle lever, so the crew has positive visual and tactile feedback that the system is operating properly. The system automatically reduced thrust to max continuous for the climb, maintaining engine parameters within limits.

FMS climb speed varied from 173 KIAS at takeoff, decreasing to 138 KIAS near level-off at FL 310. Our route of flight took us northeast to Kimberly VOR (IMB), then up to Spokane, west to Yakima, down to The Dalles and finally back to Redmond. That would give us time at altitude to check cruise performance and differences in cabin sound levels.

Bergwall noted that Williams dialed up maximum climb and cruise thrust of the FJ33-5 between FL 240 and FL 310 for the G2 to enhance performance and assure the aircraft at FL 310 would meet or exceed the maximum cruise speed of the original model at FL 280, its maximum certified altitude.

It did not disappoint. Level at FL 310 at 5,457 lb. in ISA conditions, the aircraft cruised at 309 KTAS, or spot-on book predictions. The engine was producing 683 lb. of thrust, according to the cockpit displays. But fuel flow was 60 gph while the book forecast 64 gph. Specific range at 309 KTAS was better than book predictions for cruising at 280 KTAS.

Just as impressively, cabin sound levels were considerably lower when we removed our headsets, based on subjective observations. This was in part due to the G2's improved acoustical insulation and in part because of its increased cabin pressurization.

Returning to Redmond, we requested the RNAV (GPS) Runway 11 approach. During the descent, the auto-pilot and auto-throttle smoothly and precisely kept the aircraft within its 250 KIAS VMO and 0.53 MMO redlines. Approach vectored us around arriving jetliner traffic and, eventually, it became clear it would be easier to hand fly the aircraft than make inputs to the autopilot.

At this point, we disconnected the autopilot, which also disconnected the autothrottle system. To reduce pilot workload, it would be advantageous if the autothrottle system could be used independently of the autopilot, in our opinion, much the same as autothrottle systems installed in most other civil turbofan aircraft we've flown.

However, Vision Jet's docile handling characteristics and slow approach and landing speeds, make it virtually as easy to hand fly as Cirrus' piston engine aircraft. At 5,000-lb. aircraft weight, VREF landing speed at flaps 39° was 81 KIAS. Landing distance over a 50 ft. screen height was 2,800 ft.

As we've previously noted, though, the aircraft does exhibit quite pronounced thrust/pitch coupling characteristics due to the engine's being mounted well above the CG. Pull back the thrust lever and the nose pitches up. Push forward and the nose pooches down.

We taxied back to Leading Edge Jet Center after 2+00 hr.

Our Conclusions

Vision Jet is well suited as a step-up product for Cirrus SR20/SR22 owner-pilots. Outward visibility is superb. Cabin spaciousness is unexcelled. The FJ33's FADEC makes pilot workload considerably lower than when operating a PT6A-powered turboprop. Based on our previous flight with Bergwall in an orginal Vision Jet, we feel confident in concluding that the G2's stall characteristics and approach speeds are right down with the best of the single-engine turboprops. This aircraft very much is confidence inspiring for piston aircraft pilots upgrading to their first jet.

While the original SF50 was an ideally suited step-up airplane for Cirrus SR20/SR22 operators, the G2 would be even more so, if Cirrus fits it with a pitch/thrust compensation system and positive nosewheel steering.

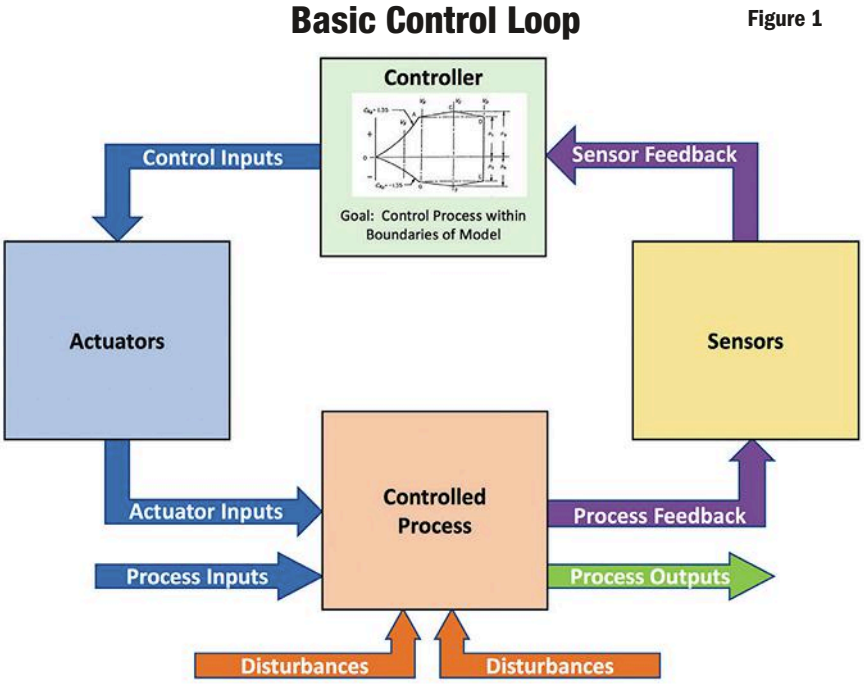
Cirrus has a well-established track record of making regular, substantive improvements to its piston engine product line. Its sixth generation SR aircraft, for instance, are head-and-shoulders above the first examples we flew at the turn of the century.

The G2 Vision Jet has a bright future and subsequent versions most likely will be more capable, quieter and longer range. For now, this aircraft has no direct competitors at its $2.38 million base price point. It's no wonder Cirrus has racked up more than 600 orders for the Collier Trophy winner. **BCA**

The signature Cirrus Aircraft Parachute System provides unparalleled occupant protection in the event of engine failure or pilot incapacitation.

