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CONTENTS SEPTEMBER 2020

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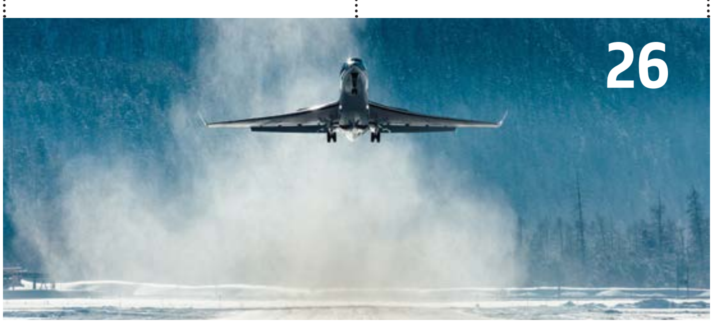

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By Informa Markets

BCA – Business & Commercial Aviation (ISSN 0191-4642) is published 11 times per year with a combined issue in June/July by Informa Markets, a trading division of Informa PLC, 22701 W. 68th Ter., Ste. 100 Shawnee, KS 66226-3583. Also the publisher of Aviation Daily, Aviation Week & Space Technology, The Weekly of Business Aviation and World Aerospace Database. Single copy: Current and back issues, $10.00 Domestic/Canada/Mexico. $15.00 International. Subscriptions (1 year, 11 issues): United States and Canada, $59.00; all other countries, $79.00. For single copies/back copies call Customer Service at (800) 455-3145 in the United States; +1 (913) 967-1719 for all other countries. Periodicals postage paid at Kansas City, MO and additional mailing offices. Registered for GST as GST #R126431964. Canada Post Publication Mail Agreement Number 40026880. Editorial contributions should be addressed to BCA, 520 Folly Rd., Ste. 238, Charleston, S.C. 29412, editorial address and must be accompanied by return postage. Publisher assumes no responsibility for safety of artwork, photographs or manuscripts. USPS 503-450.

Printed in the U.S.A.

Postmaster: Send address corrections to BCA – Business & Commercial Aviation, P.O. Box 12901, Overland Park, KS 66212. (Present subscribers include label)

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William Garvey
Editor-in-Chief
william.garvey@informa.com

Middle-Age Muddle

The headcount's **down by half**

QUIZ TIME, WITH A NOTABLE HANDICAP FOR THOSE YET TO sprout their first gray hair. How long ago did:

▶ The Symbionese Liberation Army kidnap Patty Hearst;
▶ The F-16 first fly;
▶ People magazine begin publishing;
▶ The Golf succeed the Beetle;
▶ Charles de Gaulle International Airport open;
▶ Richard Nixon resign the presidency;
▶ Jimmy Fallon take his first breath;
▶ Charles Lindbergh breathe his last?

Answer: 46 years.

Next question: What's the average age of single-engine general aviation aircraft?

Answer: 46 years.

And in my view that second answer is trouble. After all, what would be its future if the auto industry centered on, say, a 1974 Oldsmobile? Or high tech on the IBM Selectric . . . high fashion on velour jumpsuits . . . a political party opposed women's rights?

FLATLINEGOV.WORDPRESS.COM AND BOEING

It has been a long-held tenet that the single-engine aircraft serves as the threshold to general and business aviation and beyond. It is the starting point of a journey that with time, talent and enough legal tender could course through twins, instrument and commercial tickets, pressurization and, ultimately, turbine power. It represents aviation's feedstock that nourishes all. But that dish is beyond stale; it's nearly calcified.

Yes, a well-maintained aircraft can last a long, long time. Indeed, the U.S. Air Force intends to keep the B-52 Stratofortress operational for a century. But a light plane fleet well into middle age suggests something is seriously amiss. Other statistics underscore the problem:

Last year, general aviation planemakers delivered 1,111 single-engine, piston-powered aircraft. It was the first time in a decade that the total exceeded three digits and thanks to the pandemic, it is unlikely to pass that mark this year. Keep in mind, fewer manufacturers shipped 13,250 and 12,286 such aircraft in 1966 and 1979, respectively.

The total number of active, FAA-certificated private pilots dropped from 357,479 in 1980 to 161,105 last year, a decline of more than 50%. Meanwhile, the roster of those holding commercial tickets declined from 183,442 in 1980 to 100,863 in 2019, a drop of 45%. In other words, the potential pool of users and owners of those aircraft has contracted. By a lot.

Why? Several factors. One is money, of course. Flying has always been expensive, but arguably it costs more now than ever. Earning a private license can set an aspiring aviator back $8,000 or more. According to our *Purchase Planning Handbook,* a new Cessna 182T or Bonanza G36 go for a breathtaking $530,000 and $919,000, respectively, which explains why even decade-old predecessors can still command $330,000 and $505,000, respectively. Mind you, the median value of a home in the U.S. today is $247,000. Then there's the cost of avgas, now north of $5/gal. high retail, hangarage or tiedown, maintenance and inspections, recurrent training, hull and liability insurance, etc., etc.

In addition to needing the wherewithal for winging, one has to have the will to spend it on slipping the surly bonds. And while there was a rush of newbies eager to fill those expanding airline rosters, that phenom is over, maybe forever. As for aviation's appeal among the rest of the current crop of young people, it's not apparent to me. My bride and I hail from large families so that the tally of our offspring, nieces, nephews and children of first cousins is 70. Of all those, just two became pilots, both sons of ours, and their training was underwritten by the American taxpayers.

It seems the Boomers who bought those tens of thousands of airplanes back in the 1960s and 70s — I accounted for three — are transferring to Airstreams, The Villages, and beyond. And regardless of a pilot's passion and skill, upon turning 70, insurance becomes elusive or simply unavailable.

So, to sustain the industry that has given us so much, the community has to find a way to embrace the new generation on its terms. Here I agree with the National Aviation Hall of Fame's Amy Spowart (see *Fast Five,* page 19). If piloting a drone fitted with a GoPro camera is more appealing than grabbing the yoke of a geriatric Skyhawk, so be it. Aircraft that are pollution-free and silent? Go for it! And welcome to the family, miss.

This ain't your father's Oldsmobile. **BCA**

Readers' Feedback

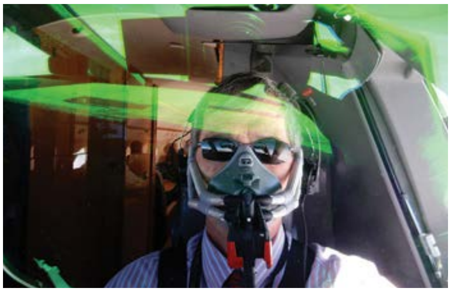
First-timer Hooked

I just finished reading *BCA* for the first time, and found many of your feature articles as very informative and thoroughly detailed, with a keen focus on safety.

With regard to the article **"Under Pressure" (June/July 2020),** I thought the content of the article was exceptional, save for one aspect: The author recounted an incident involving a loss of cabin pressure in a Lear 35, during which the crew descended promptly to 10,000 ft. MSL, and then continued to their destination for a routine landing. Only afterwards did they discover that the loss of cabin pressure was due to a bleed air duct failure, the proximity of which directed uncontrolled bleed air onto an adjacent wire bundle and melting the wire insulation.

Many pilots know, either through education or personal experience, that the underlying causes of system failures airborne may not be fully understood inflight. We may think we know, but are we willing to bet our lives that we're right? In this case, the crew reacted appropriately to the immediate circumstances by donning supplemental oxygen and descending immediately, but they failed to follow through with the emergency by landing at the nearest suitable field. Had the planned destination been further away and the bleed air leak continued to impinge hot air on the wiring bundle, this situation could have evolved into a compound emergency involving multiple electrical failures or an onboard fire, each of which could have had disastrous consequences. Landing at the nearest suitable field would have minimized that risk.

As transportation professionals, we are all hard-wired to mission completion, but when circumstances occur that require emergency action, a pilot-in-command's responsibility shifts from "getting to Point B" to "getting on the ground safely."



William Shivell
San Diego, California

"American Airlines adamantly denied that we were ever taught or encouraged to use rudders for roll control, but I can assure you that we were."
Charles Cox

The Pressure Is On

Reading **"Under Pressure," in the June/July BCA**, brought to mind some little vignettes that may be of interest. Those Comet depressurization accidents had ramifications in New Zealand.

At the end of the flying boat era, TEAL (Tasman Empire Airways Ltd.) bought three ex-Canadian Pacific Airline DC-6B's and was operating these at the time of the Comet accidents. Arnold Hall, later "Sir Arnold," was the bright spark who had the idea of cycling the pressure test water tank to simulate the pressurization cycles which highlighted the much-underrated stress analysis and pressurization cycles on the fatigue life of the airframe.

It was after these findings that Douglas Aircraft called for rather extensive modification to TEAL's DC-6's. I believe that Boeing called for mods to the Stratocruisers, as did Lockheed to the Constellations. Thus, American aircraft manufacturers benefitted greatly from Sir Arnold's testing and findings.

The other item that piqued my interest was reference to the forward cargo door that blew out on United's UA 811 out of Honolulu bound for Auckland. One of the passengers sucked out was a young lad, Lee Campbell. His dad, Kevin, was a very switched-on and capable engineer who lived here in Wellington. I don't know what was the initial trigger for his dispute of the NTSB's findings of the accident cause, but he strongly questioned both Boeing and the NTSB causal findings for the freight door to open. He proved both completely wrong, and the NTSB was forced to withdraw and reissue its findings as to the cause of the accident.

That was one hell of an achievement for a one-man crusade which resulted in worldwide B747 fleet modifications.

Brian J. Souter
Wellington, New Zealand

Catching On

I was amused that on the day the June/July edition arrived — including my letter regarding potential TP delivery by drone — that a school board somewhere on the east coast announced that they were going to deliver some textbooks by that method. These things may catch on.

John M. Davis
Wichita, Kansas

Design Error

Regarding **"Who Says It's Ready?" (Cause & Circumstance, April 2020),** I see the foreign object (FOD) damage as a result of a design flaw. Yes, any time you design an aircraft with the engines low enough to allow a human to use one as a convenient shelf, you're introducing an inherent flaw.

Recall the 2014 crash of a GIV in Bedford, Massachusetts, when the pilots were unable to release the control lock after they were at speed and committed to takeoff. That involved a serious design error akin to control ends that can be reconnected backwards. Giving the job to another human will only kick the can eventually. Remember the old cars and gas caps? You took them off and had to lay them someplace, and we all saw gas caps laying on top of fuel pumps and gas pouring out from behind someone's license plate when taking off from light.

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

"As long as there are 'systems,' there will be gremlins subverting their fail-safe features."
Ross Detwiler

You can implement several procedures or sensors to eliminate the cowling-as-convenient-shelve problem. Can the pilots see the intakes? Are the intakes marked or painted to avert the threat? Are there sensors inside to warn of an unwelcome object, etc.? The same type of thought can be applied to preventing pitot covers being in place and overlooked.

Alan Hyman
Baltimore, Maryland

Editor's Note: I agree it's a design flaw. But since the A320 is going to be around for quite a while, we're stuck with any flaws. I feel that, as with any system, someone has to say it's ready. And as long as there are "systems," there will be gremlins subverting their fail-safe features. **Ross Detwiler**

Rudder Reversal

I found **"The Organization Failed . . ." (May 2020)** informative, thought provoking and close to home.

As a pilot for American Airlines, I attended Capt. Vanderburgh's Advanced Aircraft Maneuvering Program (AAMP) along with thousands of my colleagues. While the program taught us many valuable lessons about situational awareness and energy management, it also emphasized (mistakenly) the value of using rudder authority as a useful tool in roll control without any cautions or warning restrictions. Subsequently, in simulator training we were encouraged and praised for using rudder only for roll control during windshear escape maneuvers because the use of ailerons raised wing spoilers creating drag thus degrading energy and performance.

After the New York Airbus accident (AA587) American Airlines adamantly denied that we were ever taught or encouraged to use rudders for roll control, but I can assure you that we were. Years later while learning systems on the Boeing 787 I asked about yaw dampers and Dutch roll. In the Normal and Secondary flight control modes yaw damping is provided, but in the most degraded mode, Direct, yaw damping is lost. I pointed out that we never discuss Dutch roll anymore, thinking of those early jet age accidents. I was told not to worry about it, and we moved on to the next subject. I'm still not so sure about that.

But thanks for the great article. Keep up the good work and good writing.

Capt. Charles Cox (Ret.), Boeing 787
American Airlines
Dallas, Texas

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NEWS / ANALYSIS / TRENDS / ISSUES

TEXTRON AVIATION HAS UNVEILED the Beechcraft King Air 360 and 360ER, upgrades of the iconic twin turboprop with new autothrottles, avionics upgrades and other enhancements to the cockpit plus a redesigned, more open cabin. The autothrottle system is also available as a retrofit on King Air 300-series aircraft equipped with Pro Line Fusion avionics. **The King Air 360 is on the production line in Wichita, with customer deliveries expected to begin in the fall.** The aircraft will replace the King Air 350i, officials said during in a virtual press conference announcing the upgraded aircraft. The company continues to produce the King Air 250. Officials declined to say how many orders the company has taken for the King Air 360. It will provide more information on its launch customer, a farming family in California, in the following weeks. The King Air 360 is designed to create an enhanced flying experience for pilots and passengers, said Ron Draper, Textron Aviation president and CEO. "The aircraft is a result of our extensive conversations with our turboprop customers worldwide as we continually increase innovation and next-generation capability to help them achieve their varied missions with greater comfort, technology and ease."

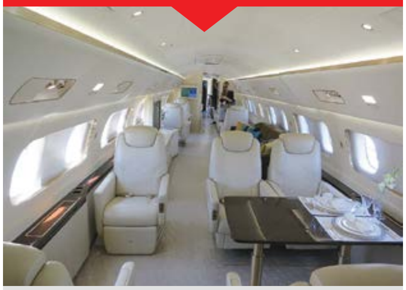
A main feature is the addition of a full regime autothrottle system, called the Innovative Solutions & Support (IS&S) ThrustSense Autothrottle. The system computes and manages engine power through a flight from takeoff roll to landing, said Rob Scholl, Textron Aviation senior vice president of sales and flight operations. The autothrottle reduces pilot workload and provides over-speed and under-speed conditions as well as over-temp and over-torque conditions. The company has received special type certificate approval for the system, it said, which will be available as an aftermarket upgrade on King Air 300-series turboprops equipped with Pro Line Fusion avionics. The autothrottle is controlled through a new IS&S standby instrument. The retrofit design allows installation without any structural modifications to the existing throttle quadrant, the company said. "Thousands of pilots take to the skies daily for a wide range of missions in their Beechcraft King Air turboprops," said Brian Rohloff, senior vice president of customer support. **"We're committed to supporting our customers and operators with the latest technology and avionics upgrade options that offer them maximum support and efficiency."** Upgrades to the King Air 360 also include a digital pressurization system, which automatically schedules cabin pressurization during climb and descent to increase passenger comfort and reduce pilot workload, Scholl said. Cockpit upgrades also include the relocation of indicators, including flap position, cabin rate of climb and cabin altitude. Sirus XM is also an option. The King Air 360, which seats up to 11 people, has a base retail price of $7.9 million, while the King Air 360ER has a base price of $8.795 million.

Jetfly Takes Delivery of First PC-12 NGX, Fifth PC-24

European fractional ownership company Jetfly Aviation has taken delivery of the first PC-12 NGX along with its fifth PC-24 aircraft. The Jetfly Group, which includes Fly 7 Aviation, currently operates 47 Pilatus aircraft. Its four PC-24 aircraft have flown more than 2,400 hr. Delivery of the fifth PC-24 comes within two years of its first delivery. The PC-24 fractional ownership program has attracted 50 fractional owners, company officials say. Jetfly, founded in 1999, plans to take delivery of its sixth PC-24 at year's end. (See PC-12 NGX Pilot Report on page 34.)

For the latest news and information, go to AviationWeek.com/BCA

Embraer Ends Legacy 650/Lineage



Embraer is ending production of the Legacy 650 series and the Lineage 1000. Production of Legacy 450 and 500 types is also being restricted to orders from "key strategic customers," but will eventually be phased out as well. The Brazilian airframer says the move will allow it to better focus on the Phenom 100 and 300 series, and Praetor 500 and 600.

Meanwhile, Embraer announced that maintenance intervals for Phenom series jets have been extended from 600 flight hours and/or 12 months to 800 hr. and/or 12 months. The company says this 33% interval improvement is "almost double" the industry average.

THE COVID-19 PANDEMIC THAT FORCED THE NATIONAL Business Aviation Association (NBAA) to cancel its annual 2020 Business Aviation Conference and Exhibition (BACE) is the latest in a series of event terminations this year for the organization that potentially involve millions of dollars in lost revenue.

While the association's signal activities are serving as an industry advocate in legislative and regulatory matters, and in helping educate and advise its membership on those and other operational matters, the fact is much of its income is derived from conventions, seminars, training sessions, etc. And in that regard, the COVID-19 pandemic has been devastating to that revenue stream.

The association announced July 1 that it had called off its Oct. 6-8 annual event in Orlando, Florida, as the number of corona virus cases and deaths across the country, and especially in the Sunshine State, spiked upward. The action was based on guidance from public health officials, it said.

The organization carries cancellation insurance for its events, a spokesperson told our sibling publication The Weekly of Business Aviation, in early May. At the time, however, it was still awaiting the financial outcome on claims for events canceled from March through May because of the pandemic. Other earlier cancellations included the Asian Business Aviation Convention and Exhibition in Shanghai, China; the European Business Aviation Conference & Exhibition in Geneva, Switzerland; along with regional NBAA gatherings and other conferences, seminars, forums and training classes.

In May, NBAA announced it was cutting its workforce, although it declined to provide specifics, due to challenges from the pandemic. Association officials declined to comment on the financial impact of the cancellations. "NBAA began hosting live events in 1950, and they have grown to be a fundamental part of the business aviation landscape," said Dan Hubbard, NBAA spokesperson. "While we're disappointed we were forced to cancel several events in 2020, we are shifting our focus to an outstanding lineup for 2021."

The organization had no choice but to cancel, said Rolland Vincent, president of his eponymous business aviation consultancy in Texas. He said overall attendance at the Florida gathering would have suffered had it moved forward. "We did some polling on this," he said. "It was pretty bleak."

In 2018, NBAA recorded revenue of $34.65 million from NBAA-BACE and other conventions, according to the annual report posted on its website. It also generated $8.77 million from other conferences, forums and seminars and $6.54 million in membership dues. In all, it recorded $54.13 million in gross revenue in 2018, operating expenses of $52.76 million and net assets from operations of $1.375 million, its annual report said. Its unrestricted net assets totaled $20.2 million at the end of the year.

Meanwhile, the 2017 annual convention grossed $18.03 million, according to NBAA's Form 990 tax return filed with the IRS for its fiscal year ending June 30, 2018, the latest year available.

The show, the world's largest business aviation event, typically attracts some 25,000 attendees, 1,000 exhibitors and about 100 aircraft on static display.

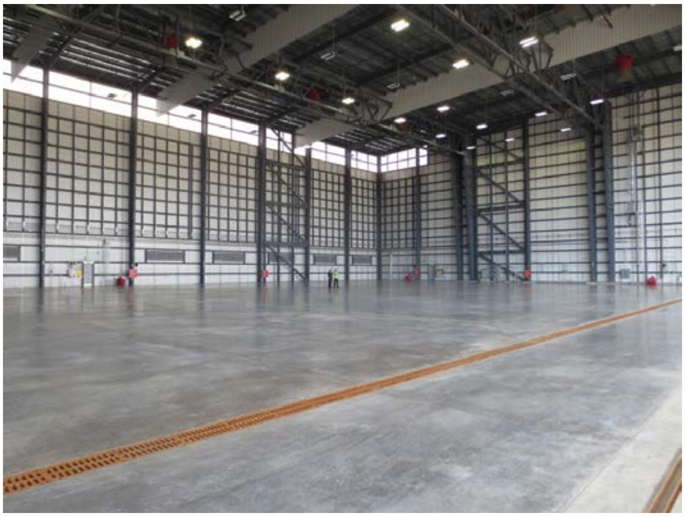
This year's cancellation is not the first time NBAA's largest show has been impacted by outside events. Following the Sept. 11, 2001, terrorist attacks, the association's annual gathering set for New Orleans was postponed from October to mid-December.

Since March, organizers canceled a long list of aviation events because of the outbreak of the novel coronavirus, notably including the Farnborough International Air Show in England and the Experimental Aircraft Association's AirVenture Oshkosh event in Wisconsin for which it had no cancellation insurance. In 2017, the latest year available, EAA posted $27.25 million from AirVenture, according to its Form 990 filed with the IRS.

Hangar Availability at San Jose, CA (SJC)

HANGAR 7 BCH SAN JOSE(SJC)

Location	San Jose International Airport (SJC) West Side
FBO	Signature Flight Support
Address	373 Martin Ave - Santa Clara, CA 95050
Hangar Dimensions	330' X 189' = 62,370 SF
Hangar Manufacturer	Nucor
Maintenance	Approved
Associated Ramp Area	325' X 400' = 130,000 SF (Approximate)
Hangar Door Opening Height	62' 8" - 8 Floating Doors powered by 4 Electric Door Motors
Hangar Door Manufacturer	Well-built
Ramp	Super pavement with GEOGRID
Fire Detection System	Infrared Detection
Fire Suppression System	Group 1 NFPA 409 - High Expansion Foam System Interior Walls include Intumescent Paint
Attached Office Area	47" X 152'6" = 7,167 SF
Security	Milestone CCTV
Availability	June 30th 2020
Contact	Ken Ambrose - President - BCH SAN JOSE, LLC 775-400-2767



Garmin Autoland Certified

European and FAA certification of the Garmin's Autoland system recently received European and FAA certification on the Daher TBM 940. The airframer has branded the emergency system as "HomeSafe." The single-engine Daher turboprop, powered by the Pratt & Whitney Canada PT6A-66D, is the second aircraft type now certified with Autoland; Piper Aircraft announced FAA type certification of the system on its M600/SLS single-engine turboprop in May.

Gulfstream's New Service Center

Gulfstream Aerospace opened a new 225,000-sq.-ft. service center at Farnborough Airport in July. The facility can accommodate up to 13 large- cabin aircraft simultaneously. The center, located some 40 mi. west of London, will offer a full array of support services including maintenance, repair and overhaul, interior refurbishment and various mods. Meanwhile, a Gulfstream field and support team will continue to be based at London Luton Airport to provide aircraft-on-ground (AOG) and other services.

IN JULY, ATP FLIGHT SCHOOL RENEWED an order for 100 Piper training aircraft and announced delivery of six Piper Archer TX trainers as part of that order. Deliveries of the remaining aircraft will take place over five years. The Jacksonville, Florida trainer operates 402 aircraft, including 92 Piper Seminoles, 150 Piper Archers and 160 Cessna CE172 Skyhawks. The company operates at 47 locations, including six that opened in 2020. It plans to add five additional locations by year's end. The company said that despite furlough of thousands of pilots because of flight cutbacks due to the COVID-19 pandemic, the airline industry expects recovery and long-term demand for cockpit crews. More than 80,000 U.S. airline pilots will be retiring the next 20 years. "Anticipated airline pilot demand exceeds the current capabilities of the flight training industry," said Michael Arnold, ATP's director of Marketing. "ATP continues to invest in our graduates' careers with the best flight training fleet in the industry."

SKYBORNE AIRLINE ACADEMY, BASED AT THE GLOUCESTERSHIRE AIRPORT, has ordered 10 all-electric light trainers from Bye Aerospace. It is the first UK pilot training school to place an order for Bye aircraft. The order is for six two-seater eFlyer 2 aircraft and four eFlyer 4 four-seat aircraft. The first of the two-seaters is expected to be delivered in the fall of 2022, with the four-seater model following in 2023. "We are radically redefining every aspect of our airline pilot training, and that includes incorporating all-electric aircraft into our fleet," said Lee Woodward, Skyborne CEO. "The eFlyers are great for the environment, economical to operate and have the right blend of avionic technology and handling characteristics required to train our future airline pilots." The eFlyer 2 plans to be the first all-electric aircraft to receive Part 23 certification from the FAA, Bye said. The critical design review for the aircraft took place on June 5. The next phase of the flight test program is underway. The company says its aircraft will reduce operating costs by a factor of five over equivalent piston-powered training aircraft, as well as generating less noise and zero inflight emissions. Earlier this summer Bye Aerospace closed on $10 million in strategic and venture financing.