MIT Aims to STAMP Out Accidents

Giving up the **post-mortem blame game**



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

Nancy Leveson, Ph.D., professor of aeronautics and astronautics at the Massachusetts Institute of Technology (MIT), has been on a 30+ year quest to engineer out hazards that can lead to aircraft accidents. Her Systems Theoretic Accident Model and Processes or, simply, STAMP, eschews the quick-and-dirty, blame-the-pilots approach to post-accident analysis and instead embraces a holistic approach to identifying, analyzing and eliminating a wide range of hazards during aircraft design, development and construction, as well as in everyday operation.

"Hazard analysis can be thought of as investigating an accident before it occurs," Leveson writes in her 2004 paper "A New Accident Model for Engineering Safer Systems." "The most effective models will go beyond assigning blame and instead help engineers to learn as much as possible about all the factors involved, including those related to social and organization structures." She emphasizes that when safety investigators simply sift accident data through traditional filters, they risk biasing the results in favor of only historical events or conditions. But if they choose to look outside those constraints, they may uncover a whole host of causal or contributing factors that previously may have been overlooked.

At its core, STAMP is based on a closed control loop, as illustrated in **Figure 1:** (1) controller, (2) actuator (3) controlled process and (4) sensors. In the early days of aviation, pilots were just controllers with mental models of appropriate processes, such as keeping the aircraft within its design flight envelope. They made hand and foot inputs to actuators that controlled processes. Outside inputs and disturbance also affected the controlled processes. The behaviors of the controlled processes were sensed by eyes, hands, ears and seat of the pants, providing feedback to the pilot/controllers who then made adjustments to their inputs to achieve the desired behaviors. If the controlled process went awry, it was relatively easy to trace the problem to an equipment failure or pilot error.

However, Leveson notes that as aircraft performance increased, the simple pilot-actuator-controlled process-sensor closed control loop resulted in higher and higher pilot workload. Accordingly, basic analog computers were introduced to aircraft and tasks were delegated to them with the goal of decreasing pilot workload, as shown in **Figure 2.**

Early analog computers made possible anti-skid braking, nosewheel steering and automatic redline limiting for powerplants and propellers. With the advent of digital computers, precision control of many more systems became possible. Software engineers became kingpins in aircraft design, able to create computer codes with unprecedented and near fail-proof capabilities.

Overall aircraft reliability also steadily improved, including structures, systems and powerplants. The percentage of aircraft accidents due to equipment failure plummeted. Conversely, accidents involving pilot error soared.

Leveson asserts many such accidents were symptomatic of higher level equipment design and operational control shortcomings. Hardware and software performed exactly as designed. But the original design requirements failed to encompass all possible complex process behaviors.

"We are attempting to build systems that are beyond our ability to intellectually manage. . . ." Leveson writes. It's increasingly tough for designers to foresee all potential normal, non-normal

and emergency system modes or states that can occur during flight operations. No wonder some pilots ask themselves "What's it doing now?"

Leveson's holistic approach to system design and accident investigation is becoming more essential because of the accelerated pace of technology development. That's a major factor that has often been overlooked in accident investigation in the past. Technology advances are particularly challenging as they have outpaced system safety engineering.

Why Won't It Stop?

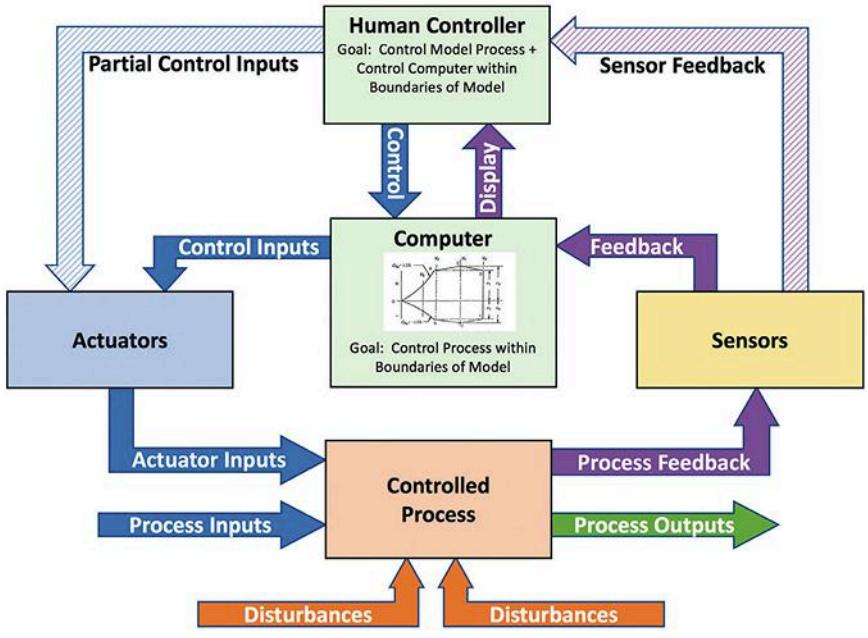
Leveson cites two fatal jetliner accidents as being especially emblematic of shortcomings in aircraft design requirements and operational control. First, an Airbus A320-211, performing as Lufthansa Flight 2904, flew from Frankfurt to Warsaw in September 1993. Okecie Tower warned the pilots that wind-shear conditions were encountered on the approach to Runway 11 by Lufthansa Flight 5764, which had just landed. In response to AFM guidance, the pilots of LH 2904 increased the selected landing reference speed. The pavement was very wet and surface winds were shifting.

When the Airbus touched down on the runway, the contact was so gentle the left main landing gear didn't sufficiently compress to trigger the weight-on-wheels (WOW) squat switch to ground mode until halfway down the runway, 9 sec. after the right main WOW switch activated. Hydroplaning prevented the main wheels from spinning up to 72 kt., the minimum needed to override the WOW switches to the ground mode. As a result, ground spoiler deployment and thrust reverser activation were delayed. Also because of hydroplaning, the main wheels didn't spin up until 4 sec. later, thereby allowing the wheel brakes to start functioning. Compounding those problems, the crew touched down long and 20-kt. fast. These were critical factors, considering the wet runway and 13-kt. tailwind.

The thrust reverser lockout, brake-by-wire system and automatic ground spoilers worked perfectly, according to design spec. Unfortunately, though, those systems in part prevented the flight crew from stopping the aircraft before it reached the end of the runway at 72 kt. The jetliner crashed down a shallow embankment, came to rest partially on a perimeter access road and caught fire. The pilot in the right seat and one passenger died as a result and 49 passengers and two crewmembers were injured.

Figure 2

Human/Computer Control Loop



A second example: Red Wings Flight 9268, a Tupolev Tu-204, flew on a positioning mission from Pardubice Airport, Czech Republic to Moscow-Vnukovo in December 2012. The crew was cleared to land on Runway 19, a 10,039-ft.-long strip. It had recently snowed at Vnukovo prior to the aircraft's arrival. With gusting winds reported, the crew increased approach speed from 113 kt. to 124 kt. to provide more stall margin. The crew actually flew 14 to 16 kt. faster.

The aircraft crossed the threshold of Runway 19 at 50 ft., but at 140 kt. It touched down long, fast and at a soft 1.12 G, with a 26-kt. right crosswind. The left main strut compressed, but the right main strut remained partially extended due to the crosswind. As the nosewheel touched down, the crew selected maximum reverse thrust in one continuous movement and initiated maximum autobraking. While engine rpm increased, the thrust reversers did not deploy, thus the aircraft accelerated. In addition, the air brakes and ground spoilers did not automatically deploy. And the crew did not actuate them manually, further compounding the problem.

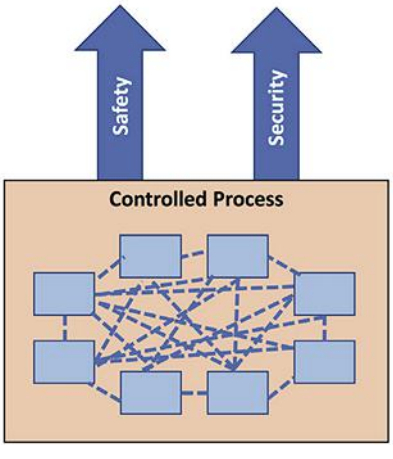
The flight engineer shouted, "Reversers! Deploy reversers!" The pilots again moved initiated max reverse. Again, engine rpm increased, but the reversers didn't move. And, again, the aircraft accelerated.

The aircraft skidded down the runway for 32 sec. and careened off the end at 116 kt. It plowed through snow and small obstacles, impacted a slope in a steep ravine at 102 kt. and broke into pieces. Five of the eight crewmembers on board were killed.

Accident investigators concluded that the crash was caused by maladjustment of the WOW sensors, causing the thrust reversers to be locked out and preventing automatic deployment of the ground spoilers. But the Russian Interstate Aviation Committee also faulted the pilots for not following AFM procedures and for flying an unstabilized approach. Aboard the Tu-204, pilots are required to first unlock and deploy the reversers at idle rpm, verifying that the reversers are in proper position before they fully actuate them. The accident report didn't mention that during the stress of

Figure 3

Emergent Properties of a Controlled Process



attempting to stop the aircraft on a slippery runway with gusting winds, this two-step actuation process may be easy to overlook.

All too often, Leveson notes, blaming the pilots just results in their being censured, fired or retrained. Alternatively, the quest to eliminate "pilot error" may result in increasing the level of automation or making standard operating procedures more rigid. It's no guarantee that the same type of accident won't recur because latent hazards remain hidden.

"In complex systems, human and technical considerations cannot be isolated," she writes, reflecting specifically on the Warsaw A320 and Moscow Tu-204 accidents. "Human error is a symptom of a system that needs to be redesigned."

In Front of the Screen, Behind the Screen

Too often, there is an invisible, impermeable wall between pilots and computers. According to Leveson, "Human factors concentrates on the [cockpit display or ATC computer] 'screen out.' Hardware and software engineering concentrates on the 'screen in.'" The two parts of the system are not integrated, often leading to "mode confusion, situational awareness errors, inconsistent behavior, etc.," Leveson asserts.

She cites the December 1995 American Airlines Boeing 757 controlled flight into terrain near Cali, Colombia, as a prime example of human/computer interface dysfunction. The flight crew was faulted for a breakdown in CRM. But Leveson notes that there was an inconsistency in the name of the waypoint identifier for ROZO intersection, used to navigate on the approach into Cali, between the published approach chart and the FMS navigation database. She also asserts that the carrier's training department did not alert its flight crews about the inconsistencies between the charts and FMS identifiers. She notes that Jeppesen-Sanderson furnished both the published approach charts and FMS navigation database updates for the aircraft but didn't tell the airlines that different waypoint identifiers were used on charts and in FMSes. And, finally, she points out that no international uniform standards existed for the digital navigation databases used in different avionics manufacturers' FMS boxes.

Leveson says she didn't invent the holistic approach to accident prevention. Rather, she credits the late Jerome Lederer, founder of the Flight Safety Foundation and NASA's director of safety. A half century earlier he wrote, "Systems safety covers the total spectrum of risk management," encompassing the states of mind of designers and producers; employee/management relations; the relationships between government, associations and operators; human factors; and the approach to safety by top management.

And she writes, "Studies have found that the most important factor in the occurrence of accidents is management commitment to safety and the basic safety culture in the organization or industry." Top management cannot afford to assume that old accident analysis methods are adequate for today's complex aircraft operations. Or that ever-increasing technological complexity can be crammed into conventional cockpits without providing pilots with more intuitive displays and controls.