FAA RECENTLY AWARDED EPIC AIRCRAFT A PRODUCTION certificate for its six-seat E1000 carbon-fiber, single-engine turboprop. The award authorized the Bend, Oregon, airframer to manufacture, flight test and issue airworthiness certificates. The E1000 received its type certification last November. The company was poised several months ago to complete the FAA's production audit, a precursor to the production certificate, when the COVID-19 disrupted its plans, officials say. FAA-mandated travel limitations restricted the on-site visits needed for the approval process. Instead, the FAA and Epic worked together to use remote technologies to conduct the required reviews and audits before the final on-site assessment. Epic CEO Doug King applauded the agency's "We rapid adoption of these new tools and technologies in the face of this pandemic, allowing us to keep the PC process moving forward and ultimately achieving final approvals." The $3.25 million Epic 1000 is powered by the Pratt & Whitney 1,200 hp PT6A-67A engine. It has maximum cruise speeds of 333 kt., a range of 1,106 nm and operates up to 34,000 ft.

Bell 505 Gets Tanzania Civil Aviation Authority Type

Bell Textron's Bell 505 helicopter received airworthiness certification from the Tanzania Civil Aviation Authority. It is the sixth country in Africa to certify the aircraft. The Bell 505 is type certified for operations up to 22,500 ft., has more than 260 deliveries worldwide, and has logged more than 45,000 flight hr. since its first delivery in March 2017.

Hartzell Offers Odyssey Propeller for SR22s And SR22Ts

Hartzell Propeller's four-blade composite carbon fiber propeller, known as the Odyssey, is available for Cirrus SR22 and SR22T aircraft. The 78-in.-dia. propeller provides features such as advanced structural composite blade technology that delivers low weight, low inertia, low life cycle costs and high durability. The propeller is offered as a Supplemental Type Certificate option for new aircraft for $35,000. The unit is supplied with a polished aluminum spinner assembly and comes with or without ice protection.

IN MAY, EHANG ELECTRIC AIRCRAFT RECEIVED approval from the Civil Aviation Administration of China (CAAC) to begin commercial operation of its EHang 216, an autonomous, electric vertical takeoff and landing aircraft with two seats and 16 rotors. A short time later an EHang 216 conducted the first passenger-carrying public flights in the coastal city of Yantai, China. The trial flights, which were part of a demonstration tour, flew four passengers on aerial sightseeing trips over the sea around the city's Fisherman's Wharf.

IN LATE JULY SPIRIT AEROSYSTEMS BEGAN A LONG TRANSITION into the production phase for the Aerion AS2. The Wichita, Kansas-based supplier for mostly Boeing and Airbus commercial aircraft agreed to an expanded role on the AS2 that includes producing the supersonic business jet's forward fuselage. Aerion and Spirit have been working together to finalize the preliminary design for the AS2's pressurized forward fuselage for about 18 months. The milestone should be completed in 2021. The agreement on Spirit's new role comes as Reno, Nevada-based Aerion prepares to start building AS2 jets in 2 1/2 years at a new facility in Titusville, Florida whose construction is to begin later this year. "I'm delighted to have expanded our already excellent relationship and look forward to continued collaboration between our two companies as we bring the AS2 to market," says Tom Vice, Aerion's CEO. The collaboration on the forward fuselage includes the only pressurized sections of the aircraft, such as the cabin and cockpit. "We have contributed innovative and cost-effective design solutions to help make the AS2 supersonic jet a reality," Spirit CEO Tom Gentile says. Aerion plans to break ground privately on a new final assembly plant for the AS-2 in September or October, a spokesman said. A date for a public event to commemorate the milestone is "a little unclear at this point" due to the COVID-19 pandemic, the spokesman said. GE Aviation has also signed on to deliver non-afterburning Affinity jet engines for the AS2.

GULFSTREAM AEROSPACE REPORTS ITS $75 MILLION G700 flagship is surpassing testing milestones in speed and altitude. The ultra-long-range jet has flown more than 100 test flights since its first in February and has completed its flutter testing and expanded flight envelope and high and low speeds. Powered by Rolls-Royce Pearl 700 engines, the aircraft has exceeded its maximum operating speed and cruise altitude, reaching Mach 0.99 and an altitude of 54,000 ft. as part of the test program, the company said. The G700 will typically have a Mach 0.925 MMO and a maximum cruise altitude of 51,000 ft. First deliveries are targeted for 2022. Qatar Airways is the launch customer with ten ordered while Flexjet is the model's initial North American buyer.

NETJETS RECENTLY ANNOUNCED PLANS TO RECALL ALL PILOTS AND CABIN CREWS furloughed in April from its NetJets Europe subsidiary and has revised plans announced for the early retirement of some of its fleet. The Berkshire Hathaway subsidiary, said in late July it will "restore a portion of the fleet in Europe to reach typical pre-pandemic flight levels," and will "offer to reinstate" pilots and cabin crew stood down in April. Meanwhile, Patrick Gallagher, president of Sales, Marketing and Service, said that the reinstatement covers "most of the fleet in Europe that was previously planned for disposal." In addition, the company confirmed its intention to "add more than 60 additional aircraft across the fleet worldwide between now and year-end 2021." Gallagher noted that NetJets is "confident in the momentum" it is experiencing as the sector rebounds toward pre-lockdown activity levels.

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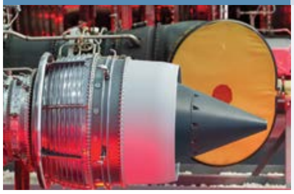

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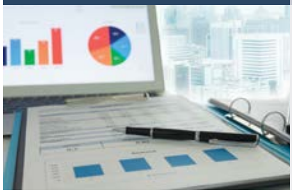

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Huang to Lead Icon Aircraft

Jason Huang has been named president of Icon Aircraft, maker of the Icon A5 light sport amphibious aircraft. He assumes the role from Thomas Wieners, who took over as president on an interim basis in 2018. Wieners has left the company. In his role, Huang will focus on manufacturing, product development and innovation. He most recently served at EMC and Open Text as head of cloud platform engineering and operations.

Bombardier Safety Stand Down 2020 Into Virtual Event

Bombardier is changing its annual Safety Stand Down 2020 into a virtual event because of health and safety concerns in the midst of the COVID-19 pandemic. The 24th annual event, called Safety in Focus 20/20, had been scheduled for Aug. 25-27 in Wichita. It typically draws hundreds of participants. Bombardier is working with safety leaders to build a program that highlights the information needed to change principles of aviation safety into participants' flight operations. The company will provide additional information as it finalizes details.

A GROUP OF 62 ENVIRONMENTAL ORGANIZATIONS wants the FAA to abandon plans to establish takeoff and landing noise standards for civil supersonic aircraft, characterizing the revival of high-speed air travel as "madness" and arguing it would fuel the global climate crisis. Meanwhile, the National Business Aviation Association (NBAA) says it welcomes the guidance and emphasized the need to balance innovation and development of new technologies with protecting the general public and the environment.

"Business aviation is consistently at the forefront of aviation technology in a manner that is both innovative and environmentally responsible," said Stewart D'Leon, NBAA director of Technical Operations. "The development of passenger-carrying supersonic aircraft and quiet boom technology will be pivotal enhancements to long-range business aircraft travel, reducing travel times and increasing efficiency throughout the industry." The group of environmental organizations responded in a July 13 letter to the FAA's notice of proposed rulemaking (NPRM) on noise certification for supersonic aircraft. "Given our limited carbon budget, limited time to act, and urgent need to slash greenhouse pollution from the aviation sector overall, allowing super-polluting aircraft to enter the U.S. sky would be madness," the group said in its remarks.

The FAA is proposing to amend noise certification regulations to add landing and takeoff (LTO) standards for supersonic aircraft with a maximum takeoff weight no greater than 150,000 lb. and a maximum cruise speed up to Mach 1.80. "The proposed standards include noise limits that are quieter than the Stage 4 limits at which most of the current subsonic jet fleet operates, though louder than the current certification level of Stage 5 for the same aircraft weights," the NPRM said.

Although it concerns only LTO noise and does not address emissions or sonic boom, "the proposed rule would provide a means for these aircraft to be certified to fly in the U.S. at subsonic speed," the environmental nongovernment organizations (NGO) argue.

"Because of its high costs, travel via a rebooted supersonic aviation industry would not be accessible to the vast majority of people in the [U.S.], but it would have catastrophic climate impacts for everyone," argue the NGOs, citing analysis by the International Council for Clean Transportation. Aerion plans to certify the AS2, a Mach 1.40 trijet, to the same Stage 5 LTO noise standards as subsonic airliners. The startup also plans to use sustainable aviation fuel and carbon offsetting to enable carbon-neutral operation of the supersonic business jet. Larger and faster, Boom Supersonic's planned Overture airliner would not be covered by the initial rules as proposed, but the company is similarly intending to meet Stage 5 noise limits and enable carbon-neutral operation of the 75-seat, Mach 2.20 aircraft.

IN RECENT PROGRAM UPDATES, TEXTRON SAID THE DENALI AND SKY COURIER are advancing and that the Beech Bonanza and Baron will remain in production for the foreseeable future. Rob Scholl, senior vice president of Sales & Flight Operations at Textron Aviation, said recently of Denali that "the overall program is going well" and that the delayed GE Catalyst engine is "meeting or exceeding" all of its key goals. "We're not really ready to say yet when we're going to do first flight on that airplane, because we want to make sure we have confidence in when GE's going to be able to get us an engine and their entire timeline," he said, adding, "I'm very encouraged by what I see." As for the Sky Courier, the twin turboprop cargo hauler n flight testing since May, he said, "The program looks to be on track" with delivery to launch customer FedEx expected in the second half of 2021. And even though only seven and 15 Bonanzas and Barons were delivered, respectively in 2019, Scholl said, "We plan on those to be a part of our product portfolio for a long time to come."

INTERVIEW BY **WILLIAM GARVEY**

Questions for Amy Spowart

1 **How did you become involved with the Hall of Fame?**

Spowart: In 1998, I met Mike Jackson, then its executive director. Knowing my majors, he invited me to attend Enshrinement. As soon as I arrived, he shoved me toward John Glenn and other enshrinees. I was enthralled to be among such heroes and soon started volunteering. Once I graduated from WSU, the Hall hired me and I have been here in some capacity ever since. I love the place because of our enshrinees. It's spending time with these national treasures that keeps me motivated and involved.

2 **The Hall's location at Wright-Patterson Air Force Base might make some wonder if it is owned by the service.**

Spowart: It is not. We are a totally separate 501(c)(3) established by Congress in 1964. We are located on land leased by the state of Ohio from the federal government. Visitors to the Hall enter through the National Museum of the U.S. Air Force, which is filled with an amazing array of historic aircraft. We have a truly synergistic relationship with the museum. People coming to see the "hardware" of aviation can see the world's best collection there. Then, at the Hall, they can learn about the people of aviation — the amazing "software."

3 **As you note, there are quite a few aviation museums. What makes the Hall of Fame special?**

Spowart: We are aligned with several museums. While they focus on things, we celebrate people. The Hall exists to memorialize and promote the achievements of individuals. We honor them to motivate the following generations. We believe the stories of their tenacity and triumph inspire. When Charlie Bolden, a Marine Corps major general, shuttle astronaut and former NASA administrator, was enshrined in 2017, he was moved to tears. I asked him why and he said, "Amy, it doesn't get any bigger than this." These are aviation's heroes, and it is everything to them. It is a tremendous privilege for us to be able to do this for them and for our nation.

4 **Do you think the younger generations get it, or for them is aviation on the wane?**

Spowart: It is up to all of us in aviation to change the narrative in a way that helps kids understand and embrace their calling. We need to inspire them, but on their terms. Let us ensure they get the tools they need to thrive. If members of the next generation are bothered by jet pollution, want electricity to power aircraft, find a way to Mars or reduce airport noise, they need to step up. Let us ask them, "Why don't you figure it out?" But also give them the tools to achieve that passion. Future enshrinees of the National Aviation Hall of Fame are in the making right now and they will solve these matters and more. We can also help them by casting the widest net for those who will guide them. Today we must include more people of both genders and all races. The bias and bigotry of the past must remain there.

5 **How has COVID-19 impacted the Hall?**

Spowart: We were closed for eight weeks. During that time, we found creative ways to keep members engaged and worked with our development committee to refocus fundraising. We also made the difficult choice to postpone our 2020 Enshrinement. Prior to the pandemic, we were on target to launch a capital campaign. For now, most support has been redirected to COVID relief. In the days ahead, our vision, outreach and path may look a bit different than it did earlier this year, but our mission is clear and good and we will honor it. **BCA**

Editor's note: To support the NAHF mission, go to **www.nationalaviation.org**

AMY SPOWART

Amy Spowart

President & CEO
National Aviation Hall of Fame
Dayton, Ohio

A high-energy overachiever who graduated summa cum laude with double degrees from Wright State University and a member of the Phi Beta Kappa honor society, Spowart finds solace in running. Often out the door for a 5-mi. run at 5 a.m. most days, she has completed 11 marathons, six ultra-marathons and 11 half marathons. She is in peripatetic pursuit of support, collaboration and recognition for the National Aviation Hall of Fame. In May, the mother of two daughters was named by Transportation Secretary Elaine Chao to the Women in Aviation Advisory Board whose purpose is to encourage women and girls to enter the industry. First affiliated with the Hall in 1999, Spowart was named executive director in 2015 and promoted to her current position last September.

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Mentoring Leadership

You can't teach leadership, **but you can learn it**

U.S. AIR FORCE

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

Leadership is the subject of countless books, courses, and even entire schools. But it is something few really learn well. We can quickly recognize poor leadership, and with a little more experience we can identify good leadership in action. But we are hard-pressed to predict which of our peers will become great leaders and which will simply be added to a long list of leaders not to emulate.

As a U.S. Air Force officer, I was a subject of the military "leader factory," designed to produce as many leaders as possible, as quickly as possible. The nature of military service meant a high-velocity throughput; assignments were rarely more than a few years in length, so the number of leaders digested by the system was high. And the results of this factory were hit and miss.

In the civilian world, a leader's tenure is longer, which means fewer will have the opportunity to lead. That extended tenure means a good leader isn't quickly replaced, but that tends to be true for the poor leader, too. In my 20 years as an Air Force pilot, I think the ratio of good versus poor leaders I experienced was no better than 50%, but my 20 years as a civilian pilot reveal a ratio that is even worse. Why is that?

With that background in mind, a list of questions takes form: Are great leaders made or born? Can leadership be taught? Does good "followership" pave the way for good leadership? I contend that leadership lessons are best learned "under fire" and that you cannot really appreciate the lessons unless you have the risk of failure. And a good leadership mentor can provide you with the opportunity to fail, which translates into the opportunity to succeed as a leader.

A rite of military leadership: the change of command ceremony

Is Leadership an Innate Skill? Are Great Leaders Born?

By the time I had been in uniform for 10 years, I sensed that most flying squadrons were doomed to be led by either careerists who cared not a whit for their people, or by good pilots who didn't have a clue on how to keep their people happy while satisfying the needs of the higher commands. Lucky for me, there was one year in which I was treated with the best commander I had ever served while at Andrews Air Force Base, Maryland.

Lt. Col. Kurt Bock checked out as a copilot in the Gulfstream III (C-20B) and even though he was the boss, he did all

the things copilots had to do to satisfy the requirements of our high-visibility White House and congressional missions. He and I were seated next to each other, both planning missions, when his boss, the group commander, called. It seemed that we had a Gulfstream violate a diplomatic clearance while flying between Taiwan and Mainland China. His orders, as I heard screamed through the phone, were to fire the pilots immediately. Kurt said calmly, and with the needed diplomacy when addressing a senior officer, that he would get to the bottom of it.

A few phone calls later, Kurt made contact with the pilots. His opening: "This isn't one of those 'You are in trouble' phone calls, I just need to know what happened." The call ended with him saying, "I knew you guys were on top of it and I hope you get some time to visit the sights. Great job, get some rest." As it turned out our embassy in Beijing confused Zulu with local time and got the date of the diplomatic clearance wrong. Kurt then called the group commander who redirected his fire at the embassy. I told Kurt that I had seen several pilots in our squadron fired in similar circumstances and asked how he had learned his calm approach to this kind of high-stakes poker. "I don't know," he said. "I just think you should treat people the way you would want to be treated."

Kurt was not only respected by those who worked for him, but by those he worked for as well. That was bad news for us since he was promoted and taken away after only a year. In that time, I realized that Kurt's personality gave him what he needed to be a great leader. He was smart, humble and respectful. He was ambitious, but he wasn't about promoting himself over his people. I think he may have been born a great leader; he certainly had these qualities before he was commissioned as an officer.

Years later, at my first civilian job, we had one poor leader follow another. Both were former military officers with years of leadership training. The Air Force veteran tended to be too laid back and allowed the inmates to run the asylum while the Army veteran tended to be too dictatorial and unwilling to listen to negative feedback. In both cases, morale was low and the flight department segregated itself into factions. The pro-standards group thought the laissez faire group was a risk to flight safety; the laissez faire group thought the pro-standards group to be one step shy of fascism. Nobody was happy.

Then one day the dictatorial leader was fired and a civilian with no leadership training at all took over. Let's call him Keith. He sat down with the group and dispassionately listed the grievances of both groups. He then made note of our trajectory, which wasn't good, and enlisted everyone's advice on how to make things better. Within six months things were very good indeed, by his building a team out of the factions. In some ways Keith was Kurt's opposite: He wasn't ambitious and he certainly wasn't humble. But in other ways they were the same: Keith was respectful of others, smart, and didn't care about self-promotion. Keith was also born a great leader.

Is Leadership a Trained Skill? Can Leadership Be Taught?

My favorite squadron commander, Kurt, was a product of every Air Force leadership school offered to a lieutenant colonel at the time: a three-month-long "Squadron Officer's School," a one-year-long "Air Command and Staff College" and a five-day "Squadron Commander's Course." The schools served him well. But a few years before this, I was under the command of the worst squadron commander. Let's call him Greg.

I had heard that Greg was a line pilot in our Boeing 747 squadron before going off to a staff tour and two of those leadership schools. Early on, I thought of him as "Colonel Cliché" because he never failed to get a word in edgewise in an attempt to leave no stone unturned. His words were good, but his actions were poor. He often reacted positively in public to training mishaps with, "That's why we call it a training sortie." But then with equal swiftness he sought out retribution against any pilots who put him in a bad light. Those same schools that turned Kurt into a great leader seemed to have passed Greg by.

Of course, we in the military have an advantage in the leadership-scholarship routine. Since most military duty assignments are one, two or three years, there is a natural turnover of leaders. Turnover in the civilian world tends to be rarer. In business aviation, a chief pilot or director tends to stay until retirement or until the job goes away. Rarely is a flight department leader demoted or dismissed for cause; most companies are either loathe to confront the problem or unaware one exists in the first place.

For my second civilian job I was hired as the third pilot in a three-pilot operation. The boss, let's call him Tom, had spent nearly 40 years coveting the chance to call himself the chief pilot. He read all the right books, took a few after-hours courses, and graduated from his management company's client aviation manager (CAM) school. The term CAM was new, but he wore it with an imperiousness that only got worse when we tripled in size to nine pilots. His decisions were hasty and not to be questioned. Requests from younger pilots almost seemed to prompt the opposite decision.

I flew with Tom a lot and he often talked about having to claw his way through the civilian ranks as an instructor and then flying canceled checks for a living. He had one horror story after another about suffering under the dictatorial hand of one chief pilot after another. Now that he was the big boss, he didn't have to take that abuse from anyone. "Remember what that great philosopher Bob Dylan said about that," I told him. "It doesn't matter who you are, you're gonna have to serve somebody."

Two years after I was hired, I recognized an alternate leadership structure in our 11-person flight department that can be poisonous for an organization. Moreover, I realized I was the head of that alternate leadership. Pilots and mechanics would come to me with their complaints and I would do what I could to get things changed. I was approached by every pilot in the organization, except Tom, with complaints about scheduling. Half the pilots were away 20-plus days a month, the other half were doing between five and 10. None of them were happy. I sat down with our scheduler and we came up with a chart to illustrate everyone's complaints were valid. Tom dismissed the chart, saying that his scheduling system was more sophisticated than a computer spreadsheet. I asked him which scheduling system he used and he pointed to his head and said, "It's all up here."

A year later, I resigned my position and found out the company had me earmarked to take Tom's place, and was simply awaiting him to retire gracefully. After I left, every other pilot also left and all but one of the mechanics departed shortly thereafter. Tom retired about a year later and we will never know if his exit was on his terms or as a response to the personnel turmoil.

Cultivating Followers When Leaders Are Needed

It is clear that some great leaders are born and not made, as if leadership was part of their genetic makeup. It is also clear that while leadership can be taught, it is rarely learned well. My training was in the Air Force, what the other services will tell you is the least military of the military branches. I often think that leadership is the art of convincing your followers that they want to do what you want them to do. I doubt many wartime leaders would place that high on their list of leadership and command tenets. For the opposite side of the leadership coin, it is hard to envision a more autocratic environment than that aboard a U.S. Navy nuclear submarine.

Retired Navy Capt. L. David Marquet writes about this in his excellent book, Turn the Ship Around! As the commander of the USS Santa Fe (SSN-763), a fast-attack submarine, Marquet bore the responsibility of leading a crew of 110 on missions throughout the world. Besides her torpedoes, the Santa Fe's armament included land attack missiles, anti-surface ship missiles and mobile mines. In addition, the Santa Fe housed its own nuclear reactor for its propulsion. Needless to say, the Navy did not entrust leadership of such a formidable warship to just any officer.

Marquet notes that if an organization measures success only in the short run, a top-down, leader-follower structure can be appealing. "Officers are rewarded for being indispensable, for being missed after they depart. When the performance of a unit goes down after an officer leaves, it is taken as a sign that he was a good leader, not that he was ineffective in training his people properly." This approach also leads to what Marquet calls "induced numbness." It absolves the followers of the need to think, to make decisions and to be responsible. "Hey, I was only doing what I was told."

We see this kind of institutional numbness in the civilian world, too. When you are worried about your paycheck, you tend to do what you can to please the boss. When the boss doesn't receive negative feedback, the boss assumes everything is going well. A flying organization can fall into the trap of operating inefficiently, and even unsafely, when the troops keep bad news from the person responsible for flight operations.

But there is another cost to the organization: It robs followers of the training needed to become leaders.

Marquet was diverted from one command to another when the captain of the USS Santa Fe unexpectedly quit. Marquet was taking on problems. The Santa Fe was then the worst performing submarine in the fleet, with poor ratings and low personnel retention. Moreover, it was a different type of sub that he knew little about. About a month into his command, he was running a drill to simulate a fault in the nuclear reactor. He ordered a shift to an electric propulsion motor and ordered, "ahead two-thirds," an order his deck officer repeated. After nothing happened, he learned that there was no two-thirds setting in the electric motor, but his crew would not challenge the captain's orders. He realized that in this leader-follower environment, his crew would do anything he said, even if it was wrong.

Subsequently, he began treating his crew as leaders, not followers. He gave them more control, contrary to their previous training. The Santa Fe quickly started excelling in all its exercises, morale improved and retention rates

The USS Santa Fe (SSN-763), off the coast of Australia

U.S. NAVY

soared. Even more impressive, I believe, is that the Santa Fe's winning ways continued long after Marquet's departure.

When Leaders Fail to Mentor

I've flown for a number of management companies as a check airman and standards pilot, occupying the jump seats of various aircraft to observe crews in action. My job was to ensure they were following company standard operating procedures and to provide them an avenue for feedback to management. I liked to learn about the crews I was observing and spent some time in "chat mode." I met many pilots with very different backgrounds, none of those more interesting than one I will call Clyde.

We were flying one of the nicest Falcon 900s I had ever been on and both pilots were doing a fine job until the top of descent (TOD). For some reason their flight management system (FMS) indicated that TOD was about 100 nm too early. We were at 35,000 ft. descending into an airport near sea level. The "TOD" symbol appeared at 200 nm and that's when they started down. I was happy to have a few innocuous critique items.

"I'm not a Falcon pilot, but I have a few questions," I started. "I am surprised we cruised at 35,000 ft. for hours and wonder if you would have gotten better fuel economy higher."