"The problem is complexity," Leveson says. Historically, engineers have oversimplified system behaviors. They've used the analytic reduction method to examine individual components, or pairs of components. Behaviors have broken down into individual events that occur during a predictable time sequence. This "divide and conquer" approach assumes each component functions autonomously

Figure 4

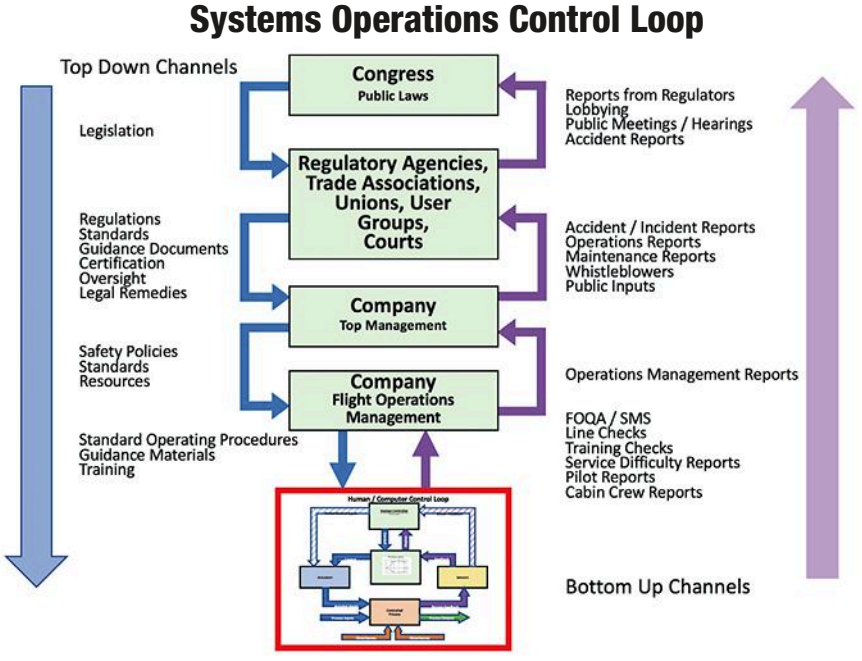
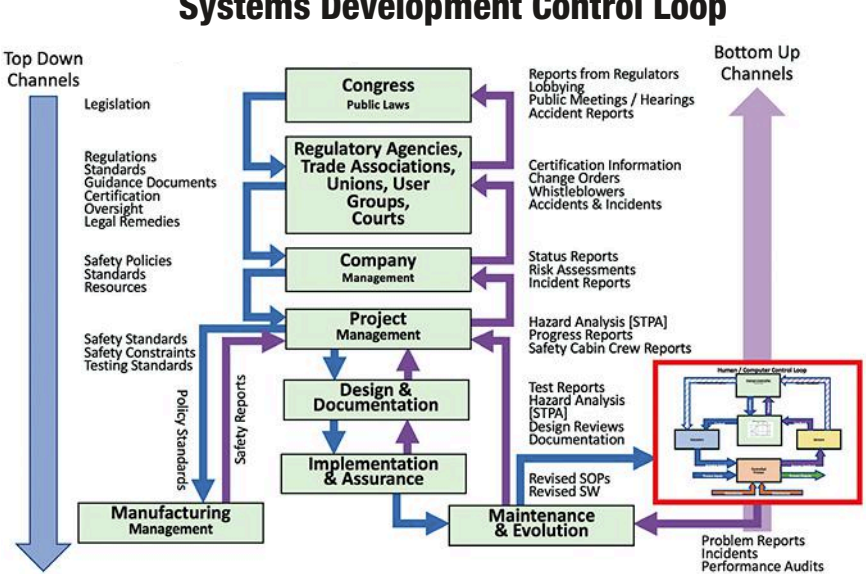


Figure 5



or in concert with another component. It also assumes that each component functions the same individually or when operating as part of a whole system. According to analytic reduction advocates, you can combine those simple interactions and you can predict the behavior of the entire system.

But such a simplistic approach, Leveson says, doesn't work with today's complex systems. "The whole is greater than the sum of its parts," she maintains, because of the myriad ways individual components, especially ones with complex software, can function with each other within a system in unexpected ways.

Greater Than the Sum of Parts

Emergence is a term used to describe synergies that evolve as a result of parts interacting with each other in a system. A single ant in a colony, for instance, is a simple creature that cannot lead the actions of the entire colony by itself. But when groups are guided by strong pheromone trails, when they are working with others to gather food, or when they are compelled to protect the queen ant at the cost of their own lives, individual ants in colonies are able to exploit their environments impressively over long periods of time. The emergent properties of ant colonies thus extend far beyond the limited capabilities and short life spans of individual ants.

J. Doyne Farmer, complex systems scientist and Oxford University math professor, says that emergence isn't magic, but it feels like magic because individual components in a system, similar to ants in a colony, can self-organize to produce wholly new properties and actions.

That's why Leveson's systems theory approach to investigating potential accidents before they can occur is so relevant. It emphasizes the study of emergent properties, attributes or behaviors that arise from the complex and seemingly unprogrammed interaction of all parts contained within a system, as illustrated in **Figure 3.**

Both "safety and security are emergent properties," says Leveson. The most effective way of keeping potential risks in check is by exerting firm, top-level control over the entire system. Preventing aircraft from intruding into minimum separation bubbles, keeping aircraft from operating outside of a safe flight envelope, requiring component replacement or restoration well before they can break, and assuring adequate crew rest periods between duty times are examples of top-level control functions.

To optimize safety and security, Leveson believes that a series of two complementary closed control loops are necessary. **Figure 4** depicts a systems operations control loop applicable to pilots, flight operations, FAA field offices, air traffic control organizations, flight training organizations, and maintenance and repair organizations. For simplicity, we've chosen to show only a systems operations control loop for an aircraft operator.