"We aren't really comfortable much higher than the mid-thirties," Clyde explained. "So, we pretty much avoid the forties."

"I am also wondering why you started down so early," I said. "You ended up flying below 10,000 ft. for quite a while as a result. That has to cost some extra gas, too."

"The airplane tells us when to descend," Clyde said. "That's pretty much what we have to do in this airplane."

"Your FMS is pretty much the same as mine," I said. "There is usually a good reason for a top of descent error, but sometimes the box gets confused. You can double check it by multiplying the thousands of feet to descend by three to get an ideal descent."

"I think doing mental math in the cockpit is usually a bad idea," Clyde said. "The computer is smarter than we are."

"It wasn't so smart today," I said. "Besides, the math is easy. Today at 35,000 ft. you just multiply 35 by three to come up with 105. When the FMS told you to start down at 200, you would have known it was a mistake."

Throughout the critique, Mark, the other pilot, kept quiet. A few days later he called to ask how the "three times the thousands" technique works. He said he could never use the technique in Clyde's flight department, but perhaps he could after Clyde retired. Ten years later, I met Mark at an annual convention. He peppered me with questions about how to lead a flight department. He said that Clyde had just announced his plans to retire in a year. As the second in seniority, Mark was hoping to be elevated to the chief pilot position.

Mark's questions had little to do with leadership and more about the mechanics of running a budget, paying bills and dealing with owners. "Maybe you should be asking Clyde these things," I said.

"I can't," Mark said. "Clyde keeps these things to himself and gets angry if you ask him about how he does his job."

Two years later, at the same convention, I met Mark again. He was working for a new company. "Our Falcon owner didn't think I had what it takes to lead and hired in a new chief pilot. The new chief had one of our guys so rattled that they both forgot the steering link and ended up aborting a takeoff and ended up off the runway. The airplane was damaged, and the entire flight department was fired. I heard they are trying to convince Clyde to come back, out of retirement."

Clyde's leadership style would have been a good case study for Marquet. Clyde was an autocratic leader who didn't listen to his people but somehow got the job done. After his departure, his followers rejoiced, but performance fell. Clyde failed to develop his successor and the organization, as well as his followers, suffered.

When Leaders Recognize the Need to Mentor

I was first assigned to the Headquarters U.S. Air Force at the Pentagon working for Col. (later Maj. Gen.) Gary Heckman. He was in charge of mobility requirements and I was a newly promoted lieutenant colonel wondering how to survive in the "Five-Sided Puzzle Palace." We had 10 officers in our division, one who shared my rank but all of whom had more experience in the office.

During my second week we were tasked to brief a three-star general about the Air Force's position on a new Navy program, something the Air Force was sure to oppose. The idea was to have transportable barges that could be lashed together to create very large runways, a kind of poor man's aircraft carrier. The program would save the Navy billions of dollars but could

U.S. AIR FORCE

The Pentagon, aka "Five-Sided Puzzle Palace"

cost the Air Force a portion of its budget. (As strange as it may sound, that is the primary focus at the Pentagon: defending the budget.) Heckman assigned me the task with the instructions to defend the Navy's position.

I did my research and the next day presented the Navy's case to an Air Force general who proceeded to tear me to shreds. I felt devastated until the general dismissed me, saying, "Thanks colonel. Good job."

Heckman explained that the general wanted to see how I reacted under the brutal treatment because he was sure to get the same treatment from his boss, a four-star. When I tell my Pentagon peers the numbers of such events I was handed, events we called "chances to excel," they marveled at the fact a mere lieutenant colonel got so many chances. During my time with Heckman, I realized that was his leadership style. He gave his people the opportunity to do what he did, with just enough guidance to either succeed or fail. His people usually succeeded, but even the failures became invaluable learning experiences.

Heckman was promoted out of our office and his replacement had the opposite view of these chances to excel. He constantly worried that his people would get credit without his name in lights, so he took these opportunities and often failed. Comparing Heckman and his successor, I realized that you can get a lot more accomplished if you don't care who gets the credit.

How to Mentor

Are leaders born or made? When you are fortunate enough to work for a very good leader — think Kurt Bock, David Marquet or Gary Heckman — it would be tempting to think leadership can be taught. However, the evidence suggests otherwise because there are so many graduates of leadership schools that failed to grasp the lessons. But even if leadership cannot be taught, I believe it can be learned. You need to be an observant follower and learn what does and does not work. Your progress can be greatly facilitated by a leadership mentor. As leaders, it is our responsibility to mentor.

Let me first say there is no one way to do this. How you mentor others to be leaders depends a great deal on your own leadership style and how you were mentored. It depends on the successes and failures you have witnessed, as well as those for which you were personally responsible. So, what follows are my steps. They've worked for me; I think they will work for you. But only you can be the judge of that. At the very least, these steps will give you a head start on developing your own techniques.

▶ **Lead by (conspicuous) example.** Before you can be identified as a leadership mentor worth emulating, you need to be seen as an effective leader in your own right. This becomes complicated in aviation and other technical fields because you also have to be seen as an expert in your profession. If, for example, you are a pilot leading a flight department, your leadership will be greatly hampered if you are not seen as a good pilot. Step one, then, is to become a good pilot (or mechanic, or doctor, etc.).

Good leadership is so rare that it should be noticed, but you can help the process with a little strategic timing. There is a fine line between a self-promoter and someone who just gets the job done without thinking about getting credit. It is easier than you might think, however. Let's say one of your subordinates realizes no one from your staff remembered to attend an important and mandatory meeting with the FAA. The person attends for you, takes diligent notes, and leaves you a detailed accounting of what was said and what is due. You could thank the person in private and believe that you did a good job leading because you acknowledged the person's vital contributions. But what if you saved that thank you for when the subordinate was in front of his peers? Now a pat on the back from the boss goes a lot further.

▶ **Survey your people.** In just about every organization you will find people who openly aspire to leadership positions, people who secretly want the chance, people who are ambivalent about the subject, and even those who are openly fearful of the possibility. But you may also find there is an acknowledged hierarchy of informal leaders. If everyone senses you have made a choice of the person to mentor and, more importantly, one not to mentor, morale can be impacted. Playing "favorites" might be the right call and the best use of your time, but it can also be a poison pill in an organization with more than one aspiring leader.

Another reason to canvass the troops is to learn what the organization is thinking about you and your potential "mentees." This can help you address potential problems and to anticipate what these mentees need to work on.

▶ **Sponsor/develop relationships/counsel.** It may be a common practice in business to identify a mentee and then schedule time together to develop a mentor/mentee relationship. This makes it clear that the leader has full faith in the mentee, putting pressure on both to follow through with the relationship.

I've never found it advantageous to formally sponsor a mentee, but perhaps that is because I've never felt that I was being formally sponsored. I have felt many times that a leader was pushing opportunities my way and actively sponsoring me up the hierarchy, but I never felt their fates were tied to mine. I like this method better than active sponsorship. Over the years I've had several people openly refer to me as their mentor, even though we've never discussed any kind of formal sponsorship. I consider the fact they think of me as a mentor to be the highest compliment a leader can receive.

▶ **Advocate and challenge.** You will often hear that the best thing about having a sponsor is that they will advocate for you up the hierarchy, getting you noticed and opportunities for further advancement. I think that is true, but I think a good leader should be doing that for everyone with the potential, not just a chosen mentee.

You should always strive to challenge your people to reach the next thing just out of their grasp. If a person has zero leadership experience, give them a task that will change "zero experience" to "some experience." If a person has done everything possible from their level in the organization, try shifting them to someplace that broadens their horizons. When these people do well, sing their praises up the hierarchy. If they fall on their faces, take full responsibility, give them a few pointers, and look for another opportunity for them.

▶ **Teach.** Regardless of how you intend to mentor, your position as a mentor should mean that you have something to offer those being mentored. You are an instructor and should be aware that not only are your actions being used as lessons, but everything you say can (and will) be used. Everything is a teachable moment.

Can leadership be taught? Sure. But it is best learned situationally. Having an effective leadership mentor can pave the way for the next generation of leaders. As a leader, mentorship is one of your most important duties. BCA

ICELAND: Aviation at the Arctic Circle

A small island **playing a major role** in North Atlantic air traffic control

BRYTTA/ISTOCK PHOTO

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

In their westward migration from Norway more than a thousand years ago, the seafaring Vikings navigated their longboats across the treacherous North Atlantic all the way to today's Eastern Canada. Along the way, they settled numerous islands isolated by thousands of square kilometers of ocean, the largest of which was a volcanic pile they initially called Snaeland ("Snow Land"), then later renamed Iceland for the icebergs that clogged a prominent fjord.

According to ancient records, the first permanent settler on the island was Norwegian chieftain Ingolfr Arnarson, who arrived in 874, although archeological digs have revealed that he may have been preceded by Irish monks called the "Papar." Despite its location (66 deg., 37 min. north) brushing the Arctic Circle — and its reputation and name —Iceland sits in the path of the Gulf Stream's relatively warm water that provides it with a somewhat temperate climate (and keeps Western Europe from emulating Siberia). As a result, the misnamed island's eastern side actually greens up in the northern summer, which ultimately attracted immigrants from Scandinavia, principally Norway and Sweden.

By 930, Iceland had become a commonwealth governed by the Althing, one of the oldest legislative assemblies on the planet, but infighting among tribes in the 13th century resulted in an accession of rule by Norway. This lasted until 1397 and the formation of the Kalmar Union among Norway, Sweden and Denmark, which brought Iceland along for the ride. When the Union broke up a century later, Iceland reverted to the Norway/Denmark joint kingdom but was dominated by the latter country, which also claimed possession of Greenland.

The 17th and 18th centuries were not kind to Iceland, as Denmark imposed harsh trade limitations on the island, which were compounded by natural disasters — including volcanic eruptions and epidemics of smallpox and other

The small town of Keflavik (pop. 15,000) hosts Keflavik International Airport (BIKF), Iceland's premier field servicing the country's capital Reykjavik. It is located on a narrow peninsula on Iceland's southwest side.

diseases, famines and raids on coastal settlements by pirates. Following the Napoleonic Wars in 1814, the Norway/Denmark alliance was broken, and Denmark assumed full possession of Iceland. In the mid-19th century, an independence movement began to gel in Iceland, inspired by nationalistic ideas in Europe and Danish intellectuals living in Iceland. In 1874, Denmark granted Iceland a constitution and limited home rule, which was expanded in 1904. Then, in 1918, the Danish-Iceland Act of Union was signed in which Denmark recognized Iceland as a fully sovereign and independent state in a union similar to that of the British U.K. But the Act of Union had a 25-year limit, expiring in 1943. The following year, a plebiscite was held in which Icelanders voted overwhelmingly to end the union with Denmark and establish a republic, and on June 17, 1944, Iceland became a constitutional republic with Sveinn Bjornsson as its first president.

An Aviation Heritage

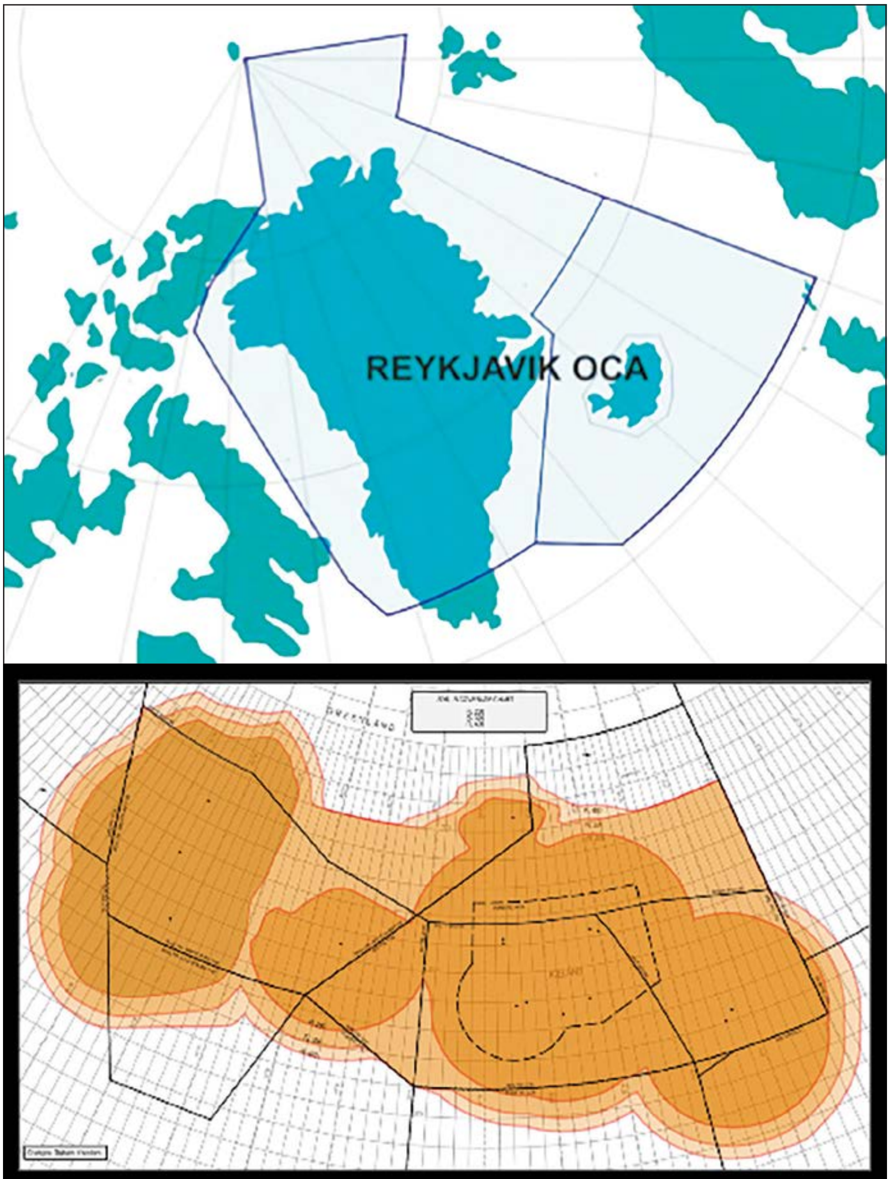
This small (39,682-sq.-mi.) country played a strategic role during World War II as a base for the air defense of the ship convoys that daily crossed the North Atlantic from America and Canada, bringing essential supplies to Great Britain and Russia for the war effort and, after the U.S. entered the war, troops for the impending invasion of Europe. It also served as a refueling stop for aircraft making transatlantic crossings in both directions.

The British Royal Air Force based Hawker Hurricane fighters at Reykjavik Airport (dubbed RAF Reykjavik for the duration of the war), while the U.S. Army Air Force built two airfields near the town of Keflavik that were merged after the war to eventually become Keflavik International Airport, today Iceland's principal airdrome. And, significantly, the remnants of the Norwegian Air Force, after fighting a heroic but ultimately futile defense against the invading Nazi German Luftwaffe, retreated to Iceland, remaining there to fly convoy defense for the remainder of the war.

Although Iceland does not maintain an army, it nevertheless became a member of NATO in 1949, a move not without controversy among its citizens, many who believed that a small, vulnerable island in the North Atlantic should maintain neutrality. During World War II, the U.S. undertook the defense of the island, then departed after the German surrender in 1945. However, as the Cold War era began, the two nations entered a defense pact in 1951, and the American military returned to the island, maintaining a presence there until 2006.

Aviation has played a significant role in Icelandic culture and business since the early 20th century, acting as a counterpoint to the isolation of the island by being able to connect it to numerous destinations in Europe and North America within a matter of hours. Its mid-Atlantic location also worked in Iceland's favor as a refueling stop for early transoceanic airline flights and, later, when range-limited first-generation business jets began transits between Europe and North America in the 1960s.

Iceland also spawned two indigenous international commercial carriers, Icelandair in 1937 and Icelandic Airlines in 1944, the latter famously introducing low-cost or "economy" fares for transatlantic flights favored by college-age travelers in the 1960s (lending it the sobriquet "the Hippie Airline"). The two airlines were merged in the mid-1970s, continuing operations as Icelandair, which today operates a fleet of legacy Boeing 737s, 757s and 767s to international destinations. (It was in the process of accepting new 737 MAX jetliners — and had several in operation — when the type was grounded in 2019. The five MAXs delivered, out of a total order of 11, were in storage as this was written. Also on order are Boeing 787 Dreamliners.)

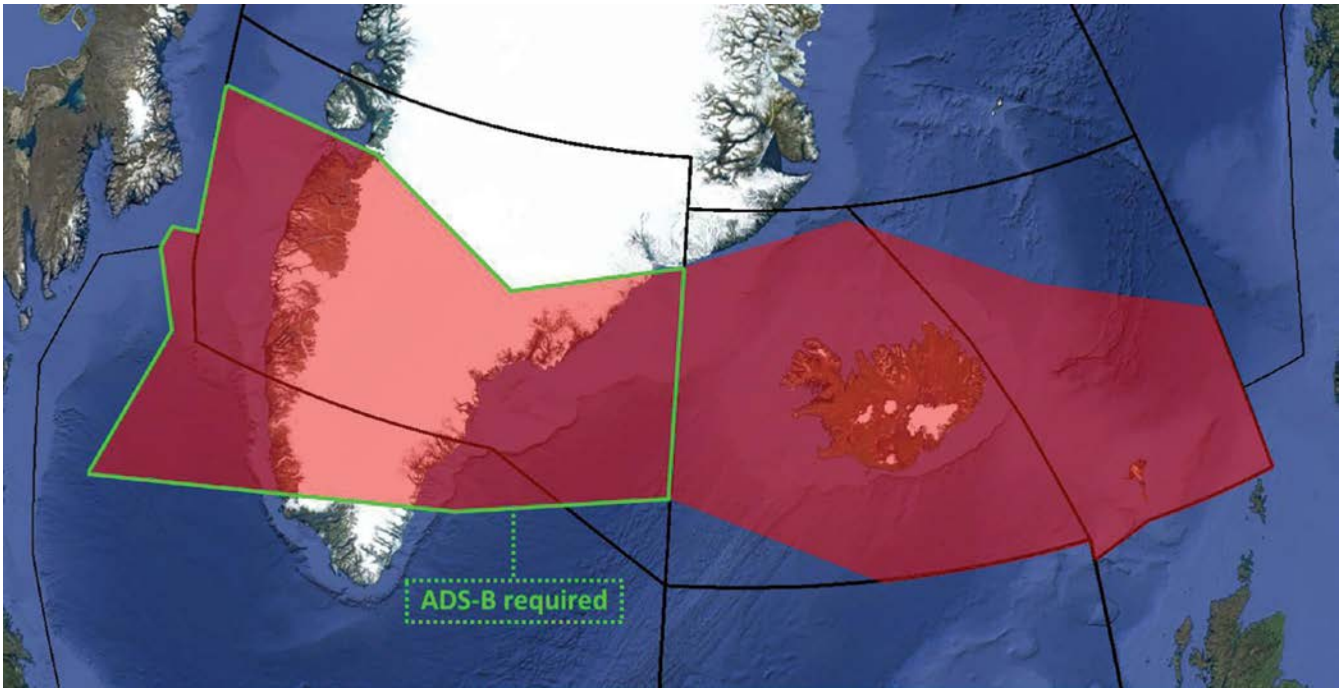


FAA AND ICELANDIC ISAVIA

Iceland's Oceanic Control Area is one of the largest FIRs, extending from 61N to the geographic north pole. Note that the line encircling Iceland represents the boundary of its domestic airspace. (Lower) North Atlantic ADS-B coverage at 20,000, 30,000 and 40,000 ft. Again, domestic airspace (the dotted line) encircles Iceland.

Major Player in Oceanic ATC

Iceland's geographical location also has lent it a major role in North Atlantic oceanic air traffic control. The country's privatized ATC provider, ISAVIA, manages a huge parcel of airspace in the upper latitudes as one of the seven member



NORTH ATLANTIC SYSTEMS

Reykjavik ATS Surveillance airspace allows North Atlantic passage with ADS-B equipage and no HF radio, as VHF comm is available. Note that it encompasses Central Greenland all the way east to the Faroe Islands.

states vested by the International Civil Aviation Organization's (ICAO) North Atlantic Systems Planning Group (NATSPG) with provision of ATC services in the North Atlantic, the others being the U.S., Canada, the U.K., Denmark, Norway and Portugal (through the Azores). Transatlantic operators who may never go to Iceland as a destination or tech stop will often be worked by ISAVIA (and pay their considerable nav fees) as they overfly the island.

Overflights, in fact, have lately accounted for a considerable amount of activity in Iceland's oceanic airspace — or did before the coronavirus pandemic. Ultra-long-range airliners like the Boeing 777-300ER (7,300 nm) and business jets like the Gulfstream 650 (6,997 nm), Bombardier Global 6500 (6,150 nm) and Dassault Falcon 8X (6,450 nm), capable of operating nonstop between the West Coast of North America and Central Europe, are flying great-circle routes that take them through Icelandic airspace and, often, right over the island. "The airspace up there has really changed the NAT traffic flow," Mitch Launius, president of 30West International Procedures Training, pointed out. "The Icelanders play a significant role in the NAT meetings because so many people overfly them, and they manage so many airplanes. So, they have a lot of responsibilities and have high technical and skill levels to meet them. They are key players in that region."

The importance of that role is evidenced by the 23-year service of ISAVIA chief Asgeir Palsson as NATSPG chairman. So admired was Palsson that when he completed his term in 2019, NATSPG members conferred on him an "honorary chairman" title. It is also noteworthy that Palsson's successor — elected by the other NATSPG members — is Hlin Holm, head of the Air Navigation Services Section, Icelandic Transport Authority.

This traffic plus a portion of the Blue Spruce published routes and the North Atlantic Track System (NATS) — when seasonal conditions move it that far north into Iceland's airspace to take advantage of more favorable winds — is managed by the Reykjavik Area Control Center (RACC) in Iceland's capital city. The Center also serves as the terminal control area (or TRACON) for Reykjavik and Keflavik Airports. Its terminal maneuvering area (TMA) is effective to 24,500 ft. within a horizontal radius of 40 nm from Keflavik Airport.

At 2.085 million sq. mi. (5.4 million sq. km), the Reykjavik Oceanic Control Area (OCA) is one of the planet's largest FIRs. It extends from the prime meridian to 76 deg. west, just west of Greenland and abutting the Gander OCA, and from 61 deg. north latitude, just south of the Faroe Islands and bordering the Shanwick OCA, to 90 deg. north, the geographical north pole. To the east, it adjoins the Norwegian-controlled Bodo and Stavanger OCAs and the Russian-controlled Murmansk OCA. Reykjavik also provides terminal control for Sonderstrom and Thule Airports in Greenland (the southern tip of Greenland south of 61 deg. north falls under Gander OCA) and Vagar Airport in the Faroes.

Before the COVID-19 pandemic, more than 25% of North Atlantic air traffic passed through the Reykjavik OCA. According to ISAVIA statistics, in 2018, total traffic in the Reykjavik OCA amounted to 196,001 transits, 7,067 by general aviation aircraft, most likely business jets. In 2019, total traffic was down by 7.5%, while general aviation had increased to 7,233 movements. For comparison, totals for the year 2010 were, respectively, 102,275 and 6,049. Of course, with the coronavirus pandemic eviscerating commercial air travel in 2020, total transits through Reykjavik-controlled airspace are expected to tally far lower than in recent years.

For a small country with limited resources to not only be handling high traffic loads like this but investing in considerable cutting-edge ground infrastructure to support it, ISAVIA consequently charges fairly high navigation fees. This has often been an issue for private operators accessing its OCA, as well as Iceland's airports, which are also operated by ISAVIA. Perhaps some compensation can be found in what Craig Mariacci, vice president of sales at Skyplan in Calgary, Canada, terms "some of the cheapest fuel prices on the planet" at Reykjavik airports, clearly an incentive for encouraging operators to plan tech stops on the island.

Commitment to ADS-B

This oceanic airspace is unique in that the south and east sectors (constituting about half of it) are covered by radar surveillance from seven stations spread among locations in Iceland, the Shetland Islands and the Faroe Islands. Thus, control in those sectors is similar to that in most domestic airspace, while in the north and west sectors, procedural control is the norm.