In this closed loop, the U.S. Congress is at top-level control, ultimately responsible for the safety and security of civil flight operations in the US. The second tier, comprising the FAA, trade associations, unions, user groups and the court system, exercises authority granted by laws passed by the federal legislature to provide rules and regulations, oversight, guidance, operating standards, certification of pilots and operators, and, as a last resort, legal remedies.

The third tier, the company or organization top management level, perhaps is the most vital to operational safety and security, as noted by Leveson. The culture of a flight department operation directly depends on the commitment of top management to the highest safety and security end goals.

The company flight operations department, at the fourth tier, is charged with the responsibility and is given sufficient authority to screen personnel for qualification, to train people and to promulgate standard operating procedures and guidance materials to assure safety and security at the cockpit, cabin, service and maintenance level.

Congress ultimately is charged with the safety and security of flight operations, but time lags in the bottom-up feedback channels may result in delays of months or even years before issues are addressed. In addition, filtering may occur at each level in the feedback loop caused by internal organizational politics, strict cost control considerations and personality conflicts.

Yet, control actions only are as effective as the feedback provided by the people operating closest to the risks .

Dissecting data from the crash of Comair Flight 5191 at Lexington, Kentucky's Blue Grass Airport (KLEX) in August 2006 provides examples. About an hour before sunrise, the crew attempted to depart from 3,501-ft.-long Runway 26, instead of Runway 22, a 7,003-ft.-long strip. Departing at a weight of about 49,000 lb., takeoff roll for the Bombardier CRJ100 was 3,744 ft. The aircraft crashed off the end of Runway 26 at 137 kt., 5 kt. below rotation speed, killing everyone on board but the copilot.

The NTSB concluded the accident primarily was caused by the flight crew violating sterile cockpit procedures, failing to confirm they were on the correct runway and non-compliance with Comair's standard operating procedures.

But "Blame is the enemy of safety," says Leveson. "To prevent accidents in the future, [we] need to focus on why it happened, not who to blame." Hindsight bias often just concludes the crew "should have, could have, would have" that identifies and illuminates peoples' mistakes but fails to determine why those mistakes were made.

Paul Nelson, a former Comair captain, Air Line Pilots Association safety specialist and mentee of Leveson, conducted a STAMP Analysis of the KLEX Comair 5191 accident as part of a master's program. The analysis, which delves deep into the accident's root causes, includes the published airport diagram, which accurately depicts the layout of ramps, runways and taxiways as the flight crew had seen on their previous flights into Lexington. But since their last flight to the airport, the taxiways near the ends of Runways 22 and 26 had been partially closed and renamed. There was no "heads-up" alert of the change in the taxiways provided by the tower, ATIS or Comair dispatch release. Comair didn't have an internal process for including some airport NOTAMs on dispatch releases. Nelson asserts that the crew, at a minimum, needed an amended airport chart that would have shown the changes in taxiway layout.

The flight crew indeed had a flawed mental model of the airport diagram, aggravated by flashing low barricade lights on the closed taxiways and the lack of lights where they had previously seen them. The tower did not caution them that the taxi route was different than depicted on the airport diagram. The mishap occurred long before tablet computers and MFDs with moving map depictions, including airport diagrams, became commonplace. The pilots believed they were taxiing to Runway 22, unaware of the changes in taxiways. Comair didn't have an SOP requiring the PFC heading bug to be set to runway heading prior to taxi.

It was dark at the airport. The crew probably was fatigued with a change in schedule and an 0400 wake-up call. Comair was in bankruptcy and attempting to save costs; it was demanding large

cuts in pilot wages. This created financial stress on flight crews and it was a frequent topic of conversation in cockpits.

The Blue Grass Airport Authority also exercised unsafe control actions. It relied only on FAA guidance for erecting signage during construction. It did not seek out additional FAA help, other than NOTAMs, to find out how to assist pilots in identifying potential hazards. It never asked airport users how to improve situational awareness and it changed the name of Taxiway A5 to Taxiway A but only erected minimal signage.

The FAA also had a role. The hold-short markings for Runways 22 and 26 were standard pairs of solid and dotted yellow lines. The agency did not upgrade signage with white on red runway name signs adjacent to the hold short lines. Such enhancements only were required at airports with more than 1.5 million annual passengers. Furthermore, Lexington Tower was staffed with a single person during periods of low traffic volume. Budget constraints prevented assigning two people to work the tower and ATC coordination functions.

The single tower controller was multitasking that morning. The controller's possible sleep deprivation could have impaired performance. The Comair crew was issued nonstandard taxi instructions. And the controller didn't have time to monitor the position of the CRJ prior to clearing the aircraft for takeoff.

According to Nelson's analysis, all these factors combined and emerged as a critical safety breakdown that ultimately led to 49 people dying in a fiery, high-speed crash. Congress, Comair, the FAA and the Blue Grass Airport Authority, as well as the flight crew, failed to exercise critical safety controls that could have prevented the accident.

STAMP Tackles Future Accidents . . . Before They Happen

Leveson conducts STAMP workshops at MIT every March, to teach participants her holistic STAMP control techniques, such as Causal Analysis using System Theory (CAST) pertaining to accidents, and System Theoretic Process Analysis (STPA), which applies to hazards.