Now, add ADS-B to the radar network, and you have an enhanced level of precision in oceanic control. This owes its origins to a commitment some years ago by Nav Canada to install a string of ADS-B ground stations across northern Canada and through the Maritime Provinces in lieu of conventional surveillance radar and its implicit cost and maintenance requirements. Subsequently, Nav Canada partnered with ISAVIA to implant 10 more stations across Greenland — and in parallel with those, installation of VHF comm transceivers. Further, in Iceland, eight ADS-B stations are under construction on mountaintops, ensuring a reception range of at least 250 nm from land, with four additional stations planned in the Faroe Islands. All of this revolutionizes oceanic operations in this region by enabling actual surveillance of en route flights as opposed to procedural control.

Consequently, within Iceland's OCA, ISAVIA has created a block of "ATS Surveillance Airspace" overlaying Iceland and beginning above 19,500 ft. over Greenland to take advantage of this technology. (While Greenland controls its own airspace up to 19,500 ft., above that, the airspace is delegated to Reykjavik; as noted, Gander controls the southern tip of Greenland.) According to NATSPG, Ops Bulletin 2017_001_Rv. 04, July 9, 2019, airspace not encompassed in the North Atlantic Data Link Mandate (DLM) includes that "where an ATS surveillance service is provided by means of radar, multilateration and/or ADS-B, coupled with VHF voice communications." (This assumes that the aircraft is "suitably equipped," *i.e.,* with a transponder and ADS-B avionics.)

And this opens up North Atlantic transits to domestically equipped aircraft. Launius points out that controller-pilot data-link communication (CPDLC) is not required when transiting this block of airspace: "It is 'data-link exemption airspace,' allowing you to operate without FANS 1/A [*i.e.,* ADS-C] and which is handled much like domestic airspace with VHF comm."

Meanwhile, operations on the Blue Spruce fixed routes can be carried out with one long-range nav set and no HF radio — with some exceptions. But they do require a Letter of Authorization and an FAA review; however, if the operator is already approved for NAT oceanic ops, that nod also covers the Blue Spruce routes. The Blue Spruce routes can also serve as a backup for a fully equipped jet if it were to lose its HF capability before entering oceanic airspace. The same goes for failure of one of the two required long-range nav systems. (The aircraft would have to refile if unable to pass an HF operational check or lose the nav set before entering oceanic airspace.)

Operating Into Iceland

So far, we've considered Iceland and its airspace in respect to overflights. As a destination or a tech stop, operators will find the island friendly and accommodating. Because Iceland is a party to the Shengen Agreement, U.S., Canadian and EU citizens can enter the country and remain for 90 days without visas. "We would recommend at least three months validity on passports," Marek Siwiak, an international trip support manager at ARINC/Collins Aerospace, said. "Check the Icelandic immigration website for other nationalities' requirements."

Permits are, likewise, "wide open," Siwiak continued, meaning none are required for FAR Part 91 operations. "Most of our clients use Keflavik as a tech stop, and a permit is not required since no one will be disembarking." However, he cautioned, "If going in as a charter under Part 135, a permit is required thru ICETRA [Icelandic Transportation Authority]. The charter permit is easy to get, with only three business days lead time." And as Skyplan's Mariacci pointed out, no permits are required for Icelandic overflights.

Customs clearance is also straightforward. "No APIS required," Siwiak said. "They will ask for a copy of the GenDec, that's all. You clear on the aircraft or an FBO, and then you're on your way. But don't show up without a passport." Mariacci advised that operators should be prepared for occasional

Besting the Pandemic

When COVID-19 cases began to appear in some number in Wuhan, China, in January, Icelandic health officials moved quickly and decisively, focusing on early detection. Targeted testing of persons determined to be at high risk for infection commenced on Jan. 31. The first confirmed COVID-19 case turned up on Feb. 28, and the island was placed on high alert, hospitals were prepared, self-quarantining directed, and travel in and out of the country restricted. By late June, the total number of cases registered was 1,823, of which 1,805 had recovered, and 10 died, with no new cases reported. This has been attributed to more testing having been done per capita in Iceland than in any other country, including a screening of the general population by Icelandic biotech company deCODE Genetics to determine the spreading of the virus within the population.

According to EVO Jet Services, as of early June, tech stops by business aviation operators were permitted at Keflavik as long as no one exited the aircraft during the refueling procedure. For an international flight to remain in the country, however, crew and passengers were required to be quarantined for 14 days. As of the end of June, Icelandic health officials were looking at opening the country to international arrivals, contingent upon the ability to test passengers for COVID-19 and the availability of sufficient quantities of tests. Plans in place at that time were to be able to test up to 1,000 passengers a day by mid-July. In the event of a flare-up in the domestic population, testing of symptomatic individuals would take precedence. **BCA**

Reykjavik Internatonal Airport is Iceland's original aerodrome and was an RAF base during WWII. Today, it is Reykjavik's general aviation field. Note the Icelandair DC-3, once used for regional air travel on the island and now a commemorative "ramp guard." Due to cheap fuel prices, Reykjavik and Keflavik are magnets for business aviation tech stops.

GESTUR GISLASON/ISTOCK PHOTO

European-style ramp safety inspections at Icelandic airports.

Iceland is WGS 84-compliant and altimetry is measured in QNH. ICAO Pans Ops apply, as they do in oceanic airspace and European airspace.

There are four designated international airports on the island. Reykjavik (BIRK) and Keflavik (BIKF) both serve Reykjavik, Iceland's capital and largest city, located on a peninsula jutting into the ocean on the west end of the island. The other two are much smaller regional airports, Egilsstadir (BIEG) near Iceland's far eastern coast and Akureyri (BIAR) on the edge of a north coast fjord.

Almost all international traffic entering Reykjavik domestic airspace goes to Keflavik International Airport. It is a modern, well-equipped field located 31 sm (50 km) southwest of Reykjavik, about a 25-min. drive to the city on good roads. A 24-hr. airport, BIKF has two asphalt runways with clear approaches: Runway 1/19, 10,020 ft. in length, and Runway 10/28, 10,056 ft. Both are 200 ft. wide and equipped with ILSes. Field elevation is 171 ft.

Slots are required at BIKF, which can be requested online by a service provider or the operator. According to Cameron Moore, also an international trip support manager at ARINC/Collins Aerospace, "There is a quick response on the web." Reportedly, no slots are required at any other Iceland airport for general aviation. Moore also pointed out that noise abatement procedures apply at Keflavik, but "they are not as stringent as European airports." Operators are referred to the Icelandic Aviation Information Publication (AIP) for further information.

Reykjavik Airport (BIRK) is the domestic field for the city, hosting intra-Iceland airline flights, a few international charters, flights to and from Greenland, transatlantic aircraft ferry flights and some business aviation activity. Located only 1.2 sm (2 km) from Reykjavik's business center, it was Iceland's original airport, a dirt field until the advent of World War II when the British RAF established its base there and paved over the runways. Because it sits within the city limits, a night curfew has been imposed on BIRK between 2300 and 0700 weekdays and 2300 to 0800 on weekends. BIRK also has two active asphalt runways: Runway 1/19, 5,840 ft. long by 147 ft. wide, and Runway 6/24, 3,150 ft. by 98 ft. A third strip, Runway 13/31, 4,034 ft. by 147 ft., is closed as of this writing. Runway 19 is equipped with an ILS. Field elevation is 44 ft.

The two main airports are somewhat unusual for a country that identifies mostly with Europe in that both host multiple FBOs servicing business aviation. IGS Ground Services and ACE FBO have facilities at both airports, with SouthAir also at BIKF. All maintain passenger lounges and flight planning centers. Each provides fueling and claims quick turnarounds for tech stops. Other services such as deicing, hotel reservations, ground transportation and catering are available. Parking is claimed to be generous on FBO ramps and reservations are generally not necessary. Very large aircraft such as BBJs and Airbus AC319s are easily accommodated on the airports but not always on FBO ramps. Security is claimed not to be an issue: "All airports are fenced," Moore said, "and if you need it for the aircraft, it can be arranged."

The two other Icelandic international airports are worthy of consideration for domestic travel within the country or as alternates in case of contingencies. "For a divert or ETP," ARINC/Collins' Siwiak told *BCA,* "these two fields can be opened within 30 min., depending on the season." Egilsstadir, near the town of the same name, connects the Icelandic east coast with Reykjavik and provides some airline flights to Copenhagen, London and Edinburg. It has a

Iceland and the N-3PB

In 1939, Jack Northrop, renowned aeronautical engineer and founder of Northrop Aircraft, received one of the first commissions for his newly reorganized company. A veteran of Lockheed and Douglas aircraft whose first attempt at original equipment manufacturing wound up as a subsidiary of the latter, he had been approached by representatives of the Norwegian government about developing a common reconnaissance/patrol bomber for the country's naval and army air services. A variant of the Northrop A-17/Douglas A-33 single-engine attack bomber was proposed, heavily redesigned to incorporate floats, as the Norwegians intended to operate from the country's numerous fjords. The commission was especially sweet since Northrop was of Norwegian descent.

The resulting aircraft, now a full creation of the new Northrop Corp., was dubbed the N-3PB Nomad. Powered by a 1,200-hp Wright R1820 radial engine, it could pull a maximum speed of 257 mph at sea level, range 1,000 sm, and carry 2,000 lb. of bombs or a single torpedo. It was armed with .30- and .50-caliber machine guns.

Even before the N-3PB's first flight, the Norwegians ordered 24 of them. But before the aircraft could be delivered, the German Nazis invaded Norway in April 1940, and the country's naval and air force aviators went into exile in Canada and Iceland. After training with six N-3PBs at Vancouver Island, the remaining 18 were delivered to Iceland by ship to equip Norwegian No. 330 Squadron attached to the British RAF at Reykjavik, where they spent the war flying air cover for naval convoys transporting war supplies to Russia and Great Britain.

In April 1943, the pilot of N-3PB airframe serial number 320 flew into bad weather on the east coast of Iceland, got lost and made an emergency landing on the Pjorsa River. The pilot survived, but mired in silt, s.n. 320 sunk to the bottom of the river where it remained for more than 35 years. Then in 1979, Ragnar R. Ragnarsson, vice president of the Icelandic Aviation Historical Society, pinpointed the wreck, and that year, the aircraft was recovered by a team of U.S. Navy and volunteer divers from the U.S., Great Britain, Norway and Iceland. It was loaded aboard a Norwegian Air Force C-130 and flown to the Northrop plant in Hawthorne, California, where another group of volunteers, including Northrop employees and retirees — 14 of whom had worked on the assembly line that had built the N-3PBs — totally restored the aircraft. This involved the fabrication of many replacement parts using damaged and corroded originals as templates.

GEORGE T RUSSELLL

In November 1980, reborn s.n. 320 was unveiled in a hangar at Northrop Field in a ceremony attended by company employees, many surviving members of No. 330 Squadron, a contingent of Icelandic aviation aficionados (including Ragnarsson) and this writer, where the N-3PB was officially presented to Norway. Afterward, it was disassembled and flown to Gardermoen, site of Oslo Airport, where today it remains on display in the Norwegian Armed Forces Aircraft Collection.

Jack Northrop, of course, went on to develop the famous (and ultimately star-crossed) flying wings, the YB-35 and YB-49. Using technology pioneered by those aircraft, Northrop Grumman Corp. developed the B-2 Spirit flying-wing stealth bomber during the 1980s. Northrop, who died in 1981, never got to see it fly. BCA

single asphalt runway: 4/22, 6,562 ft. in length and equipped with an ILS. Its elevation is 75 ft.

Volcanic Reliever

Up north, Akureyri Airport, which sits on the delta of the Eyjafjordur River that flows into the fjord of the same name, also has a single runway paved in asphalt: 1/19, 7,874 ft. long and equipped with an ILS. Its elevation is 6 ft. In 2010, Akureyri achieved notoriety among international operators in the North Atlantic region when the Eyjafjallajökull volcano erupted, blanketing both Keflavik and Reykjavik Airports with thick ash fallout and diverting dozens of airline flights to the small airport. The field's ramp was covered with large airliners and its small terminal choked with stranded passengers originally headed to Reykjavik. As a result, ISAVIA has announced plans to enlarge both the ramp and terminal to support Akureyri's expanded role as a reliever airport for Keflavik in the event of future volcanic eruptions.

Since Iceland is volcanically active (it sits astride the North American and Eurasian tectonic plates and is part of the Mid-Atlantic Ridge), operators heading there should keep an eye on the volcanic situation by checking the London Volcanic Ash Advisory Center (VAAC) operated by the U.K. Met Office on behalf of ICAO. It monitors active volcanoes in Iceland and the northeastern Atlantic, providing volcanic ash advisories and graphics at **https://www.metoffice.gov.uk/services/transport/aviation/regulated/vaac/advisories**

When the Eyjafjallajökull volcano erupted in April 2010, it spewed a massive amount of ash particles into the flight levels where winds carried them into European airspace, almost shutting down aviation on the Continent. Eurocontrol's Network Manager implemented its ash contingency plan, and based on VAAC ash dispersion reports, closed affected sectors, redirecting aircraft into clean airspace to prevent flights from entering ash clouds and risking engine damage.

A Magnet for Fuel Stops

Meanwhile, the low cost of fuel in Iceland has served as a tech-stop magnet for operators making the North Atlantic crossing. "I've been to Iceland a dozen times for tech stops," Tim Slater, chief pilot for a large West Coast charter/management firm, told *BCA*. "We used to go to Winnipeg from the West Coast as a fuel stop on the way to Europe. But when fuel got so expensive there, we started using Keflavik as a tech stop due to the favorable prices."

This got so good that the operator would even tanker fuel from Iceland to the Continent, make several stops there on behalf of principals, then fly back to Iceland to tank up for home. "Their VAT taxes are so low," Slater said, "that even with a $2,000 handling charge we saved money over what we would have had to pay on the Continent. The last time I was in Europe, gas was $2/gal. in Iceland, and it was $12/gal. in Zurich. When you roll up and ask for 3,000 to 4,000 gal., that gets pricy real fast!"

We asked Slater about winter weather on the island. "While the Icelandic weather gets low [in terms of overcast and visibility] in the winter, I never experienced it below Cat I minimums. At Keflavik, you will never be stuck with a 90-deg. crosswind; 45 deg. at the most, thanks to the perpendicular runway layout. The visibility can be low with blowing snow, but it's not as dynamic as the rest of the region. It will be cold [-10C (14F], but generally in the wintertime, the lowest will be -11.6C [11F] and the warmest is 4.4C [40F]. On the other hand, in July, the low is 8.8C [48F] and the high is 14.4C [58F] on average."

But the winter weather can change rapidly, *BCA* contributor and retired business aviation captain Ross Detwiler warned. "Remember, too," he said, "that Iceland is so far north that, in the wintertime, you can experience the midnight sun, which can really mess with your circadian rhythm."

He reminisced about one flight in 2006 in a Global Express: "We came out of Fairbanks and overflew Eureka in Canada, then entered Greenland 198 nm north of Thule, traversing from the northwest to the southeast and out over the sea right over Iceland. We were worked by Icelandic ATC, very efficiently. In oceanic airspace, you report your position every 10 deg. of longitude, but that high up, 10 deg. is only 25 nm, so position reports come up fast! Then we went on into Shanwick control and, finally, to Stansted near London. On that flight, we averaged Mach 0.85."

Back in mid-1990s, when Detwiler was a member of the New York Air National Guard, he captained a Lockheed C5A on a flight from the Middle East to the U.S. with a fuel stop at Keflavik. "That end of the island is a big windswept volcanic rock," he said. "In the old days, if coming out of western Europe in a shorter-range airplane, you couldn't make it all the way to Gander [against prevailing winds]. So, Iceland

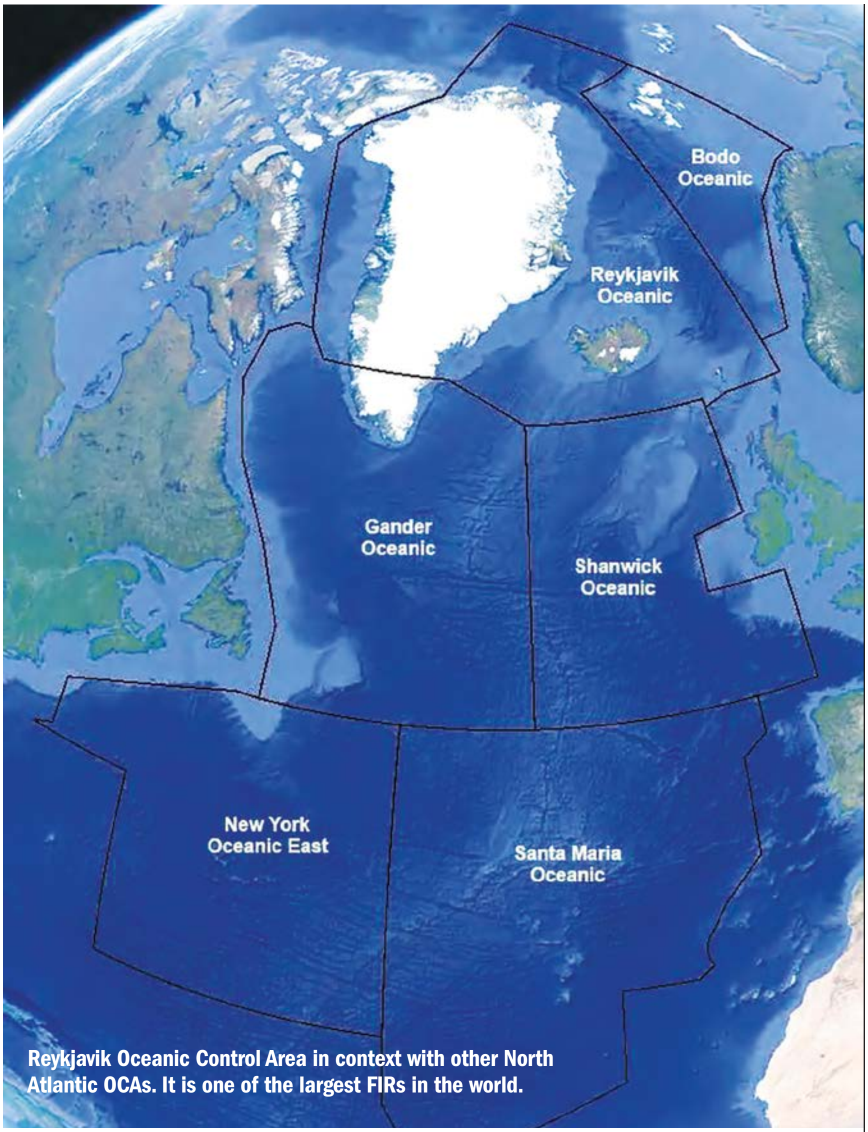
A Personal Discovery

In the early 1980s, this writer traveled to Iceland on a delivery flight of a new Canadair Challenger 600 just bought by a European customer. I rode the jump seat as an observer, gathering information for an article commissioned by an aviation journal, while my partner at the time enjoyed the luxury of the executive-outfitted cabin. We had picked up the aircraft at Canadair's Hartford, Connecticut, completion center and planned to overnight in Reykjavik where the owner had a close friend. We arrived around 0500, and the crew made an uneventful instrument approach and landing at Keflavik.

Our local host had arranged for a cab to meet us at the FBO, and we drove through sunrise-lit streets to the home of a Capt. Johnsson, retired from Icelandic Airways, and his wife, where we were served a delicious Scandinavian breakfast. We were exhausted, but it was delightful: home-baked bread, strong European coffee and cold "monkfish," which tasted like lobster to me and which our host described as "the ugliest fish that swims in the sea." (I looked it up when I got home, and he was right: The monkfish is actually the angler, that prehistoric thing with a mouth full of needle-sharp teeth and an appendage off its snout that it uses — or angles — to mesmerize its prey before mashing it up in those fangs.)

After some "there-I-was" stories (naturally), we cabbed to our hotel for a few hours of sleep. I remember the hostel was warm, luxurious, and the water in the bathroom smelled of sulfur. Oh, and the towel racks were heated with it, as well. These people knew how to live at 64 deg. north. Early in the afternoon, our friend Ragnar Ragnarsson, at that time president of the Icelandic Aviation Historical Society, and two of his colleagues met us outside with a car and took us for a tour of the city.

Reykjavik was like nothing my partner and I had ever seen. It had a stark, yet modern quality to it, with one foot in its Nordic past and the other in the European future. The former was emphasized when we drove by the harbor and viewed a line of whale boats affixed with harpoon guns on their bows. Ragnar explained that the few trees we saw around town had all been brought to the barren island centuries ago from Europe. For me, having grown up in a provincial Pennsylvania steel town, to not only be abroad for the first time but in this remote, magical place was like a dream. It was early November, and while cold, the temperature was tolerable. The quality of the light so far north, the pristine air, the fellowship of friends immersed in aviation — to share this with the love of my life . . . it was an experience I'll never forget. **BCA**



NORTH ATLANTIC SYSTEMS

Reykjavik Oceanic Control Area in context with other North Atlantic OCAs. It is one of the largest FIRs in the world.

was a good tech stop for an airplane with lesser range." (When Detwiler retired from the Air Guard, he held the rank of brigadier general.)

Descended From Vikings

Iceland lists 96 airports among its transportation infrastructure; however, only seven have paved runways, with the four described here suitable for jet-powered commercial or business aviation aircraft. With a population of 366,130 people and a landmass the size of the state of Kentucky, Iceland is the most sparsely populated country in Europe. Reykjavik also holds the distinction of being the northernmost capital of a sovereign state. It is a representative democracy with a parliamentary government built on a tradition dating from the Althing of 930.

While Iceland entered the 20th century plagued with poverty, it has since evolved to be one of the most highly developed countries in world, with low unemployment (at least before the COVID-19 pandemic) and remarkably even income distribution. Its current economy is built on tourism, aluminum smelting, other diversified industries and fishing. The last was, for many years, the primary foundation of the Icelandic economy, representing 90% of export revenue at the mid-20th century, but declining fish stocks (and the collapse of the North Atlantic cod population) have reduced it to 40% today. In recent decades, Iceland's industry has been diversifying into service, software production, biotechnology and finance. On average today (and before the coronavirus pandemic), tourists visiting the island represent three times the number of residents. Iceland's 2017 GDP purchasing power parity was $18.18 billion, and at that time, 4% growth.

But this prosperity was not achieved easily. Following privatization of Iceland's financial industry in the early 2000s, domestic banks embarked on aggressive expansion in foreign markets, over-borrowing among foreign currencies. Worsening financial conditions through 2008 led to a depreciation of the Icelandic krona, and when the value of the loans reached nine times the Icelandic GDP, the country's banks collapsed. Like the rest of the globalized economy, Iceland had entered the Great Recession.

But the government took matters in hand and established new banks to assume the assets of the old ones, moved to stabilize the krona, control inflation, reduce the country's high budget deficit, restructure the financial sector and diversify the economy. The success of these economies is implicit in the recovery seen today.

Living on a landmass created by still-active volcanism, Icelanders have taken advantage of plentiful — and renewable — geothermal (and some hydroelectric) energy to satisfy virtually all of the country's electricity and heating needs. Less than 15% of Iceland's energy consumption derives from imported oil, currently used to power its fishing fleet and satisfy aviation needs. As its geothermal energy sources also enable it to produce large quantities of hydrogen — one of the few countries able to do this — most of its surface transportation is powered by hydrogen fuel cells. Iceland, in fact, has such a surplus of energy capacity that it is currently in negotiations with the U.K. to export electricity to the British Isles via an undersea cable. While the rest of the world argues about carbon net neutrality, Iceland achieved it years ago.

Since 1983 and the formation of an all-female political party (merged with the Social Democrats in 1999), women have played an active role in Icelandic politics. Following the 2016 elections, 48% of the Icelandic Parliament were women. The current prime minister of Iceland is 44-year-old Katrin Jakobsdottir (Icelandic women's names carry the suffix "daughter;" men's names in the same families carry the suffix "son"). In 2020, she led her North Atlantic nation, descended from Vikings, to a near-virtual eradication of the COVID-19 virus on the island. BCA

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Pilatus PC-12NGX

Leaping far ahead of its predecessors

Faster, quieter, quicker climbing, more comfortable, easier to fly. Fourth-generation PC-12 NGX secures its position as class leader.

PILATUS

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

From a distance, it's tough to distinguish the PC-12 NGX, the fourth-generation of Pilatus' best-selling single-engine, pressurized turboprop, from those that came before. It bears close resemblance to the original airplane that made its debut more than a quarter century ago.

True to its roots, it still boasts a cabin that has 10% more volume than that of the King Air 250, along with an 18-sq.-ft. aft cargo door and the only flat floor in its class. It's just as comfortable flying out of a grass strip as it is operating from the nearly 6,000 airports with paved runways. In other words, it remains business aviation's favorite flying off-road vehicle, offering virtually unmatched utility.

When nearing the aircraft, the NGX's larger cabin windows, with squarer corners, tip off spotters that it's the new model. Unbutton the engine cowl, belt into the left seat or nestle into the cabin and dozens of upgrades become apparent.

Up front, there's Pratt & Whitney Canada's PT6E with full-authority integrated prop and engine digital controls. P&WC calls it an Engine and Propeller Electronic Control System, EPECS for short. The Canadians call the EPECS a system of systems, as it's linked to fuel and prop controls, stand-alone electronic engine control, and engine trend monitor unit and sensors, among other components. It's mounted low in the engine compartment, well isolated from engine heat and vibration for long life.

From a pilot's perspective, the only meaningful difference between flying with a PT6E with the EPECS and operating a FADEC-equipped turbofan engine is the five-blade prop spinning on the nose. Look closely under the cowl and you'll notice no prop governor and no associated mechanical control linkages. The prop control unit is electronically controlled by the EPECS, hydraulically changing blade pitch with oil pressure.

Similarly, the fuel control unit (FCU) has no mechanical linkages. It schedules fuel flow in response to electronic commands from the EPECS. The FCU has a fuel/oil heat exchanger that warms bypass fuel flow from the engine-driven

PILATUS

The 6 + 2 seat exterior interior is a $455,000 option. New chairs recline fully to create lie-flat berths. Quick release chair mounts allow interior to be reconfigured for cargo in less than 10 minutes. (Rearmost +2 seats not shown.)

fuel pump to 50C to 60C that is then recirculated back to the wing tanks to power the jet pumps. The heated and insulated motive flow system prevents ice from forming in wing fuel and thus eliminates the need for anti-icing fuel additives, such as Prist.

The flight deck has several modifications. Most noticeable is the throttle quadrant. Gone are the manual override and prop condition levers, plus all mechanical linkages to the engine. As with FADEC-equipped turbofans, the PT6E's power control lever is electronically linked to the EPECS. An optional full-authority autothrottle handles power setting chores from takeoff roll to short final on landing.

The dual-channel EPECS provides fuel scheduling redundancy and the flight/ground idle transition is controlled by a weight-on-wheels switch. The left side of the overhead panel has a simple engine stop/run toggle switch and start button. The EPECS provides start malfunction protection, chock-to-chock torque limiting and prop control, along with automatic dry motoring to cool or purge fuel from the engine as necessary. A prop low-speed mode button reduces prop speed to 1,550 rpm from 1,700 during most phases of flight for considerably lower cabin sound levels. The PT6E has a slightly higher torque limit to assure that all 1,200 shp are available at 1,550 rpm.

The flight deck has been upgraded from Honeywell Primus Apex Build 10 to Build 12. Similar to the PC-24, it's now branded as Pilatus ACE, short for advanced cockpit environment. The displays are much brighter and clearer, VHF VDL Mode 2 CPDLC has been added as an option for Europe, ADS-B In is standard and there's an emergency descent mode that can be armed above FL 200. Data-link weather services have been upgraded and the center console now sports a touchscreen control unit that replaces the mechanical keypad and joystick. Overall, the PC-12 NGX's flight deck is more advanced than the current version of the PC-24's avionics suite.

The cabin has numerous improvements. Overhead-mounted, drop-down oxygen masks now are optional. The available vapor-cycle air conditioner is more powerful. Most apparent are the new windows that have the same width and height as the older models, but the squarer corners increase area by 10%. At first glance, that seems like a minor change, but it's much easier to look outside because of their different shape. The chairs now fully recline to convert into lie-flat berths. Seat mounts have quick-release fittings that allow chairs to be removed or replaced in minutes.

The headliner has been recontoured to increase seated headroom, to improve air distribution and to accommodate upwash lighting. Noise levels have been reduced. At 1,550 prop rpm and with the forward lav door closed, the cabin appears to be the quietest in class, in our opinion.

Proven Swiss Structure and Systems

The fourth-generation NGX retains all the ruggedness of the original 1994 model, plus it incorporates the drag reduction modifications made to the third-generation NG. As with all Pilatus designs, the PC-12's airframe primarily is fabricated from high-strength aluminum alloys using conventional semi-monocoque construction. The nose cowl is a carbon fiber/nomex honeycomb composite sandwich, covered with a copper mesh for electrical bonding and lightning protection. Composites also are used for various fairings, landing gear doors and wingtips/winglets, plus the dorsal fin extension forward of the vertical stabilizer and ventral fin on the tail cone.

The wings use conventional ladder inner structures, with top and bottom skins riveted to front and rear spars, along with machined and hydro-formed chord-wise ribs. Each wing has an integral wet wing fuel tank with an over-wing refueling port and a usable capacity of about 1,347 lb.

All PC-12 models feature NASA-derived airfoils developed in the early 1970s. The Swiss chose a modified LS (low speed) 0417 design for the root that blends to an MS (medium speed) 0313 section at the tip. The result is a relatively low pitching moment coefficient, good lift-to-drag characteristics in climb and cruise, plus docile stall behavior.

Its predecessor, the NG, has over a half dozen drag reduction improvements that, in combination with a Hartzell five-blade, thin chord, carbon-fiber prop, enable the aircraft to cruise up to 5 kt. faster, take off on slightly shorter runways and climb to cruise altitude 10% quicker. Compared to the first two generations of PC-12s, the NG and NGX have an oil cooler cover that has been reconfigured, a cowl exhaust vent with a flush surface, antennas aligned with the local airflow patterns, gap seals fitted to the flaps, flap track fairings that are more streamlined and a flush-mount operating handle on the main entry door, among other small refinements.

The fuel system has left and right collector sumps, each with a DC-powered boost pump used for engine start,

PILATUS (4)

(Left) Pilatus Advanced Cockpit Environment features brighter, crisper displays, plus new functionality. $450,000 global choice upgrade includes co-pilot's PFD, datalink weather and dual iPad Mini mounts, among dozens of other enhancements. (Right) Single power lever control. No need for manual override or condition levers. Optional auto-throttle is a valuable addition.

crossfeed and as a backup to the main jet pumps. Fuel balancing is automatic, but it can be pilot controlled in case of a malfunction. Jet pumps also are used to transfer fuel from low points in the tanks to the sumps. The jet pumps use high-pressure bypass fuel from the engine-driven pump for motive flow pressure.

The left and right windshields are glass layers with stretched acrylic sandwiched between the plies. All other windows are stretched acrylic. The main airstair entry door is 2.0 ft. wide by 4.5 ft. tall. There is a 2.1 ft.-high-by-1.5-ft. wide emergency exit plug door over the right wing.

Aluminum is used for all of the primary control surfaces, all of which are manually actuated, with inputs from the control wheel and rudder pedals transmitted to the control surfaces by push-pull rods and cables. There is an aileron/rudder spring interconnect to help prevent adverse yaw or roll, a three-axis electric trim system actuating tabs on the rudder and ailerons, plus a screw jack that moves the trimmable horizontal stabilizer. The ailerons have geared servo tabs that reduce roll control effort by two-thirds, endowing the aircraft with excellent pitch/roll control force harmony. The left aileron servo tab doubles as a trim tab. The elevator has a stall-barrier stick shaker and pusher system to help prevent excessively high angle of attack.

The Fowler flaps are electrically actuated by means of a single motor driving flex shafts connected to gearboxes and jackscrews with 0-, 15-, 30- and 40-deg. preset positions.

The landing gear, having low-pressure tires, is built for rough-field operations. The trailing link main gear have 14 in. of travel. In contrast to the NG, which uses a 28-volt electrically powered, 2,800-psi hydraulic pack to actuate the gear, the NGX uses electric motors and linear motion jackscrews. The gear are held in place by motor brakes. The emergency gear extension system releases the jackscrew actuator gear train so the landing gear can free-fall into position.

Mechanical links through the rudder pedals provide +/- 12 deg. of steering. Differential braking can pivot the nosewheel up to 60 deg.

The 28-volt DC electrical system is a dual-redundant, split-bus design, similar to that of the Eclipse 500 or Embraer Phenom 100. Each side of the split-bus system has its own 42 AH lead-acid battery and 300-amp generator bolted directly to the engine accessory gearbox. The primary side has a pure generator and the secondary side has a combined starter-generator. Standard equipment also includes an emergency power system with a third battery. Optional heated NiCads provide 10% more power than unheated ones. There is a separate, standard 5-amp/hour emergency battery. Notably, the PT6E's fuel control unit has an integral permanent magnet alternator that powers all EPECS components in the event of a total electrical failure.

The split-bus system is designed for easy operation, with each side carrying designated loads. There are automatic bus tie and automatic load-shedding functions that reduce pilot workload when both generators are not on line. The primary side powers essential equipment and the secondary side supplies non-essential gear. For pre-departure clearance delivery chores prior to engine start, a stand-by bus provides power to radios, the FMS and the MFD map.

The split-bus's primary side battery powers all avionics and essential equipment prior to and during the initial part of the engine start cycle, thereby protecting it from current surges and eliminating the need to turn off avionics gear before both generators are on line. At 10% rpm, the primary side battery automatically ties into the secondary side to assist in cranking the engine. The delay function improves cranking performance to prevent hot starts as well as current surges. With both generators on line after start, the electrical system reverts to the normal split-bus configuration.

The newly added touchscreen control unit replaces the multi-function keyboard and joystick. A virtual keyboard can be configured as alphanumeric or qwerty display.

Both generators must be on line to power the standard auxiliary electric heaters or optional vapor-cycle system (VCS) air conditioner. The refrigeration system has been upgraded with separate motors for the compressor and condenser cooling fan, thereby eliminating the belt drive in older versions. Air distribution is improved to increase flow and reduce noise.

If external power is available, it can be used to power equipment on all buses, including the electric heaters or VCS air conditioner. External power also is the only way to provide power to all four Primus Apex screens prior to engine start because of the system's automatic load-shedding design.

Ice protection is provided by deice boots on the wing and horizontal stabilizer leading edges, exhaust heat ducted through the engine inlet lips and a particle separator that can be deployed in the engine air intake duct. Electric heaters provide anti-ice protection for the windshields, probes and static ports.

Pressurization is modulated automatically by a dual-channel, electronically controlled system that uses FMS-derived landing field elevation. If the destination airport is not in the FMS database, the crew can program in landing field elevation. That's a useful function if your destination is an uncharted grass strip next to your favorite fishing lodge.

A standard pneumatically controlled safety outflow valve backs up the automatic system to prevent over-pressurization. Cabin altitude is 8,000 ft. at FL 262 and 10,000 ft. at FL 300, the aircraft's maximum certified operating altitude.

The NGX has a dual-zone temperature control, albeit one limited to providing a +/-9F (5C) difference between the cockpit and cabin. Temperature sensors in the cockpit and cabin provide actual temperature indications on the ACE flight deck displays.

The airplane has ample heating capacity, as dual under-floor electrical aux heaters are standard equipment. Additional electric foot warmers for the pilots are optional. The standard aircraft has an air-cycle machine (ACM) that provides air conditioning once the engine is running. But the bleed air supplied to the ACM by the engine is too meager to provide much cooling in warm climates. Serial number 2001, the aircraft we flew for this report, has the optional VCS air conditioner with the higher volume air distribution system. We recommend ordering that option.

Standard kit includes three 10.4-in. ACE displays — pilot's side PFD, plus stacked MFDs in the center panel, along with a solid-state standby instrument display that eliminates the need for a "wet" compass. The base model is fitted with a single SBAS GPS receiver, single ADS-B capable Mode S transponder, dual comm and nav radios, single radio altimeter, DME transceiver, ADF receiver and RDR 2000 4-kW magnetron weather radar with vertical scan mode. Also standard are a 406 MHz ELT with GPS position input, data recorder, TCAS I, Class B TAWS, PFD synthetic vision, coupled VNAV with FMS 3-D visual approach guidance, and RVSM capability, along with pilot-defined FMS approach guidance, vertical glidepath, vertical situation display on the MFD and coupled VNAV.

A tactile feedback function, using the autopilot aileron servo, has been added to help nudge the aircraft back to a 31-deg. bank angle, should the pilot inadvertently exceed a 51-deg. bank angle when hand-flying the aircraft. Tactile feedback may be overridden by pressing the touch-control steering button, thereby releasing the aileron servo clutch.

A fourth, copilot-side 10.4-in. PFD is optional, along with available Sirius XM satellite data-link weather, 6 kW weather radar, second SBAS GPS receiver, ATN B1 CPDLC for Europe that piggybacks on VHF comm 2, second Mode S ADS-B capable transponder, and dual iPad Mini mounts. Other options include TCAS II, 2-D airport maps with ADS-B In cockpit display of traffic, autothrottle, Aerowave 100 Inmarsat or Iridium satcom, electronic checklist (not interactive), USB charging ports on the flight deck, electronic charts, Honeywell SmartRunway and SmartLanding hazard alerting systems, Bluetooth connectivity between tablet devices and FMS, and Stormscope lightning detector, among other equipment. Honeywell's Go Direct Flight Bag Pro, running on iPads, can be used to upload flight plans to the FMS, but ACE is not yet interactive with ForeFlight.

Let's Go Flying

Serial number 2001, ordered by Pilatus Business Aircraft of Broomfield, Colorado, as a demonstrator, is loaded with options. The baseline aircraft weighs 6,373 lb. with a single 200-lb. pilot. Upgrades include the Global Choice USA option package, including virtually all of the avionics options already listed, plus TCAS/ADS-B In vertical separation approach guidance, airport moving map with ADS-B In for both aircraft and surface vehicles, advanced satellite graphical weather, plus a second FMS, steep approach capability, pulsing landing lights, Class A TAWS, heated dual NiCads, USB-A and -C charging ports on the flight deck, and cockpit foot warmers, among other items that add $870,703 to the base price.

The cabin is outfitted with the $455,000 Executive 6 + 2 interior, including six individual chairs that track fore, aft and sideways, swivel and fully recline, plus two removable, occasional-use seats for the aft cabin, along with airstair lights, USB charging ports, five AC power outlets and various other niceties. As befitting a $5.75 million business aircraft, customers are afforded a wide selection of leathers, fabrics, cabinet finishes, metal plating and interior designs. A special NGX paint scheme adds $30,000 to the demonstrator. Total retail price is $5,745,703. Options boosted the BOW by 496 lb., to 6,869 lb., giving it a 922-lb. payload with full fuel.

Demonstration pilot Brian Mead belted into the right seat and I took the left. With Tom Aniello, Pilatus Business Aircraft vice president of marketing, in the cabin, 30 lb. of cargo and 2,035 lb. of fuel, ramp weight was 9,345 lb.

Computed takeoff weight was 9,300 lb. Rocky Mountain Metropolitan Airport's (KBJC) field elevation is 5,673 ft. Using the PC-12 Pilatus performance iPad app, we plugged in pressure altitude, altimeter 30.11, 25C OAT, a flaps 15-deg. takeoff configuration and normal 1,700 prop rpm. Takeoff distance (TOD) on 7,002-ft.-long Runway 30L was 3,908 ft. and accelerate/stop (A/S) distance was 3,774 ft. Rotation speed was 78 KIAS, flap retraction speed was 100 KIAS, VX (best angle), VY (best rate) and VT (en route climb) speeds were 120 KIAS, 130 KIAS and 140 KIAS, respectively. We could have shaved 400+ ft. off those distances had we used 30-deg. flaps to enhance short-field performance. We opted to use flaps 15 deg. to improve power-off gliding performance in the event of engine failure.

Alternatively, we could have selected 1,550-fpm prop low-speed mode and flaps 15 deg. for noise abatement. TOD and A/S distance would have been 4,536 ft. and 4,231 ft., respectively.

Prestart cockpit checks are short and straightforward. However, there are a half dozen or so switches and indicators on the left armrest, left and aft of the pilot's chair, that are difficult to see, let alone check by feel. It's best to check those with a flashlight before strapping into the seat.

Once the battery switches on the overhead panel are turned on, the FMS may be programmed via the Flight Management Window pages on the MFD, using point, type and click conventions similar to Dassault's EASy layout. FMW control bar tasks are divided into three phases of flight tabs: pre-takeoff, departure and arrival. The touchscreen control unit may be configured with either an alphanumeric or conventional qwerty virtual keyboard.

Entering the data by hand into ACE sparked three thoughts. First, there's no iPad-to-ACE FMS connectivity for automatically sharing computed flight plan data. You can't yet do preflight planning tasks on the ground and push the data to the airplane once it's powered up. The tablet-to-airplane interface is on the list of Honeywell and Pilatus IOUs. Second, the NGX's ACE lacks a tabular performance computer to calculate TOLD (takeoff and landing distance) data, so it has to be entered manually, increasing the risk of fat-finger errors. Third, ACE's EFIS color conventions are inconsistent.

In our opinion, it would be easier to master the system if cyan were used for all pilot-entered data and magenta for all computer-generated targets. Ideally, green would indicate active (and ILS navigation) status and white would signify standby status.

Pre-start checks aboard the NGX are virtually unchanged from the NG, including the recommendation to open the engine intake inertia separator door to prevent FOD. Serial number 2001 has the optional electronic checklist. But it's not linked to aircraft systems or switch positions, so each item must be checked off manually as it's completed.

Starting the PT6E, though, is quite different than starting the PT6A. Flip the engine switch from stop to run and press the start button on the overhead panel, and the EPECS automates all start tasks. Fuel boost pumps come on line, the starter engages, ignition and fuel flow begin, the prop unfeathers, both generators come to life, the engine stabilizes at idle, and fuel boost pumps are turned off when motive flow pressure is sensed.

Weight-on-wheels switches signal the EPECS to set a 64.5% gas generator ground idle speed. After brief ice protection and stick pusher tests, we were ready to taxi from Pilatus Business Aircraft's ramp to the runway. Our flight plan called for flying the PLAIN1 departure with the AKO (Akron, Colorado) transition, then proceeding to KLBF (North Platte, Nebraska) for a full-stop landing. We filed for FL 270, but we would later ask for FL 290 for a cruise performance check.

Once cleared for takeoff on Runway 30L, we armed the autothrottle and pushed up the power control lever about

Pratt & Whitney Canada PT6E-67XP

The Pilatus PC-12 NGX is powered by business aviation's first turboprop to have a dual-channel, integrated electronic propeller and engine control system. The precision digital control allows more performance to be extracted from the powerplant, while assuring that hard torque, temperature and speed redlines will not be exceeded during most phases of flight. The digital control system is linked to a data transfer unit that automatically transmits trend monitoring data via Wi-Fi or 4G connection to Pratt & Whitney Canada every time the aircraft lands. Big data enables P&WC to offer 50% broader Engine Service Plan coverage while reducing ESP rates by 15%, to $143.25 per hour.

The PT6E incorporates P&WC's latest hot-section improvements, including the newest-design single crystal compressor turbine blades having CFD-refined airfoils, and enhanced compressor turbine inlet vane and power turbine cooling. Scheduled maintenance intervals are increased from 300 to 600 hr. and maintenance labor hours are cut by 40%. Every flight's data trend monitoring enables P&WC to offer a 5,000-hr. TBO at entry into service.

Optimized digital control allows max cruise power to be increased from 1,000 hp on the PT6A-67P to 1,100 hp on the new engine. The computer controls, though, do not limit engine temperature during cruise. That's up to the pilot and autothrottle system. **BCA**

PC12-NGX Performance

These graphs are designed to illustrate the performance of Pilatus PC-12 NGX under a variety of range, payload, speed and density altitude conditions. Do not use these data for flight planning purposes because they are gross approximations of actual aircraft performance.

TIME AND FUEL VERSUS DISTANCE

This graph shows the relationship distance flown, block time and fuel consumption. The PC-12 NGX's average 220 KTAS long-range cruise speed yields about 13% better fuel efficiency than cruising at 265 KTAS average high-speed cruise. These data were obtained using 1,700 normal prop rpm rather than 1,550 rpm prop low-speed mode.

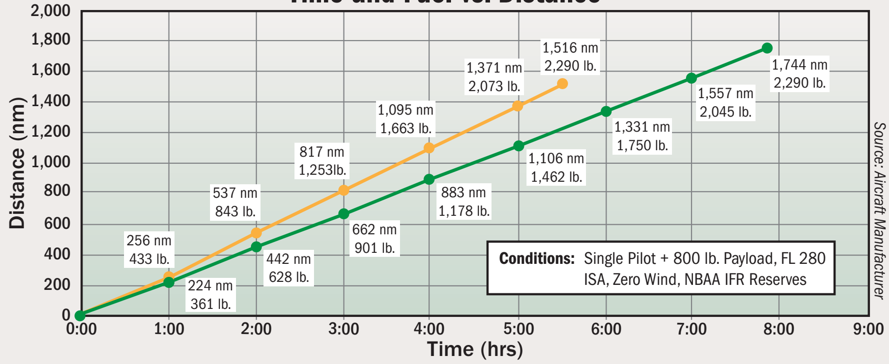
SPECIFIC RANGE (MID-RANGE WEIGHT, ISA)

This graph shows the relationship between cruise speed and fuel consumption for PC-12 NGX at representative cruise altitudes for 8,000 lb., light-midweight aircraft. We did not have the opportunity to verify these data during our evaluation flight because the aircraft was 1,000-lb. heavier during our checks. PC-12 NGX has improved climb and cruise performance to PC-12NG because of its higher out PT6E-67XP engine. Its cruise speeds are 4 to 6 kt. faster

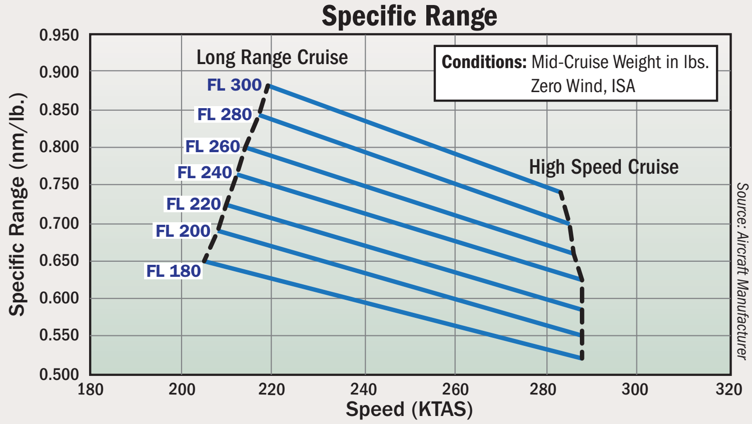
RANGE/PAYLOAD PROFILE

The purpose of this graph is to provide simulations of various trips under a variety of payload and two airport density altitude conditions, with the goal of flying the longest distance at high-speed cruise. Each of the five payload/range lines was plotted from multiple data points by Pilatus Business Aircraft performance engineers, ending at the maximum range for each payload condition. The angle of the time and fuel burn dashed lines reflects the change in high speed cruise performance related to change in aircraft weight. Runway distances for sea-level standard day and for *BCA*'s 5,000-ft. elevation, ISA+20C airport accompany the takeoff weights, using flaps 30 deg.