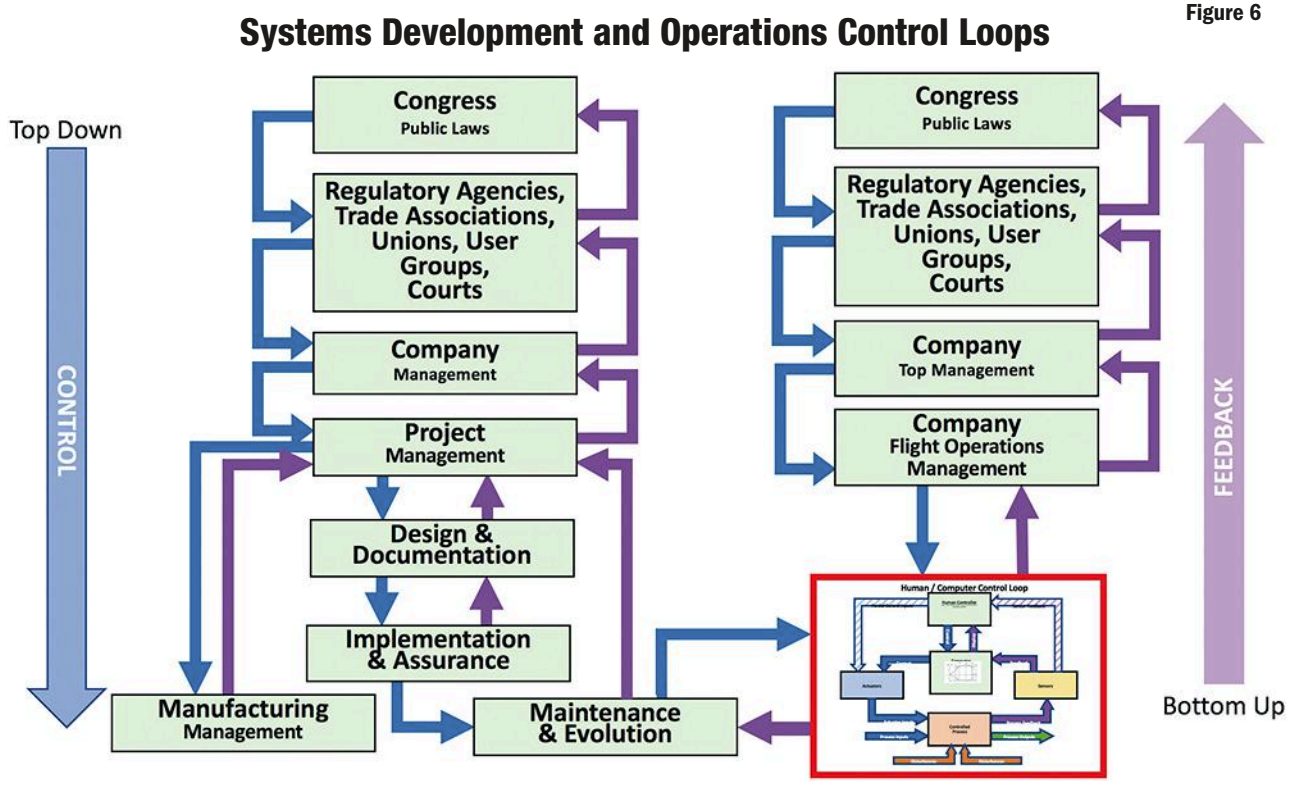
STAMP participants not only dissect accidents caused by inadequate operational safety and security control using CAST, they also examine systems development control loops by applying STPA to identify potential hazards in design, development, testing and manufacturing processes, as shown in **Figure 5.** As with systems operations control loops, systems development loops start at the top with federal law. The second and third tiers, respectively, consist of regulators and top company management, among other stakeholders.

Figure 6 shows the relationships between development and operational control loops. Each have the U.S. Congress at the top level and each provides feedback from end users. Free and open communications are the keys to success in attaining optimum safety and security in both control loops. Feedback from the people closest to hazards at the human/computer control loop level is critical to fine-tuning processes. Human and computer component interactions within the control process change over time due to fatigue, stress and state of mind, along with wear, age and maintenance. As a result, the process controls that are effective today may need updating tomorrow to attain the same safety and security outcomes.

"The public has a "decreasing tolerance for single accidents," she writes. "The losses from accidents [are] increasing with the cost and potential destructiveness of the systems we build."

That observation is particularly applicable to the aviation industry. According to Leveson, "Learning from accidents needs to be supplemented with increasing emphasis on preventing the first one." For safety-conscious aviation department managers, learning from the MIT professor's annual STAMP seminars is worth consideration. For more information on the March 2019 workshop, visit **http://psas.scripts.mit.edu/home/2019-stamp-workshop/** BCA

Figure 6



Fred George
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Citation Sovereign

Capacious midsize cabin, **near transcontinental** range, light jet runway performance

CESSNA AIRCRAFT BUILT 349 CITATION SOVEREIGN JETS FROM 2004 through 2013 when it was superseded by Sovereign+, the current production model. About a dozen of the original 349 units are available on the used aircraft market. This versatile business airplane has earned a reputation for rock-solid reliability, operators say, plus it has the largest cabin of any midsize jet of its vintage, along with class leading runway and climb performance.

Russ Meyer, Jr., Cessna's chairman in the later 1990s, was looking for a new midsize aircraft to plug the gap between Citation Excel and Citation X. Meyer told his engineers that Cessna needed to offer greater cabin comfort than other midsize competitors, but one that would retain "simple Citation" utility, reliability and runway performance. It would need transcontinental U.S.-range to beat the Hawker 800, a strong thrust-to-weight ratio to vie against the Learjet 60 and a large wing to provide unmatched runway performance. He also insisted that the new airplane not be tarred as another sub-400 kt. "Slo-tation."

CESSNA

Cessna's engineers embraced the challenge. They stretched the Excel's fuselage to create a 6.6-ft. longer cabin and increased external baggage volume to 100 cu. ft. They fitted the aircraft with a clean-sheet wing with a high critical Mach airfoil, enabling it to cruise as fast as 445 KTAS. Having 515.9 sq. ft. of wing area and large trailing edge flaps, the Sovereign would have virtually unbeatable runway performance in its class.

Cessna tapped Pratt & Whitney Canada to provide 5,686-lb. thrust PW306C engines, essentially derated versions of the same turbofans used on the Gulfstream G200 and the Do-328JET. When the Sovereign gained weight during development, Cessna just bumped up the thrust to 5,770 lb. to preserve performance. Honeywell supplied its new Primus Epic avionics suite, including four, eight-by-ten LCD screens, Primus II radios and a full complement of hazard avoidance systems. The avionics had early growing pains, but they've matured into a highly reliable system.

The Sovereign's 25.3-ft. long cabin typically is configured with double club seating for eight travelers. Across from the entry door, there is a ninth, side-facing seat and forward galley. That's handy if you're carrying a flight attendant. There is 35 cu. ft. of internal luggage capacity.

Typically equipped, the Sovereign can carry 1,177 lb. of payload with full fuel. The aircraft can fly 2,840 nm at a block speed of 406 KTAS. That's not as fast or as far as the class-leading Gulfstream G150, but the Sovereign's 6.6-ft. longer cabin accommodates two more seats. The Sovereign has the largest and heaviest airframe in the midsize class, so it burns more fuel than most competitors.

Operators typically climb directly to FL 410 in 19 minutes, even though the aircraft will climb up to FL 430 in 26 minutes. This enables the Model 680 to travel 400 nm in the first hour while burning just under 2,000 lb. of fuel. Second hour cruise speed is about 420 KTAS and fuel burn is 1,550 lb. Step climbing to FL 430 in the third hour decreases fuel burn to 1,400 pph with negligible impact on cruise speed. A max range profile requires subsequent step climbs to FL 450 and FL 470. The 9.3-psi pressurization holds down cabin altitude to 7,200 ft. or lower.

Operators say the Sovereign's 2,840-nm range is sufficient for most transcontinental U.S. trips, but it's slim for West Coast to Hawaii or transatlantic missions. On shorter trips, operators fly at FL 400 to FL 410 where they cruise at 430 to 440 KTAS and where cabin altitude is 5,500 feet. Plan on burning 2,000 lb./hr. for most short missions. Pratt & Whitney ESP runs about $591 per hour for both engines. Textron Aviation's Pro Parts costs $535 per flight hour and Honeywell Avionics Protection Plan costs $146 per hour. Investing in HAPP is highly advisable as the Primus Epic avionics system is one of the aircraft's few shortcomings.

Upgrading with ADS-B service bulletin SB680-34-33 R1 runs about $150,000 for WAAS GPS and the Primus II XS-858B ADS-B transponder update.

Basic maintenance intervals are at 400 hr. and the aircraft is MSG 3 compliant, so it's easy on technicians. Textron Aviation's product support is a strong point of the Citation product line.

Main competitors include the Learjet 60, which has a considerably smaller cabin, but higher cruise speeds and better fuel efficiency; the Gulfstream G150 offers more range, speed and fuel economy, plus a superior cabin cross section, but less cabin length; and the Hawker 900XP, which features a tanks-full, seats-full capability and a wider, but shorter cabin, along with 100 nm less range and slower cruise speeds.

Aircraft resale value, however, speaks louder than simple data points. Sovereign resale prices range from $5 million for early 2004 models to $8 million for 2013 aircraft. That's considerably better value retention than most midsize competitors, providing evident that aircraft is near tops in its class. **BCA**

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FAA Reauthorization — Finally

The agency gets funding and **many new tasks**

AFTER MUCH DEBATE AND DELAY, THE FAA REAUTHORIZATION Act of 2018 was finally signed into law. The business aviation community has mostly focused on what the law does not contain: ATC privatization. But enough about what didn't happen — exactly what did the nation's aviation authority get for our $90 billion over the next five years?

Weighing in at nearly 1,200 pages, the Act addresses many issues, while directing the FAA to study many more.

Airline Passenger Protections: Business aviation people ride on the airlines too, not only to remind ourselves of why our industry exists but because we just have to. Congress devoted many pages of the Act to addressing the declining civility and increasing chaos of airline travel. The law prohibits involuntary bumping of passengers who have already boarded and requires clarification of regulations regarding compensation for bumped passengers. It also directs the FAA to set minimum pitch (legroom), width and length requirements for passenger seats on commercial flights. Use of cellphones for inflight calls is prohibited on airline flights. And the penalties for interference with cabin or flight crews is increased from $25,000 to $35,000 and the statute was expanded to cover "sexual assault."

Business Aviation: FAR Part 91 and 135 operators can expect to read a wide variety of reports and rulemaking efforts in the coming years. The FAA will create a task force to assess its oversight and authorization processes under Part 91. The agency is also required to provide "clear and concise" advisory guidance on how a pilot may share flight expenses with passengers. The Act further requires a report on how the agency is improving efforts to combat illegal charter flights.

In addition, the FAA is required to initiate rulemaking to increase the duration of aircraft registrations for noncommercial general aviation aircraft to seven years. And it's required to form a rulemaking committee for Part 135 rest and duty and provide a Notice of Proposed Rulemaking within three years. The last such committee made a recommendation nearly 15 years ago, but no NPRM was issued.

Furthermore, the comptroller general must study whether the FAA's recent change in enforcement policy (which deemphasizes penalties in favor of cooperative compliance) has resulted in increased reports of safety incidents. There will also be a variety of studies and reports on aircraft noise. And Congress beefed up the Pilots' Bill of Rights to address the release of FAA investigative reports in enforcement actions.

Unmanned Aircraft Systems (UASes): Congress gets pulled in many directions by UASes, aka drones. Many voters worry about "Peeping Tom" drones, and model aircraft operators want to be left alone, while retailers like to imagine drone delivery of small packages. The Act devotes many pages to UAS issues, but Congress doesn't want to acknowledge the elephant in the room: If there is a drone outside your window with a camera, do you call the FAA or 911?

The best way to build a reliable regulatory framework for the economic growth of the UAS industry and community is to give the FAA the authority, budget and personnel to regulate all aspects of the aircraft at all altitudes. But Congress just isn't ready for that. So, the FAA is being required to keep updating its comprehensive plan for UAS integration into the National Airspace System and the Government Accountability Office is required to study financing options related to UAS regulation and safety oversight. In the meantime, the FAA has been given greater flexibility to approve advanced UAS operations.