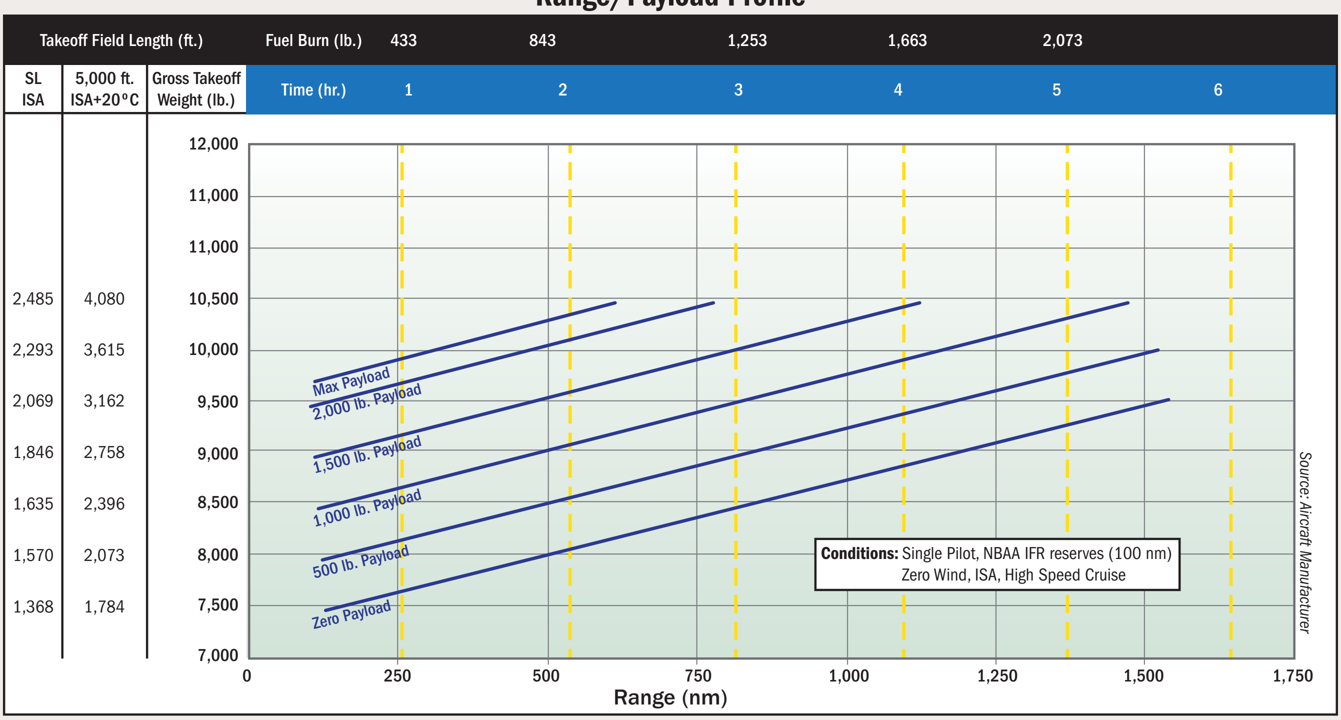
Time and Fuel vs. Distance



Specific Range



Range/Payload Profile



two-thirds travel. The autothrottle engaged and smoothly advanced the lever to 44.3-psi torque, producing 1,200 shp at 1,700 prop rpm. With 1,550-rpm prop low-speed mode selected, the EPECS would have boosted torque to 44.84 psi to achieve rated takeoff power.

The system enabled us to concentrate our scan outside the aircraft, hawking heading control and watching for runway intrusions. There was no need to babysit the engine as would have been required when flying with the PT6A.

We rotated at 78 KIAS, accelerated through 100 KIAS, retracted the flaps, closed the inertia separator door to boost intake efficiency and selected flight level change on the glareshield mode control panel. The autothrottle automatically adjusted power to the maximum climb setting.

Denver Departure Control assigned us multiple headings and intermediate altitudes to route us around the north side of Denver International, keeping us clear of traffic conflicts. The ADS-B In function enabled us to identify the registration number of each of the potential intruders, as well as see their altitudes, tracks and ground speeds. At each intermediate level-off, the autothrottle adjusted power to maintain either FMS preset speed or the airspeed we dialed into the flight guidance panel.

Handed off to Denver Center, we continued our climb to the northeast toward Akron. Passing through FL 180, it became apparent that the PT6E-67XP offers improved climb performance up to the aircraft's FL 300 maximum cruise altitude. The engine is rated at 1,825 thermodynamic hp for climb versus 1,745 thp for the PT6A-67P in the NG. If 1,550-rpm prop low-speed mode is used instead of the normal 1,700 rpm, it adds about 10% to climb time, climb fuel and climb distance.

We turned on the autopilot and let the aircraft stabilize at 24.9-psi Tq (torque) max cruise power set by the autothrottle at FL 290. At a weight of 9,000 lb. in ISA+15C conditions, the aircraft attained a 262-KTAS cruise speed while burning 344 lb./hr., 2 kt. slower and 6 lb./hr. less than book predictions. Notably, it's up to the crew to keep the engine within recommended temperature limits during cruise as that function is not programmed into the EPECS.

Book cruise numbers for the PC-12 NG, in contrast, predicted 258 KTAS while burning 336 lb./hr. If you expect the aircraft to cruise at its advertised 290 KTAS max speed, you'll have to unload most of the interior, empty the fuel tanks to 100 gal. and fly it between 19,500 ft. and 24,500 ft. while burning close to 500 lb./hr. Everyday cruise speeds, in contrast, are 280 to 285 KTAS in the high twenties while consuming 380 to 420 lb./hr., assuming standard day temperatures.

Then we selected prop low-speed mode, reducing rpm to 1,550 and increasing Tq to 27.2 psi. Speed increased to 265 KTAS, 2 kt. faster than book, and fuel flow steadied at 345 lb./hr., or 7 lb./hr. less than book predictions.

Our cruise performance measurements were anecdotal, at best, because of unstable atmospheric conditions and building cumulus nearby. Using book numbers rather than inflight observations, we concluded that reducing cruise rpm from 1,700 to 1,550 costs only 1-2 kt. and increases fuel flow by about 2%, while slashing interior sound levels by several dB. Passengers are going to notice the reduction in sound levels at 1,550 prop rpm.



PILATUS (3)

(Left) 18+ sq. ft. cargo door and flat cabin floor are favorite features with operators. (Middle) Full-cabin-width forward lav has flush toilet and full height privacy doors. (Right) New windows with squarer corners are 10% larger, flooding the cabin with considerably more ambient light.

We then proceeded direct to North Platte Regional Airport Lee Bird Field and programmed the FMS for a right-pattern, downwind visual entry to Runway 12. Left-, right- and straight-in VFR pattern guidance are new features added to the NGX's ACE system. We used the flight guidance track mode to set a course directly to the downwind entry point and engaged VNAV with a 3-deg. descent path to arrive at pattern altitude a few miles outside of the airport.

Activating left- or right-pattern visual approach guidance causes the FMS to create three temporary waypoints: (1) abeam, offset 1 mi. from the runway threshold, (2) base, 2 mi. downwind from abeam, and (3) final, aligned with the runway centerline and 2 mi. from the threshold. The preset lateral distances can be changed, if required, by the crew.

There is full vertical guidance during visual approach, including a preset synthetic 3-deg. glidepath on final. The preset glidepath angle can be changed by the pilot if it's necessary to clear obstacles, such as trees or power lines, on final approach.

The FMS commands autothrottle speeds of 150 KIAS at flaps 0 deg., 110 KIAS at flaps 15 deg., 100 KIAS at flaps 30 deg. and 90 KIAS at flaps 40 deg. We used flaps 30 deg.; turning final we manually selected 85 KIAS for VREF. Book landing distance was 2,600 ft. for the 8,600-lb. aircraft.

If the autopilot had been coupled, it would have provided 3-D guidance from FL 290 all the way down to short final on the visual approach. But the aircraft is so enjoyable to hand-fly, we didn't defer to the computers.

It's almost impossible to make a hard landing in the PC-12 because of its exceptionally long travel, trailing-link main landing gear. But it is possible to float for several hundred feet if you're carrying excessive speed in the flare.

Memo to self: Disconnect the autothrottle over the threshold and pull back the power lever to idle. The aircraft has plenty of energy to decelerate slowly, especially as flight idle prop pitch produces very little drag at low indicated airspeeds.

After a breakfast break at North Platte, we departed the airport, engaged the autopilot and programmed the FMS to guide us to Akron's Colorado Plains Regional Airport (KAKO). We plugged in the RNAV GPS Runway 29 approach and let the autopilot and autothrottle handle the rest. At decision altitude, we pressed the go-around button on the throttle and observed the coupled go-around capability of the flight guidance system. Outside of landing gear and flap configuration changes, ACE handles the rest. The combination of a full-function flight guidance system and autothrottle greatly reduces pilot workload.

After a few touch-and-goes in the pattern at Akron, we proceeded VFR back to Broomfield to land on Runway 12R. En route, we noted that the flight deck on this particular aircraft doesn't appear to have much flow from the air-conditioning gaspers, so it gets uncomfortably warm at low altitude in direct sunlight.

Conclusions, Competition, Cost

The NGX climbs quicker, cruises faster and is far more capable than any previous version of the PC-12. It's more comfortable, quieter inside and considerably easier to fly because of its upgraded FMS, computer-controlled engine and prop, and autothrottle. But gaining FMS proficiency takes practice on the ground to avoid getting your head buried in the cockpit during flight.

The cabin of the aircraft has the feel, quiet and comfort of a light jet. The new windows make it appear wider than its measurements indicate, the upgraded seats are more accommodating and the interior is impressively quiet in cruise at 1,550 rpm, especially with the forward door to the lav closed.

The NGX is also less expensive to operate than previous PC-12 iterations because of its extended maintenance intervals and increased TBO. It simply spends more time in the air and less time in the shop.

Glance, at this year's *BCA Purchase Planning Handbook* in the June/July issue. There are seven high-performance, pressurized single-engine turboprops. The Epic 1000, the newest entrant, is the most affordable, it's the highest flying and has virtually unmatched cruise speed. The Piper M600, while being in the Epic 1000's price range, cruises lower, slower, with less tanks-full payload and the tightest cabin dimensions in class. Daher's TBM 900-series aircraft are comfortable, efficient and long range, as well as having up to a 40-kt. speed advantage over the PC-12 NGX. Notably, all other single-engine turboprop competitors have Garmin avionics packages that offer, or soon will offer, an emergency auto-land capability. That's a significant advantage for single-pilot operators, a feature that Honeywell and Pilatus have yet to develop.

On balance, however, none of those competitors has the complete feature set of the PC-12 NGX. They lack its rough-field capability, its large cargo door, its roomy six- to eight-seat cabin and its full cabin width, albeit forward, lavatory. The NGX is the only business aviation turboprop in current production to have a computer-controlled engine and prop system. Its PT6E engine has nearly 40% longer overhaul intervals and lower hourly maintenance costs than competitors powered by the PT6A.

As shown in the accompanying specifications table, the PC-12 is the largest, heaviest and most-expensive model in the single-engine turboprop class. It continues to sell strongly with roughly double the deliveries of its closest competitor, even though typically equipped it's $1 million more expensive. The fourth-generation NGX increases the value of the PC-12, keeping it in a class of its own. **BCA**

PC-12 NGX Specifications

***BCA* Price**	$5,353,000
Characteristics	
Wing Loading	37.6/58.2
Power Loading	4.35
Noise (EPNDB)	77
Seating	1+7/9
Internal Dimensions (ft./m)	
Length	16.9/5.2
Height	4.8/1.5
Max Width	5.0/1.5
Power	
Engine	PWC PT6E-67XP
Output/Flat Rating OAT °C	1,200 shp/ISA+36C
TBO	5,000 hr.
Weights (lb./kg)	
Max Ramp	10,495/4,761
Max Takeoff	10,450/4,740
Max Landing	9,921/4,500
Zero Fuel	9,039/4,100
BOW	6,803/3,086
Max. Payload	2,236/1,014
Useful Load	3,692/1,675
Executive Payload	1,200/544
Max Fuel	2,704/1,227
Payload with Max Fuel	988/448
Fuel with Max Payload	1,456/660
Fuel with Executive Payload	2,492/1,130
Limits	
VMO	240
PSI	5.8
Climb	
Time to FL 250	19 min.
Initial Gradient	877
Ceilings (ft./m)	
Certificated	30,000/13,608
Service	30,000/13,608
Sea Level Cabin	13,100/5,942
Certification	FAR 23, 94/96/05/08/20

Downside of Aircraft Sharing

Pitfalls and penalties await the unwary

EXTREME-PHOTOGRAPHER

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

Much attention has been given to the FAA's clampdown on illicit charter and "damp" dry leases, two of the main schemes that are used to circumvent the expense and complexity of becoming a certified FAR Part 135 air carrier. Time-sharing, interchange and joint ownership agreements, if not properly structured and administered, also can expose participants to legal liability and financial penalties. And there are insurance implications that can result in "reservation of rights" denials of claims.

In mid-June, *BCA* held an hour-long webinar on "Illicit Charter: Intentional or Not" with panelists Ryan Waguespack, senior vice president of the National Air Transportation Association (NATA); Operations Inspector Don Riley of the FAA's Special Emphasis Investigation Team (SEIT); and attorney and *BCA* contributor Kent Jackson, founder and managing partner of JetLaw LLC.

"Illegal charter has been around for decades," says Waguespack. "The 'Uberization' of our culture exacerbated it." People involved in illicit charter can be divided into "the careless, the clueless and the criminal," he says.

The "criminal" element intends "to skirt the regs," says Waguespack. They'll flaunt the law until they're forced to stop by the FAA, an accident investigation, loss of insurance coverage or the rare consumer complaint. They cannot be gently encouraged to change their behaviors.

"We still see all three of those [categories]," posits the FAA's Riley. He estimates that 50% of the cases the FAA gets are "intentional violations, and that, of course, is troubling." Those cases lead to FAA enforcement actions.

The NATA therefore is focusing its attention on the "careless," characterized by their "misunderstanding of the regulations," and the "clueless," those who just aren't aware of the rules and the FAA's recently stepped-up enforcement activities.

Since 2017, the NATA has embarked on programs to educate both consumers and providers of business aviation services regarding the potential safety risks, legal liability and financial exposure of illicit charters and sham dry leases. "Our focus has been education, education, education," says Waguespack.

As for the careless and the clueless, the FAA leans more toward "compliance" through education rather than enforcement and punishment. Charter customers often aren't aware, and some don't even care, that they've booked a trip from a firm that doesn't have Part 135 credentials. They're looking for the lowest price, unaware of the risks the trip might entail.

To avoid falling inadvertently into eight of the most common traps, our panel of experts, plus aircraft insurance brokers and tax experts, provide some tips:

(1) Clearly Define Operational Control

Riley says that flight crews typically are the first points of contact during an FAA random ramp check. Outside of verifying the usual pilot and aircraft documents, inspectors ask pilots what kind of flight operation is being conducted. If the crew responds that it's a Part 135 Air Charter flight, then the inspector may ask to see copies of the firm's Part 119 Air Carrier Certificate and OpSpecs (Operating Specifications) including D085 listing that authorizes specific aircraft by serial number for use by the air charter, along with the standard aircraft airworthiness certificate, flight dispatch release and FAA-approved general operations manual, among other documents.

The FAA maintains a master database of air-carrier certificate holders, including their D085 approvals, that can be used to crosscheck documents provided by the air charter crews. It doesn't take long to verify the required Part 135 documents and the charter crew is cleared to leave.

In contrast, if the flight crew says that the trip is a Part 91 flight, then the inspector may ask who has operational control of the aircraft. The FAA is looking for little red flags that potentially indicate noncompliance with all the required elements of a bona fide non-commercial flight.

If the crew is "a little bit fuzzy about operational control," says Riley, it opens the door for more questions regarding who owns the aircraft, whether it is being flown on behalf of the owner or whether it's out on a lease or charter. If it's unclear whether the aircraft owner or the passengers have operational control, then the FAA may probe further to determine if the owner is being reimbursed for use of the aircraft by the passengers.

Notably, passengers don't have to pay fair market value for the flight for it to be classified as a charter. The least amount changing hands is enough to trigger an investigation. "OK, just buy me lunch," is sufficient to characterize the flight as "for hire." The provider needs a Part 135 air carrier certificate if there's any compensation for the flight.

(2) FAA Queries Passengers

After talking with the pilots, if an FAA inspector begins to suspect that money is being exchanged for air transportation services, "then, most importantly, we talk to the passengers," says Riley. "Most of these people just want to go from Point A to Point B at the cheapest rate, which is sometimes a problem. And they're usually going to blurt out, 'Well, I chartered this flight from some firm.'

"That's 'game, set and match,'" he adds. The obvious disconnect between the pilots' claim that it's a non-commercial flight and the presumption by the passengers that they've chartered the airplane is probable cause for an in-depth investigation of all the details of the agreement.

In contrast, if the passengers say they've "dry leased" the aircraft, they must prove they have four-way operational control: (1) arms-length lease agreement for the aircraft, (2) own full-time or contract crews, (3) assumption of responsibility for aircraft maintenance and airworthiness and (4) covering the aircraft with appropriate insurance. That's "aircraft, crew, maintenance and insurance" or ACMI, for short, in leasing parlance.

"Most of these individuals or entities truly have no idea what operational control looks like. The insurance, dispatch, how the airplane's being operated, the crew training and currency, has the airplane been maintained properly," says Waguespack. In essence, the lessees must form their own flight department or hire a third party to handle all the responsibilities.

Operational control includes "taking on liability for the operation" and exposure to enforcement risk, says Jackson. "It would be good [for] the people [who] get into these programs that are on the wrong side of the line [to] really understand the risks."

One of the most frequent violations of the ACMI dry lease is what Waguespack calls a "damp lease," an arrangement by which the aircraft owner leases out an aircraft for Part 91 use and also provides at least one crewmember. In accordance with Title 14 Code of Federal Regulations §110.2, such an agreement actually is a "wet lease" and it requires the lessor to have an air carrier certificate. Legitimate Part 135 charter operators, for instance, often wet lease aircraft from other Part 135 air-carrier certificate holders to provide supplemental lift.

But Part 135 operators cannot simply borrow or occasionally lease additional aircraft without going through the rigors of earning formal D085 OpSpec approval for each aircraft they'll be using in air carrier service.

When a Part 135 operator subcontracts with another Part 135 operator, full ACMI operational control for the charter flight transfers to the outside certificated air carrier, says Waguespack. It's very clear that the passengers are paying for transportation to a Part 135 air-carrier certificate holder and not leasing an aircraft for Part 91 operations.

(3) Dry Lease Gets Soggier

If passengers or the crew tell FAA inspectors that the aircraft is being "dry leased," there must be a copy of the lease aboard the aircraft. "If we ask to see the lease and there isn't one on board, or if there's a stack, a book with 20 to 30 'dry leases,' that's going to be good indications that there might be something awry with this flight," says Riley.

Multiple, short-term lease agreements invite scrutiny. "We're going to look at the big things and take that information back to the office, analyze it and then make follow-up phone calls to passengers, owners and pilots," says Riley. Jackson recommends minimum one-year lease agreements. "Long-term commitment definitely is an indication of operational control," he says.

"There's really no hard and fast rule to how long a lease should last, but I can tell you, if you have a day lease, a trip lease, a ticket lease, whatever adjective you want to use for one trip or even a series of trips, that's just a huge red flag," Riley explains. "They're [the lessees are] just in it for the air transportation and the lessor is doing everything."

"For years, the biggest problem for FAA enforcement has been when people combine legitimate agreements into an illegal package," says Jackson. So-called "transportation packages" might include "perfectly legitimate pilot services and dry lease agreements." He continues, "But the person offering both services says, 'Sign here, sign here and away you go!' That's the illegal transportation package. It's hard for the FAA to go after that, because the paper [document] is correct. It's how that paper came to be that's the problem."

To meet dry lease requirements, there needs to be arm's length separation between the aircraft lessor and the entity providing crew services. It's difficult for the crew to prove third-party independence if they work principally for a firm that leases an aircraft and also part time as contract pilots for the same firm's lessees.

"You really fail the sniff test when you see multiple users, each of whom is supposed to have operational control, and yet somehow they're all using the same crew," says Jackson.

Even if the lessee hires legitimately independent contract pilots, if the lessor packages the lease with maintenance or insurance, a dry lease can get soggy enough to become an illegal transportation package in violation of non-commercial restrictions wrapped into Part 91.

(4) Insurance Company Denies Coverage

Lance Toland, president of the Atlanta-based insurance brokerage firm that bears his name, says that aircraft insurance policies are very specific as to the types of flight operations that are covered. Policies are designed to protect people from "ordinary liability," also known as "ordinary negligence," resulting from unintentional acts. Injuries suffered by a passenger who gets tossed about the cabin in unforeseen severe clear-air turbulence, damaging a winglet by hitting an unseen fence post while maneuvering on a ramp in tight quarters, and blowing a tire during a takeoff run because of FOD on the runway are examples of unintentional events that typically would be covered.

If injuries or damages are sustained during a flight for which compensation is received, the air transportation provider must have a policy that covers certificated air-carrier operations. If your insurance company suspects you've been providing illegal charter services while operating under Part 91, then you may get the dreaded "reservation of rights letter" declaring that your claim may not be covered. If your policy only covers non-commercial operations, the insurance carrier most likely will declare the policy holder has breached the warranties of the policy and "walk away" from the claim, Toland says. That leaves the operator completely liable.

Damages or injuries associated with illegal charter expose the operator to "strict liability" in the event of an accident. And even if the sham charter provider only is partially responsible for the mishap, he or she can be deemed legally [and fully] responsible for the entire consequences of an accident, potentially leaving them facing claims that can be in the millions of dollars.

If the accident results in serious injuries or fatalities, "You're very far up a creek that we don't want to name," says Toland. The plaintiffs' bar will have a field day. "That's the black and white of it."

(5) Flight Crews' Legal Liability

An insurance company "gives you proxy," says Toland, providing both (1) representation for accident investigation along with defense during litigation, and (2) financial protection up to the dollar limits of the policy.

But the policy won't cover pilots involved in illegal charter or sham dry-lease flight operations, he cautions. If damages or injuries occur on a trip, "You'll be named in the suit. You'll be out of pocket for hefty legal expenses," he warns.

Even if the flight crews financially survive a civil lawsuit, the FAA is likely to revoke all their certificates permanently.

(6) Time-Share Snags

There are a lot of ways people can legally avoid the complexities of dry leasing and the expense of air charter, including time sharing. "These issues have been around for as far back you want to go. The time-sharing rule originally was written in 1972. And, primarily, it was a compromise between the NATA and the NBAA. Time sharing, properly done, is a wet lease of the aircraft with crew. But it's limited in what you can charge to essentially two times the cost of fuel, plus some very specific flight related expenses," says Jackson.

Part 91.501 applies to aircraft that have MTOWs in excess of 12,500 lb., have multiengine turbofan power or are part of fractional ownership programs. Section 91.501(d) essentially limits time-share expenses to two times the fuel cost, crew travel expenses, hangar and/or tie down at destination landing facilities, insurance for the specific flight, landing fees, customs and handling charges, catering and beverages, ground transportation for passengers and flight planning/weather service fees. Doubling the fuel expense won't pay for debt service, depreciation, maintenance, insurance and crew salaries, among other sizable fixed costs, let alone aircraft and engine maintenance.

"Anybody who is making money doing time sharing, they are doing it wrong," says Jackson. "Time sharing is designed to lose money for the operator to keep the line between charter and legitimate business use."

"If you see a counter that says, 'Time Share R Us,'" he warns, "walk away. Don't go there."

Jackson further cautions that time-sharing agreements are leases, so participants must adhere to the FAA's Truth in Leasing requirements in accordance with Part 91.23 and detailed in Advisory Circular 91-37B. He adds that while time-share trips are operated under Part 91, they are subject to Federal Excise Tax (FET).

Interchange agreements enable two or more people to lease out their aircraft in exchange for equal time on another person's airplane. Part 91.501(c) allows one party to charge another party the difference in the cost of owning, operating and maintaining the aircraft being shared. Jackson says that interchange agreements require both Truth in Leasing compliance and payment of FET.

Joint ownership is another way people can share use of an aircraft, one that eliminates the Truth in Leasing and FET requirements. Jackson says that each of the owners must be on the aircraft registration.

Having a multi-member, limited liability corporation own the aircraft doesn't meet the FAA's definition of joint ownership, for "good reason," according to Jackson. "It would be too easy to buy and sell memberships, quickly and quietly. And maybe, even for one flight."

(7) NBAA Exemption Snag

The long-standing FAA Exemption 7897 enables NBAA members who operate piston airplanes, small airplanes and helicopters to use Part 91.501 time-sharing, interchange and joint-ownership agreements. The current version, 7897K, contains a new provision that reflects the FAA's renewed crackdown on illegal charter.

Users of Exemption 7897K now must electronically file a Notice of Joinder, including the name, physical and email address, and NBAA member number, plus contact phone number of the person submitting the notice. The applicant must attest that he or she will comply with all conditions and limitation of the Exemption. And if the applicant ceases to be an NBAA member, the Exemption eligibility ceases.