And Congress has directed the agency to update UAS regulations to authorize the carriage of property by operators of small UASes and authorized the Transportation Department to update existing regulations for UAS package delivery.

Airport Improvement Program (AIP): Money for infrastructure seems to be one of the few subjects on which both political parties agree, so the AIP is well funded. The Act also creates a remote air traffic control tower pilot program to "deploy new advanced technologies and lower costs of air traffic control services." That means we can expect more virtual control towers such as the one being tested at Leesburg, Virginia (KJYO).

Manufacturing Certification Reforms: U.S. aircraft manufacturers have long complained that certification delays impact their ability to compete globally. The Act creates a Safety Oversight and Certification Advisory Committee that will collaborate with industry to streamline certification and regulatory processes and establish clear FAA performance objectives and metrics. The Act also provides manufacturers increased utilization of delegated certification authorities.

The new law also streamlines regulatory reform efforts for the commercial space transportation sector and, notably, authorizes the FAA to certify new civil supersonic aircraft that reduce sonic booms.

Overall, the FAA Reauthorization Act of 2018 was a win for business aviation and aviation in general. ATC privatization has been defeated (again) and the FAA has the consistent funding it needs in order to achieve its long-term missions. **BCA**

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

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

▶ **AAR,** Wood Dale, Illinois, announced that its Board of Directors has appointed **Sean Gillen** as vice president and CFO succeeding **Michael Milligan.** Gillen will report to president and CEO John Homes.

▶ **American Institute of Aeronautics and Astronautics (AIAA), Washington, D.C.,** named **Katie Taplett** as managing director of Member and Market Development.

KATIE TAPLETT

▶ **Blackhawk Modifications,** Waco, Texas, promoted **Lindsay Allmon** to marking manager. Allmon most recently served as the company's marketing coordinator. She joined Blackhawk in 2016.

▶ **Duncan Aviation,** Lincoln, Nebraska, named **Kasey Harwick** vice president of maintenance for the airframe department at. Harwick joined Duncan in 1999. Travis Grimsley has been promoted to director of maintenance for the aircraft services group in Battle Creek, Michigan. Grimsley joined Duncan 14 years ago.

▶ **National Business Aviation Association (NBAA),** Wahsington, D.C, named **Annemarie McDonald Oxman** chief people officer at the, replacing **Holly Clark,** who is retiring. Most recently, Oxman served as director of human resources for the American Petroleum Institute.

▶ **Spike Aerospace,** Boston, Massachussetts, named **Shreekant Agrawal** as an executive advisor on its supersonic business jet program. Agrawal has spent 29 years at Boeing, serving in a variety of assignments in functional, program and technology management, including as a leader of the NASA/Industry High Speed Research program. Agrawal joined Northrop Grumman in 2014 and currently serves as director of flight services within the vehicle engineering directorate of Northrop Grumman Aerospace Systems.

VINCENT ESPOSITO

Gone West

▶ **Vincent Esposito,** president of JetNet, died Jan. 3, 2019. Mr. Esposito, a resident of Santa Barbara, California, graduated from Utica College and earned his JD from Syracuse University College. He and his brother, Tony, grew the company from a small aircraft listing service to a large aviation intelligence provider with 75 employees. Esposito is survived by two sons.

▶ **Chris Cannady,** OEM sales manager for Universal Avionics, died Dec. 27 in Wichita. Mr. Cannady joined Universal in 2014. In 2015, he earned the company's "Universal Shining Star Award." He is survived by his wife, Shelly, and son, Nick. **BCA**

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Advertisers' Index

February 1969 News

The editors of BCA fly some **30-40 new or somewhat new airplanes** during the course of a year. There are very few flights on **which we do not run into a failure** of a piece of avionics gear . . . — *BCA Staff*

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

Jules Verne, over 100 years ago, wrote that it was logical to assume that the U.S.A. would be the first to the moon. Not only did he predict correctly, but with psychic clairvoyance predict that the vehicle would take off from Florida.

The last Grumman Gulfstream will roll out of Bethpage, Long Island, with completion of number 200 next month. Halting of GI follows transfer of all Gulfstream II production to Savannah as of December. Output of three GIIs per month is putting a strain on completion shops.

General Aviation Fatalities Rise in 1968: Unofficial tally shows 695 fatal accidents in 1968, up 16% from 601 in 1967. Midair collisions amounted to 35 for general aviation last year, an increase over 26 in 1967 and 28 in 1966.

Who Owns Airplanes? Avemco Corp, insurer of some 10,000 private airplanes, has come up with this statistical profile of average aircraft owner. He's 35.8 years old, is male (98.4%) and owns a mortgage on a home worth $27,550, which is located in a city about the size of Columbus, Ohio (Pop. 471,000). He operates 2.2 cars and usually carries three credit cards, Texaco, Gulf and American Express. He's married (86.37%) and actually spends relatively little time in his $11,300 airplane — 89.7 hr. per year of which 43 were in the last six months. Avemco's projections for the next 10 years show nearly 1 million pilots flying 108,000 aircraft by 1977.

Model 421A air taxi operators has been approved by CAB. No CAB exemption will be required of operators using turbojets that seat 12 or less and gross under 27,000 lb.

Youth Discovers a New High: The average age of Sky-Life Flying club members is 15. "Veteran" members help the greener aviators learn the fine points of navigation. Most of the students are working toward a 16th birthday solo. **BCA**

THE ARCHIVE

Camera with "fish-eye" lens is used to capture the night lighted panel of a Swearingen Merlin IIB on the AiResearch ramp at LAX. The Merlin, purveyed by AiResearch in the U.S., has reached a total of 70 deliveries. Photo by Wen Roberts with Hasselblad camera.

Thrust reversers cost $76,000. Fortunately, the DH 125 doesn't need them because, the ad says, it has the shortest, short-field performance of all the business jets.

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