"No person may operate an aircraft under this Exemption unless the appropriate Flight Standards Office [FSDO] has been (a) notified that the operation will be conducted under the terms of this Exemption; and (b) provided with a copy of the time-sharing, interchange or joint ownership agreement under which each aircraft is being operated, if appropriate," writes the FAA's Robert Carty in an authorization letter to the NBAA.

Aircraft logbook entries, maintenance inspections and requirements apply. So, it's highly advisable for members to contact the NBAA to assure they're complying with all Exemption details to steer clear of FAA enforcement actions. "That's going to be a trap for the unwary," cautions Jackson.

(8) Illegal Aircraft Sharing by Owner-Pilots

Advisory Circular 61-142 explains how and under what circumstances pilots may share expenses with passengers in accordance with Parts 61.113(c), 61.101 and 61.315. To avoid having a flight being characterized as a commercial operation, the FAA interprets Part 61.113(c) to mean that the pilot has a "common purpose" for the flight with the passengers, for the pilot to have his or her own reason for flying to the destination.

As an example, if the pilot intends to fly the aircraft to a scenic airport for the stereotypical $100 hamburger and asks friends if they want to accompany him or her and share appropriate expenses, the flight meets the FAA's test for "common purpose."

In contrast, if a friend contacts a pilot and says he or she needs transportation to visit a parent who has only a few hours to live at a hospice 400 mi. away, the pilot cannot share expenses with the passenger as there is no "common purpose" for the trip. Even personal emergency or charitable flights don't meet the "common purpose" test.

"Unfortunately, sometimes bad facts make bad law," says Jackson. He recalled a 1992 event in which "a friend calls the pilot in the middle of the night and asks, 'Can you fly me to see my dying father?' And the pilot says, 'Sure.' There's a discussion of sharing expenses.

"Now how it came to the FAA's attention is an interesting question to which we don't really know the answer. But what we do know is it did come to the FAA's attention and it initially revoked the pilot's certificate. That was later reduced to a suspension by the NTSB. But because there was no 'common purpose,' because it wasn't the pilot's father, it didn't fit the sharing expenses case law. If you just look at the [Part 61] sharing expense rule, it doesn't explain this 'common purpose' requirement. That's only in the case law," as well as in the Advisory Circular, Jackson explains. "A lot of pilots simply look at the reg and don't see the problem."

Even if there is no exchange of money, a Part 61 or Part 91 flight can be characterized as a commercial operation, says Riley. "It might even be a promise of future business. Compensation comes in a lot of different ways. It doesn't have to be monetary. We really have to look into these things and that's going to take some time to see what exactly is happening," he cautions.

Waguespack says that discussions on the topic are "critically important." Education, dissemination of accurate information, is "absolutely paramount."

"Smart charter customers ask a lot of questions," Jackson notes. That also applies to pilots, time-sharing participants, lessors and lessees. Waguespack points out that the NATA provides plenty of information at its website **(http://www.nata.aero)**.

The FAA remains focused on shutting down illicit charters and clamping down on sham dry leases; moreover, the problem is acute in the transatlantic air transportation market. Waguespack estimates that 15% to 20% of charter flights between Europe and the U.S. are illegal. "It's been pretty alarming. Customs and Border Protection is getting heavily involved on the Florida coastline, as they realize that's a tremendous issue with illegal ops on the international side."

Jackson adds that the FAA doesn't have to prove an operator is "holding out" air transportation services, as "common carriage" is defined by Advisory Circular 120-12A to take enforcement action.

The European Union Aviation Safety Agency also has ramped up illegal charter enforcement activities in the wake of a fatal accident in an N-registered Piper PA-46 Malibu that claimed the life of footballer Emiliano Sala in January 2019. Both the pilot and passenger probably were incapacitated due to carbon monoxide poisoning, the U.K. Air Accidents Investigation Branch concluded. Its report also states that the pilot didn't have the required certificates and the aircraft wasn't approved for air charter operations.

The Sala crash refocused the FAA's efforts on stopping illegal charters overseas, Waguespack says. "There are numerous N-registered aircraft around the world and the FAA is looking at how to deal with the issue."

Riley says there are several safety risks associated with illegal charter: "No [Part 135] pilot training, no required maintenance, no [operating] manual system, no required [management] personnel, no flight duty and rest periods for pilots, no drug and alcohol testing, no FAA oversight and accountability, no proper insurance — it goes on and on and on."

The FAA just finished one enforcement action, Riley says, involving a revenue flight in a Hawker 800 in which the pilot in command had a private pilot certificate and no aircraft type rating. The second in command in the right seat was a student pilot with fewer than 50 hr. logged time. Said Riley: "That's one of the most unsafe things we've ever seen. This stuff goes on. It's not made up. People say 'You gotta be kidding me.'"

"The general flying public makes a lot of gross assumptions," Waguespack says. "They assume when that pilot shows up in that pretty aircraft, and he's wearing a white shirt, it's creased, and it has epaulets, so he's gotta be trained, he's gotta be qualified. That airplane is too pretty to not be well maintained. And we all know, that's just not the case."

As the Sala accident clearly demonstrates, there's a lot more risk associated with illicit charter than just financial and legal liability. People looking for the lowest cost private aircraft transportation have to ask themselves if it's really worth it.

Airborne ride-sharing, time sharing and pilot cost-sharing may look like attractive short-term air transportation solutions. But depending upon how the agreements are structured, the long-term consequences can be personally and financially destructive. **BCA**

EXTREME-PHOTOGRAPHER

Slip Sliding on Snow

Landing on wintry runways **demands a crew's close attention** and error-free performance.

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

FABIAN GYSEL/ISTOCK

For too many years aviation lacked a reliable, up-to-the-minute system for reporting runway surface conditions for pilots to make accurate landing performance assessments. Rather, we depended on subjective braking action reports or Mu-Meter readings that did not directly translate into an aircraft's braking effectiveness.

It is no surprise that too many aircraft have skidded off slippery winter runways despite the best efforts of professional flight crews. Dynamic snowy weather afflicted the New York airports on March 5, 2015. By 0738, a NOTAM was issued indicating that LaGuardia's (KLGA) Runway 13 was covered with thin, wet snow. By 0851, 1.8 in. of snow had fallen, resulting in 0.25 in. of wet snow on the runways. An hour later, another 0.5 in. of snow had fallen.

Delta Flight 1086, a Boeing MD-88, left Hartsfield-Jackson Atlanta International Airport (KATL) that morning for the flight to snowy LaGuardia. While en route the flight crew monitored the New York weather conditions and weighed the factors that could affect stopping performance. The crew asked the dispatcher and the Washington ARTCC controller for braking action reports, but neither had any at the time because KLGA operations personnel were conducting snow removal operations and no aircraft were landing. (With medium/fair braking condition reports the calculated landing distance utilizing maximum autobrakes was 7,800 ft.; Runway 13 is 7,003 ft. long.)

After the runway reopened, four airplanes landed on Runway 13 ahead of the accident airplane. A United Airlines Airbus 319 landed 18 min., 53 sec. prior and reported medium braking action at the touchdown zone. Another United Airbus 319 landed 16 min., 16 sec. prior and reported good braking action, as did a Bombardier CRJ-701 that landed 8 min., 23 sec. ahead of the accident aircraft. Delta Flight 1526, an MD-88, landed 2 min., 53 sec. ahead of the accident aircraft but did not report braking action, nor was it requested. If you were in line for the approach, these braking action reports would be encouraging, right?

On approach, the flight crew asked for the most current winds. It was reported as 020 deg. at 10 kt., producing a 4-kt. tailwind component (less than Delta's 10-kt. limit) and the crosswind component was 9 kt., which was less than Delta's guidelines for medium/poor runway conditions. The captain decided to continue the approach to a landing because he and the first officer had determined that the landing criteria had been met.

Besides company and ATIS reports, ATC communications as late as 1040 gave the impression to the flight crew that at least some patches of the runway surface would be visible upon breaking out of the IMC on the approach. However, upon first seeing the runway at 233 ft. AGL, the surface appeared white. This was contrary to the crew's expectations given the recent snow cleaning operations and the reports of good braking.

The pilots knew that two preceding airplanes had reported good braking action. However, it would have been difficult for them to visually assess the nature and depth of the snow on the runway.

Also, little time was available for them to reevaluate the decision to continue. Only 13 sec. elapsed between the time the captain called the runway in sight and the 50-ft. automated call-out.

Due to the combination of slippery runway conditions, an adverse wind, an unequal spool-up of the thrust reversers that contributed to a yaw, and a momentary usage of excess reverse thrust that resulted in rudder blanking, the aircraft veered and departed the left side of the runway about 3,200 ft. from its threshold. It contacted an airport perimeter fence and came to rest with the airplane's nose on an embankment next to Flushing Bay. The pilots, flight attendants and 98 passengers were uninjured, while 29 passengers received minor injuries. The airplane, however, was substantially damaged.

The NTSB determined that the probable cause of this accident was the captain's inability to maintain directional control of the airplane due to his application of excessive reverse thrust, which degraded the effectiveness of the rudder in controlling the airplane's heading. An in-depth reading of the extensive accident investigation report reveals that the flight crew otherwise met every professional expectation in this event, to include attempting to get information on the runway condition, comparing that inadequate information with the landing performance data, and flying an approach that was "spot on."

This accident amply illustrated the continuing need for determining runway friction characteristics in operationally meaningful terms. The NTSB recommended the FAA "continue to work with industry to develop the technology to outfit transport-category airplanes with equipment and procedures to routinely calculate, record and convey the airplane braking ability required and/or available to slow or stop the airplane during the landing roll."

Reported Braking

The aviation community has long relied on braking action reports despite their limitations and subjective nature. They may be influenced by the reporting pilot's familiarity with contaminated runways, the aircraft or the use of deceleration devices. It is also easy for a pilot to mistake aerodynamic and reverse thrust deceleration forces for braking forces.

The second major flaw with the reports is the rapidity with which runway conditions can change depending on precipitation, temperature, usage and pavement treatment. Thus, a runway's condition can be significantly different than that indicated in the most recent report. Weather conditions that should cause us to be wary about the braking effectiveness include precipitation during near-freezing temperatures or rapidly changing meteorological conditions.

Another situation that should cause doubt about braking conditions is when an airport reports compacted snow.

PAULVINTEN/ISTOCK

An additional problem with braking reports is the variability among aircraft.

This can occur even at the busiest airports equipped with a fleet of snowplows when the amount of incoming traffic denies them enough time to remove the white stuff down to "dry pavement," and landing aircraft hammer the remaining snow into that hard-packed sheet. It can also occur at airports with inadequate snow removal services, which is a situation common to many smaller general aviation facilities.

As already noted, another major shortcoming with braking action reports is their subjectiveness. The pilots of two identical aircraft landing in the same conditions on the same runway could give different braking action reports. The disagreement could be the result of differences between the aircraft, weight, pilot technique, experience or expectations.

According to "An Evaluation of Winter Operational Runway Friction Measurement Equipment, Procedures and Research," a report by the Winter Runway Friction Measurement and Reporting Working Group (comprising representatives from the FAA, NASA, Transport Canada, Airports Council International, American Association of Airport Executives, Regional Airline Association, Air Transport Association and Air Line Pilots Association), "Subjective braking action reports generated by pilots and drivers of airport vehicles, which are commonly relied on in the U.S., have no proven correlation to aircraft braking performance. Reliance on these subjective braking action reports may actually be a detriment to safety in some cases."

An additional problem with braking reports is the variability among aircraft. When a braking action report is received from one type of aircraft, its relevance to another is a matter of conjecture. An aircraft with dual-track landing gear has a lot more tire contact area than one with a single-track gear. In general, it's a matter of "rubber on the road" and the aircraft with more tire contact will have greater braking effectiveness. Differences in tire pressure and tire design will greatly influence stopping power as well.

And if the aircraft has an operable anti-skid system it will make a substantial difference in the pilot's evaluation of the braking action. Thrust reversers on a slick runway will decrease the stopping distance by 10-30%, and this varies by aircraft design. Turboprops with particularly flat pitch angles at flight idle or reverse are able to reduce their stopping distance somewhat more as the frontal area from those blades can be particularly effective on an icy runway as long as both props go into reverse evenly. Combined, all those factors bring into question whether an aircraft that landed ahead of us is really a good gauge of the braking conditions we will experience upon touching down.

A problem that is particularly inherent to business aviation is lack of runway surface condition reports when going into uncontrolled airports. An earlier review of 81 NASA Aviation Safety Reporting System (ASRS) reports of runway excursions by business jets by this author found that 94% of the flight crews did not have an adequate report of the runway surface condition when landing. Without a braking report you have zero idea of what to expect upon settling on the runway. It could be as dry as a desert runway, or as slick as a hockey rink after grooming by a Zamboni machine.

Using Hard Data

Some might wonder if it's possible for measured braking data from a landing aircraft to be sent directly to those following. While technically doable, there are some important limitations with this approach. Pilots seldom use the wheel brakes sufficiently to get an accurate measurement of the conditions, particularly during the higher speed phase of landing when thrust reversers are more effective. Since wheel braking doesn't become the primary means of deceleration until reaching lower speeds of the landing roll-out, it isn't possible to get an accurate measurement of the friction over the entire length of the runway. Lastly, each landing involves a large amount of variability, particularly when a runway is partly contaminated.

Friction Measurement

The industry has attempted for years to accurately determine a runway's friction using a variety of ground friction measurement devices (GFMDs), but different instruments do not always give consistent readings on the same surface. Large efforts were attempted but failed to improve the consistency between models and to correlate these accurately to airplane braking performance.

During braking, the rotational speed of an aircraft tire is less compared to a free-rolling tire. As the tire rolls and slides, friction is created by deformation within the snow/ice, and by the creation and destruction of interfaces at the contact points. High sliding speeds can induce frictional melting and loose material (water, slush, wet or dry snow) has to be squeezed out of the contact area before friction can be obtained.

Parameters like the travel speed, tire characteristics, tire inflation, aircraft weight applied to the tire (more properly in engineering terms, this would be the "normal load"), braking mode, contact time as well as the algorithms of an aircraft's anti-skid system produce significantly different friction between GFMDs and aircraft tires with a runway surface.

Wet Snow and Slush

Higher precipitation intensities with wet snow are more likely to create "poor" or "less than poor" braking conditions, according to Norwegian engineers who analyzed the aircraft braking friction of Boeing 737 aircraft during five winter seasons. They found that 21% of the landings on wet snow produced braking conditions that were poor or worse. This percentage is significantly higher than on dry snow (7%) or slush (11%).

Slush is recognized for its ability to create "impingement drag," which results when dense contaminants (water, spray, ice particles, etc.) impact parts of the airframe, such as the flaps behind the main gear. Precipitation displacement drag is created when an aircraft tire pushes runway contaminants out of the way as it rolls down the runway. Wet snow, slush and standing water can cause structural damage from spray impingement or by engine ingestion, which can affect acceleration capability.

One might think that the impact on an aircraft tire from wet snow or slush would be identical, but it is not. Slush is

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a composition of water and ice particles. When a tire rolls on pavement covered by slush, the tire squeezes the water from under the contact area. This process generates pressure on the surface of the tire, preventing its contact with the pavement. This is hydroplaning. Full hydroplaning occurs when the tire slides over the film of water without reaching the pavement texture. The thickness of the water influences the degree of hydroplaning. When the thickness is limited, the tire will be in partial contact with the pavement texture and able to generate reasonably high amounts of braking action.

Wet snow, which consists of ice particles, water and considerable amounts of air, has a different effect on aircraft tires. Since it's compressible, it compacts under the tire, filling the pavement's texture, thus reducing a tire's friction with the runway.

Temperature is an important element in this assessment, according to the FAA's Advisory Circular 91-79, Runway Overrun Prevention (dated Nov. 06, 2007). Slowly freezing water or melting snow on the runway can become slush. As temperature decreases this mixture can become ice. Each of these conditions affects the stopping performance differently. The properties of a contaminant on a runway can change over the course of a day due to solar radiant heating, ambient temperature changes or chemical

Lessons from Norway

Winter operations are "normal daily life" at Norwegian airports. Their winter season stretches approximately from November to April. On average, the runways at Tromsø, a city above the Arctic Circle, and at Oslo are contaminated for 30% of the winter.

The Norwegian aerodrome operator Avinor performed a five-year R&D project, called Intelligent Runway Information System (IRIS)*, during which it collected landing data and coupled them with reported runway condition information and weather data.

Data were collected during the winters of 2008/2009 to 2012/2013 at different Norwegian airports and the number involved increased from two in 2008/2009 to 15 in 2012/2013. Data from quick access recorders (QARs) were obtained from all landings of Boeing 737-600, -700, -800 and -900 models operated by Scandinavian Air Services (SAS) and Norwegian Air Shuttle AS. Weather stations placed near the runway (within 500 meters)

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measured air temperature, runway temperature, dew point temperature and wind at 1-min. intervals.

During the five winter seasons the project examined 117,849 landings, of which 5,097 involved runway surface conditions that required the aircraft to utilize its maximum attainable tire-pavement friction. From these data the researchers were able to estimate the aircraft's braking coefficient on a variety of runway conditions including dry snow, wet snow and slush. An evaluation of the data found that 21% of the landings on wet snow produced braking conditions that were less than poor or poor. This percentage is significantly higher than on dry snow (7%) or slush (11%). This can be caused due to higher precipitation intensity during wet snowfall, or possibly because wet snow, in contrast to slush, is a compressible material that gets compacted and fills the underlying pavement texture.

The IRIS runway model evaluates seven different factors that influence the quality of surface conditions and predicts the braking action on a common scale from 1 to 5, ranging from "poor" to "good." The first factor it evaluates is the type of contaminant, which often in the Norwegian winter can be a combination of wet snow, dry snow, slush, ice, compacted snow and/or frozen ruts.

The IRIS runway model takes into account that the contamination may vary from one end to the other, as well as the effect of runway temperature on the type of contamination. When a runway is bare and dry, there is little difference in an aircraft's tire friction if the temperature is 0C (32F) or -10C (14F). In contrast, a runway that is covered with ice has a higher chance of being slippery around 0C (think Zamboni machine) compared with -10C. The IRIS model allows for the adjustment of the runway's braking condition based on

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The properties of a contaminant on a runway can change over the course of a day.

treatment. The runway that was adequate for takeoff in the morning may not be for landing in the afternoon simply because the temperature rose, and the compacted snow started to melt and turned to wet snow and slush.

Boeing does not recommend takeoffs when slush, wet snow or standing water depth is more than 0.5 in. or dry snow depth is more than 4 in. However, it is challenging, if not impossible, for a flight crew to know what exact contamination exists on the runway at any point in time. Yet it is critical that they obtain accurate reports on the runway contaminant. The challenge for them is to translate the sometimes-complex information on runway surface condition into a single classification on the runway condition landing performance level. A better solution to that problem has finally arrived.

RCAM

The Southwest Airlines landing overrun accident involving a Boeing 737-700 at Chicago Midway Airport (KMDW) in December 2005 initiated an FAA audit to evaluate the adequacy of current regulations and guidance information. The internal review revealed a multitude of systemic problems. Approximately 50% of FAR Part 121 turbojet operators' manuals did not have policies for assessing whether sufficient landing distance exists at the time of arrival. Not all operators who perform landing distance assessments account for runway surface conditions or reduced braking action reports. Many operators did not include safety margins in their landing data. Data from third-party vendors

the type of contaminant on the runway. For instance, when ice, compact snow or frozen ruts are present on the runway, the expected braking action is downgraded when the runway temperature is warmer than -2C (28F) because of the likelihood that the melting has started or is about to occur.

The effect of contamination depth on friction is not obvious. Compacted snow is a solid contaminant whose depth is irrelevant. Loose snow that enters the contact area gets compacted, and friction is predominantly created at the snow-rubber interface, leaving a clear track of snow behind. This suggests that once the tire has lost contact with the pavement, the friction does not significantly decrease further with increasing snow depth. However, friction is created between the rubber and the pavement texture after slush has been squeezed out of the contact area.

The IRIS model also takes humidity into account. At temperatures well below 0C, runways covered with ice or compacted snow tend to be more slippery when the humidity of the air above the runway is high.

Anti-icing or deicing chemicals are often used to ensure that a wet runway does not freeze, to prevent bonding of snow/ice to the pavement, or to remove thin ice layers. Naturally, wet snow and slush mostly occur around 0C. However, wet snow and slush can also be present at lower temperatures due to the usage of anti-icing/de-icing chemicals on runways. Generally, when chemicals are applied to a wet surface, the frictional conditions are not improved, but they prevent deterioration of the conditions. When chemicals are applied on initially dry (compact) snow or ice, a melting process starts. In such cases, the frictional conditions often get worse.

Many airports apply sand to improve pavement friction. In Norway, it is applied either dry or pre-wetted with hot water. The warm pre-wetted sand freezes to the runway, creating a sandpaper-like finish, known as "frozen sand." It is most effective when spread on a solid contamination layer. Doing so ensures a strong bond between the sand and the ice. Runway maintenance personnel state that sanding on a bare or wet runway actually reduces the friction. How? Sand particles reduce the ability of the tire's rubber to grasp the asperities of the pavement. It is difficult to get accurate friction readings when sand is used, particularly loose sand.

At the end of the IRIS project data collection, aircraft performance engineers compared the aircraft braking performance with the predictions of the IRIS model, runway inspectors and friction measurements. The IRIS model performed better than the other predictors. In 86% of the landings, the IRIS model predicted closely to the airplane's actual landing performance. Runway inspectors predicted the conditions in 77% of the landings. The ground friction measurement devices (GFMDs) performed less well with 61%. The IRIS model is now implemented at 15 airports in Norway.

**Reference: "Airplane Braking Friction on Dry Snow, Wet Snow or Slush Contaminated Runways." Alex Klein-Paste, Norwegian University of Science and Technology, Department of Civil and Transport Engineering, Winter Maintenance Research Group, Høgskoleringen 7A, N-7491 Trondheim, Norway.* BCA indicated shorter landing distances than the manufacturers' data. Incorrect data for thrust reversers were discovered. Wet and contaminated runway landing distance data did not represent actual performance and landing distance information was not provided in a standardized manner.

These discoveries led to the formal charter of the Takeoff and Landing Performance Assessment Aviation Rulemaking Committee (TALPA ARC), a noteworthy effort composed of representatives from airplane manufacturers, major airlines, trade groups, pilot unions, airports and regulatory authorities. The group stipulated the need for standardized methods for assessing runway conditions and disseminating those through airport operators, the NOTAM system and ATC. Furthermore, there had to be a method for integrating braking action reports by pilots and providing a direct correlation with airplane performance data. The product of these efforts was the creation of the Runway Condition Assessment Matrix (RCAM).

During the winter of 2009/2010, the matrix was validated at 10 snow-prone airports in Michigan, Minnesota and Alaska. During the following winter, the matrix was further validated at 29 airports that included well-known snow-challenged airports in New York, Rocky Mountain ski destinations and Alaska.

The matrix divides a runway into touchdown, midpoint and roll-out sections and provides pilots with touchdown-zone-specific information along with the percentage of coverage. The system will no longer report "Mu" friction values and vehicle braking will no longer be reported for runway conditions.

The "Runway Condition Description" section of the RCAM includes contaminant type and depth categories that have been determined by airplane manufacturers to cause specific changes in airplane braking performance. The use of Runway Condition Codes harmonizes with ICAO Annex 14, Aerodrome Design and Operations, providing a standardized "shorthand" format for reporting condition (and replaces Mu values). Those codes are not generated for taxiways, ramps or helipads and are generated only when the total runway surface (or the cleared width) is contaminated by more than 25%. These provide the type and depth of contaminants, estimated aircraft braking that can be anticipated, and targeted performance data. The Runway Condition Codes are communicated via the NOTAM system, Flight Service Stations, ATC facilities (tower, center, TRACON, etc.) or directly from airport operators via CTAF.

A previous shortcoming in landing data was that they did not integrate well with the information communicated to flight crews. Now, airline operating manuals have been modified to provide landing data that correspond to the Runway Condition Codes. Landing distances are also adjusted for tailwind, no reversers and using autoland, critical steps that should be considered during the Landing Performance Assessment.

If landing distance data based on the Runway Condition Code/braking action are not available in your aircraft flight manual (AFM), the industry has established "Landing Distance Factors" that may be used with your AFM's dry runway (unfactored) landing distance to determine the Landing Distance Required. These factors incorporate a 15% safety margin.

The "Downgrade Assessment Criteria" column provides guidance if the airport authorities believe that the conditions are slipperier than the Runway Condition Codes might indicate. This gives reporting authorities the ability to take downgrade actions. The correlations of the Mu values with runway conditions and condition codes in the RCAM are only approximate ranges. The "Vehicle Deceleration or Directional Control Observation" column is used to correlate estimated vehicle braking experienced on a given contaminant. The "Pilot Reported Braking Action" column provides other pilots with a degree of expected braking.

Applying the Information

The RCAM is an immense improvement over previous systems, but like any tool, its effectiveness depends on skillful application by its users. Recommendations from industry working groups and the manufacturers highlight key factors that are especially important when landing on runways with compromised conditions.

A flight crew's landing performance assessment is based on the information available on the runway's condition. It is the sole responsibility of the pilot performing the inflight assessment to determine whether the transmitted information can be considered reliable.

The estimated runway condition and predicted landing performance may be sensitive to temperature and falling precipitation. This is especially the case when the temperature can change the water contaminant from liquid to solid (water to ice) or vice versa. For instance, the landing performance is poor on dry ice, but can become impossible if the ice surface is melting.

When snow, ice or slush accumulates, it is necessary to clean the runway as well as perform a runway condition assessment. After the stuff is removed, the runway is inspected before it reopens for air traffic. Both actions require time, and falling precipitation can make it difficult to perform an accurate measurement. The time difference between runway inspection and when operations renew is called the report age and expresses how long snow had accumulated before the landing took place.

The assumptions used for dispatch planning will most probably no longer apply to the actual conditions at the time of landing when dynamic weather prevails. The calculated landing performance depends on no unexpected variations from reported conditions. Pilots should understand that landing distance charts only consider a single contaminant evenly distributed on the runway.

A savvy flight crew needs to anticipate all the realistic degradation or aggravating factors and determine the thresholds below which a safe landing can still be performed. It may be necessary to re-evaluate landing performance prior to committing to landing.

The management of a final approach includes being on speed in the proper configuration. The aircraft should be firmly flown onto the runway at the aiming point. A firm touchdown prevents sluggish wheel spin-up and/or delayed flight to ground mode transition of the squat switches. The landing performance numbers assume touching down in the touchdown zone on speed, and timely activation of deceleration devices. There is no margin left if the flight crew makes a slightly long flare or there is a slight lag applying deceleration means.

Do not delay lowering the nosewheel onto the runway. It increases weight on wheels. Further, there should be no delay in ground spoiler extension, brake physical onset and reverse extension.

Decelerate as much as you can as soon as you can.

Reverse thrust is most effective at high speed. Let the anti-skid do its work. Do not pump the brake pedals. Do not use asymmetric reverse thrust on an icy or slippery runway unless necessary to arrest a skid. When using reverse thrust, be prepared for a possible downwind drift on a slippery runway with a crosswind. It is even more important than usual to resist turning off the runway before the airplane has slowed to taxi speed.

The RCAM provides pilots with meaningful reports on runway surface conditions so they can make accurate landing performance assessments. Landing performance charts have been modified to integrate well with the reported Runway Condition Codes. But even with these much needed improvements, the fact remains that the safety margins on wintry runways remain thin, and every landing needs the flight crew's utmost attention and error-free performance. BCA

Interpreting a FICON

The new NOTAM reporting format for field conditions integrates well with the Runway Condition Assessment Matrix (RCAM), giving pilots a better understanding of pavement's status.

RWY 26 FICON 4/3/3 50 PRCT COMPACTED SN, 75 PRCT 1IN WET SN OVER COMPACTED SN, 90 PRCT 2IN WET SN OVER COMPACTED SN.

Runway 26's field condition (FICON) report has a Runway Condition Code of 4/3/3. The 4 represents the touchdown third and is described as having a 50% coverage of compacted snow.

The second number, 3, is the slipperiness factor connected with the middle third or midpoint of the runway, described here as 75% 1 in. of wet snow over compacted snow. The final number, also 3, means the same slipperiness value is assigned to the rollout portion of the runway, which has 90% coverage of 2 in. of wet snow over compacted snow.

Scandinavia and Canada Have Contributed Much

Scandinavia and Canada, where winters are long and runways are often covered in snow, have led the way in researching better methods for quantifying anticipated runway braking action and the resulting effect on an airplane's landing distance.

The first interest in accurately measuring and reporting compact snow conditions occurred in Sweden in 1948. One airport manager urgently needed to measure the runway's friction because the facility had a 4,000-ft.-long runway with steep slopes on both ends. His team devised a method whereby a person driving a heavily loaded truck would accelerate to about 20 mph, apply full brakes (hopefully not at the ends of the runway) and record the stopping time and distance. Engineers converted these recordings into the runway's friction.

SHANNON SAVORY/ISTOCK

Another airport manager in Sweden wanted a less time-consuming method. So, a team of engineers designed the Tapley Decelerometer and installed it in a car. The device performed admirably at measuring the friction in spots along the runway, but as those of you who have landed on dicey runways know, sometimes one portion of a runway might yield adequate braking while other portions are entirely unsatisfactory.

The Swedish didn't rest on their laurels. They continued researching this area and found that a number of variables affect runway friction with compacted snow surfaces. For example, tires of different designs and pressures create divergent braking forces. And loose contamination such as snow or slush can yield unreliable friction values. Accordingly, the Swedish Civil Aviation Administration started a program to develop standardized procedures and specific tires to get friction measuring results that reasonably represented what transport category airplanes experience.

The first friction measurement device, the James Brake Decelerometer, was developed in England in the 1950s and the Canadians quickly adapted it for their use. They developed a system to take measurements from the James Brake, convert them into a useful index number, and post those in flight manuals to help pilots determine corrected landing distances.

Late that decade, the Mu-Meter also was developed in England as a side-force measuring instrument primarily used for wet runways, but it was subsequently used on winter runways as well. Swedish engineers developed the BV-11 Fixed Slip Skiddometer around the same time. This trailered device was used on wet runways and those covered with snow and/or ice.

Transport Canada's Transportation Development Center examined a wide range of ground friction measurement devices used by different countries and the large number of differing procedures in measuring winter surface friction. Its extensive work found that the frictional values reported by the various equipment differed substantially. In fact, the same model of equipment reported highly scattered frictional data. BCA

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Wrong Right-Seater

Past flaws and failures **intentionally forgotten**

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

On Feb. 23, 2019, at 1239 CST (1839Z), Atlas Air Inc. (Atlas) Flight 3591, a Boeing 767-375BCF, dived from 6,000 ft. into a shallow, muddy marsh area of Trinity Bay some 34 mi. east-southeast of George Bush/Houston Intercontinental Airport (KIAH) while on approach to that airport. The captain, first officer and a nonrevenue pilot riding in the jump seat died and the cargo aircraft was destroyed on impact.

NTSB

When the go-around mode is selected, the autothrottle system begins to increase power and the aircraft begins to accelerate and pitch-up to 5-deg.

After a 16-month investigation the NTSB determined the probable cause of this accident was "the inappropriate response by the first officer as the pilot flying to an inadvertent activation of the go-around mode, which led to his spatial disorientation and nose-down control inputs that placed the airplane in a steep descent from which the crew did not recover.

"Contributing to the accident was the captain's failure to adequately monitor the airplane's flightpath and assume positive control of the airplane to effectively intervene.

"Also contributing were systemic deficiencies in the aviation industry's selection and performance measurement practices, which failed to address the first officer's aptitude-related deficiencies and maladaptive stress response. Also contributing to the accident was the FAA's failure to implement the Pilot Records Database [PRD] in a sufficiently robust and timely manner." (See "Pilot Records Redux," page 57.)

According to the NTSB's investigators, here's what happened to Flight 3591. This information comes from testimony at the Safety Board's hearing into the incident and investigators' reports:

Atlas operated the airplane as an FAR Part 121 domestic cargo flight for Amazon.com Services LLC.

The accident airplane arrived at Miami International Airport (KMIA) from Ontario, California, International Airport (KONT) at 1941Z on Feb. 22. The accident flight crew previously had been on duty 6 hr. and 24 min. on the day before the accident and completed 24 hr. and 17 min. of rest before the scheduled report time of 1438Z for the departure of GTI3591 at 1608Z on Feb. 23. (We'll use UTC in this report because of the 1-hr. time zone difference between EST and CST.)

The accident flight departed Miami about 1633Z on an IFR flight plan to KIAH. The first officer (FO) in the right seat was the pilot flying (PF) and the captain was the pilot monitoring (PM).

The subsequent departure and climb from KMIA and cruise at FL 400 to the Houston area were uneventful. About 1715Z and again at 1717Z, GTI3591 requested and received KIAH ATIS weather information Papa.

Papa was recorded at 1713Z and showed winds 320 at 18 kt., gusting 42 knots; 8-sm visibility with mist; scattered clouds at 1,600 ft.; broken clouds at 2,000 and 2,900 ft.; and temperature/dew point 19/12C. The remarks section included wind-shear advisories in effect at the airport.

About 1759Z, GTI3591 checked in with the White Lake Ultra High Radar controller and was advised to expect light chop. The controller then provided revised routing after the GIRLY intersection and cleared the flight to KIAH via the LINKK1 arrival.

About 1809Z, ATC issued the flight a descent to FL 340, and 10 min. later it was cleared to descend via the LINKK1 arrival. At 1825Z, the captain advised ATC they were beginning their descent.

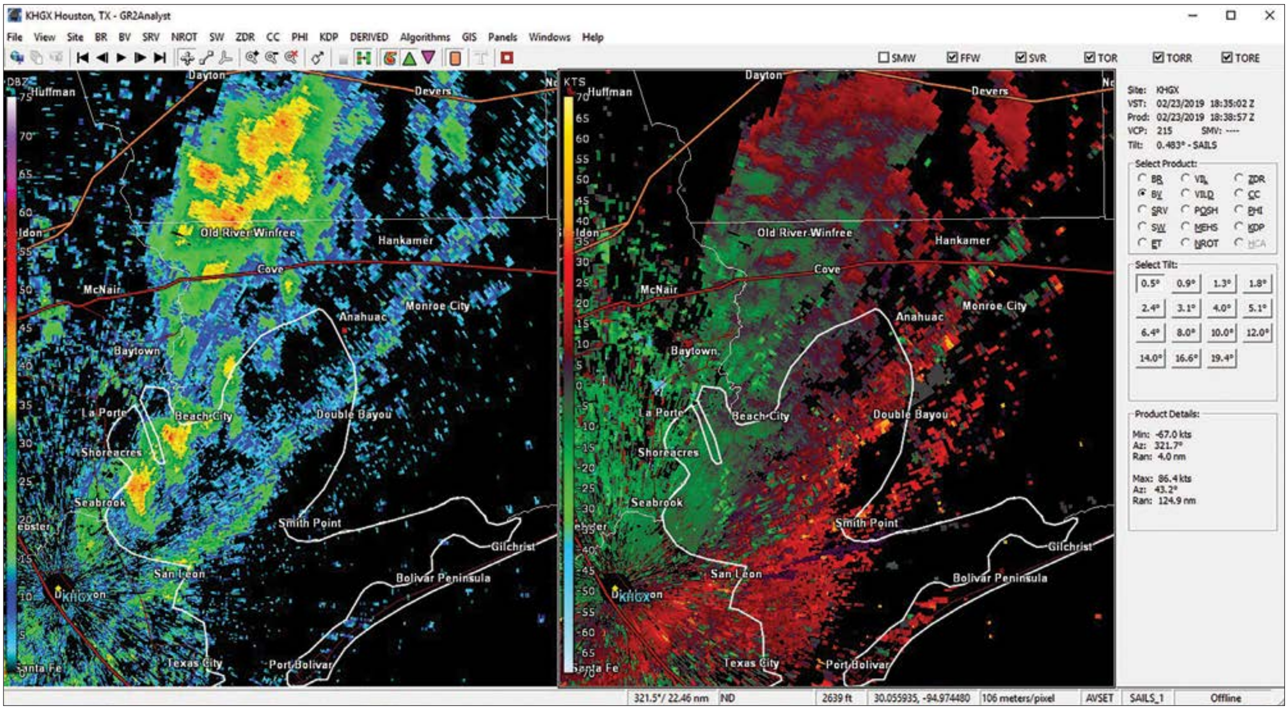
About 1830:37Z, GTI3591 checked in with Houston Approach with Information Sierra and reported descending via the LINKK1 RNAV arrival. (Sierra was recorded at 1752Z and showed winds 320 at 14 kt., 9-sm visibility, few clouds at 2,000 ft., scattered clouds at 3,300 ft., broken clouds at 6,000 ft. and temperature/dew point 21/12C. The remarks section did not include wind-shear advisories.)

ATC instructed GTI3591 to fly the Runway 26L transition as the airplane was descended through 17,800 ft. about 73 mi. southeast of the airport.

At 1834:08Z, the controller advised GTI3591 that there was light to heavy precipitation west of the airport.

At 1836:24, GTI3591 advised ATC they would fly to the west side of the weather — a small frontal area of moderate cells. The controller responded that that would be OK, but there were a "bunch of departures," so he needed the flight to descend and maintain 3,000 and to "expedite" the descent. At that point the aircraft was some 48 mi. southeast of KIAH at 10,000 ft. The captain did not respond, so the controller repeated the descent clearance and told GTI3591 to "hustle" down to 3,000 ft. The controller added that the Boeing crew could expect vectors northbound for a base leg to Runway 26L. The captain responded to ATC and confirmed the descent to 3,000 ft.

About 10 sec. later, the FO extended the speed brake and asked the captain (PM) to lower the slats, which he did. The captain then turned his attention to setting up the FMC for the approach. Both the autopilot and autothrottle



NTSB

As the aircraft penetrated the weather, the FDR recorded load factors consistent with the airplane encountering light turbulence.

were engaged and remained engaged for the remainder of the flight.

The FO then commented that he was experiencing a potential failure of his attitude director indicator/horizontal situation indicator (ADI/HSI) display information, and then made a comment about using the electronic flight information (EFI) switch. The captain took control of the airplane and the FO cycled the EFI switch, which returned the display to normal.

At 1837:18Z, the controller instructed GTI3591 to turn to a 270-deg. heading, and the captain confirmed the heading when the airplane was about 40 mi. from KIAH and descending through 8,500 ft. Shortly afterward, according to recorded data, the captain transferred controls of the airplane back to the FO, who became the PF and the captain became the PM again. The captain continued setting up the approach into the airplane's FMC.

Meteorologists determined the airplane was beginning to penetrate the leading edge of the cold front about 1838:25Z where the crew probably encountered associated wind shear and instrument meteorological conditions (IMC). As the aircraft penetrated the weather, the FDR recorded load factors consistent with the airplane encountering light turbulence.

At 1838:31Z, the airplane's go-around mode was activated. The accident flight was about 40 mi. from the airport and descending through about 6,300 ft. MSL toward the target altitude of 3,000 ft. MSL.

Investigators said this location and phase of flight were inconsistent with any scenario in which a pilot would intentionally select go-around mode, and neither pilot made a go-around callout to indicate intentional activation. The go-around mode activation seemed to have been accidental.

The FO, who was the PF, was probably holding the speed-brake lever as expected in accordance with Atlas Air's procedure, theorized investigators. The inadvertent activation of the go-around mode, they said, likely resulted from unintended contact between the FO's left wrist or watch and the left go-around switch due to turbulence-induced loads that moved his arm.

When the go-around mode is selected, the autothrottle system begins to increase power and the aircraft begins to accelerate and pitch-up to 5-deg.

At 1838:37Z and while the thrust of the engines was increasing, the controller informed GTI3591 that he would turn the flight northbound for a base leg in about 18 mi.

The FDR recorded the speed brakes retracted to the near-zero position, and the captain then responded to ATC, "Sounds good." ATC then advised GTI3591 that it was clear on the other side of the weather and they should have no problem getting to the airport. The captain responded, "OK." That was the last transmission from the aircraft. The airplane was about 35 mi. from KIAH and descending through about 6,000 ft.

About a second after this ATC transmission, the FO made an expression of surprise followed by a comment related to airspeed. Three seconds later, the FO exclaimed, "We're stalling," and 4 sec. later, "Oh, Lord, have mercy on [me] myself." The cockpit area microphone picked up someone calling, "Pull-up."

Despite the presence of the go-around mode indications on the flight mode annunciator and other cues that indicated that the airplane had transitioned to an automated flight path different from what the crew had been expecting, neither the FO nor the captain were aware that the airplane's automated flight mode had changed.

Within seconds of the go-around mode selection, the FO probably made a large nose-down control input (overriding the autopilot), forcing the airplane into a steep dive from which the crew did not recover. Only 32 sec. elapsed between the go-around mode activation and the airplane's ground impact, said the Safety Board.

At 1839:39Z, ATC lost radar contact with GTI3591 about 34 mi. from KIAH at an altitude of about 5,800 ft.

About 16 sec. after the captain told ATC "OK," the FDR stopped recording data with the airplane descending at an airspeed of about 433.5 kt. with the autopilot still engaged. The airplane had never stalled.

Security camera footage captured the final stages of the flight and showed the airplane in a steep descent into the Trinity Bay marsh. Both pilots and the jump-seater were fatally injured and the airplane destroyed.

NTSB's Findings

The investigation determined that whatever went wrong did so in the cockpit

— other factors were eliminated including ATC services, maintenance of the airplane structures, powerplants and systems, airplane weight and balance, and Atlas policies and procedures. Nor was evidence found that the crew was impaired due to medical conditions, alcohol or other drugs.

"Given that the first officer [FO] was the pilot flying and had not verbalized any problem to the captain or initiated a positive transfer of airplane control, the manual forward elevator control column inputs that were applied seconds after the inadvertent activation of the go-around mode were likely made by the FO," said the Safety Board.

The FO likely experienced a pitch-up somatogravic illusion as the airplane accelerated due to the inadvertent activation of the go-around mode, which prompted him to push forward on the elevator control column.

"Although compelling sensory illusions, stress and startle response can adversely affect the performance of any pilot," said the Safety Board, "the first officer had fundamental weaknesses in in his flying aptitude and stress response that further degraded his ability to accurately assess the airplane's state and respond with appropriate procedures after the inadvertent activation of the go-around mode."

The investigators discovered that the first officer had a history of training performance difficulties at multiple employers "and demonstrated a tendency to respond impulsively and inappropriately when faced with an unexpected event during training scenarios." That suggested to the Safety Board that the FO had an inability to remain calm during stressful situations — a tendency that may have exacerbated his aptitude-related performance difficulties.

The inadvertent selection of the go-around mode and the FO's sudden push-over occurred while the captain was setting up the approach and communicating with ATC, therefore his attention was diverted from monitoring the airplane's state and verifying that the flight was proceeding as planned, which delayed his recognition of and response to the FO's unexpected actions that placed the airplane in a dive.

"The captain's failure to command a positive transfer of control of the airplane as soon as he attempted to intervene on the controls enabled the first officer to continue to force the airplane into a steepening dive," said the Board. "The captain's degraded performance, which included his failure to assume positive control of the airplane and effectively arrest the airplane's

NTSB

Atlas operated the airplane as an FAR Part 121 domestic cargo flight for Amazon.com Services LLC.

NTSB's Training Records Recommendations

The Atlas investigation included a deep look into the aviation industry's handling of training background checks and maintenance of training records. The NTSB found practices wanting industry-wide and offered new recommendations as well as reiterating two previous recommendations. The new recommendations to the FAA involve the Pilot Records Improvement Act (PRIA) and the controversial proposal for the Pilot Records Database (PRD):

(1) Inform FAR Part 119 certificate holders, air tour operators, fractional ownership programs, corporate flight departments and governmental entities conducting public aircraft operations about the hiring process vulnerabilities identified in this accident, and revise Advisory Circular 120-68H, Pilot Records Improvement Act and Pilot Records Database, to emphasize that operators should include flight operations subject matter experts early in the records review process and ensure that significant training issues are identified and fully evaluated.

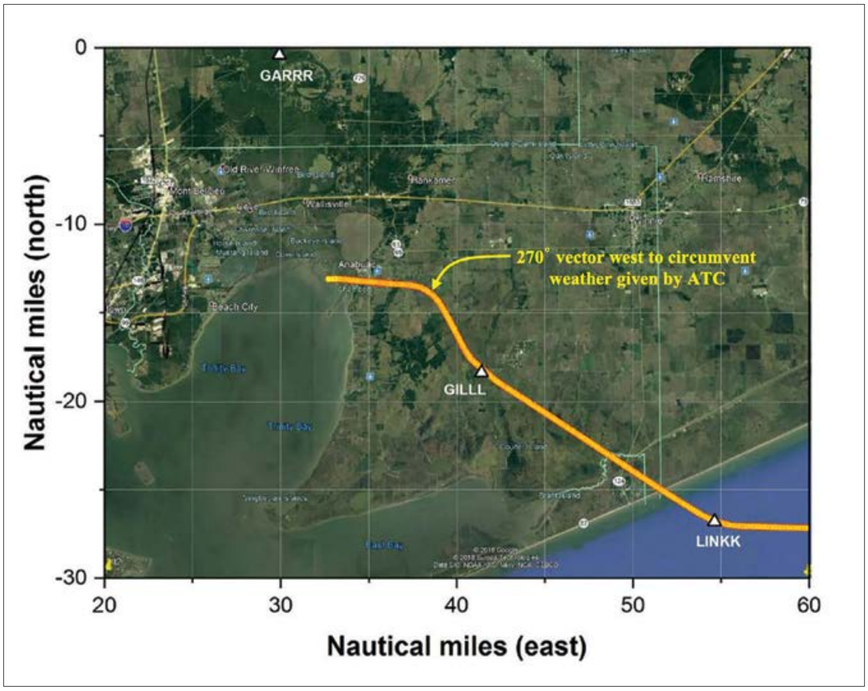
(2) Implement the PRD and ensure that it includes all industry records for all training started by a pilot as part of the employment process for any Part 119 certificate holder, air tour operator, fractional ownership program, corporate flight department, or governmental entity conducting public aircraft operations regardless of the pilot's employment status and whether the training was completed.

(3) Ensure that industry records maintained in the PRD are searchable by a pilot's certificate number to enable a hiring operator to obtain all background records for a pilot reported by all previous employers.

(4) Establish a confidential voluntary data clearinghouse of deidentified pilot selection data that can be used to conduct studies useful for identifying effective, scientifically based pilot selection strategies. This program should be modeled after programs like Aviation Safety Information and Analysis Sharing and Flight Operations Quality Assurance (FOQA).

(5) Issue a safety alert for operators to inform pilots and

NTSB



descent, resulted from the ambiguity, high stress and short time-frame of the situation."

NTSB members believe the first officer's skill deficiencies went unidentified by Atlas in part due to the FAA's struggle to develop the PRD. "Had the FAA met the deadline and complied with the requirements for implementing the PRD as stated in the Airline Safety and FAA Extension Act of 2010, the PRD would have provided hiring employers relevant information about the first officer's employment history and training performance deficiencies.

"The first officer's long history of training performance difficulties and his tendency to respond impulsively and inappropriately when faced with an unexpected event during training scenarios at multiple employers suggest an inability to remain calm during stressful situations — a tendency that may have exacerbated his aptitude-related performance difficulties."

Contributing to the accident was the captain's failure to adequately monitor the airplane's flightpath and assume positive control of the airplane to effectively intervene.

The Safety Board added that the first officer's repeated use of incomplete and inaccurate information about his employment history on resumes and applications were deliberate attempts to conceal his history of performance deficiencies and deprived Atlas Air and at least one other former employer of the opportunity to fully evaluate his aptitude and competency as a pilot.

"Atlas Air's human resources personnel's reliance on designated agents to review pilot background records and flag significant items of concern was inappropriate," said the Safety Board, "and resulted in the company's failure to evaluate the first officer's unsuccessful attempt to upgrade to captain at his previous employer."

Employers — airline, charter and business aviation operations — that rely on designated agents or human resources personnel for initial review of records obtained under the Pilot Records Improvement Act (PRIA) of 1996 should include flight operations subject matter experts early in the records review process, according to the Board's report. **BCA**

operators of Boeing 767- and 757-series airplanes about the circumstances of this accident and alert them that, due to the close proximity of the speed-brake lever to the left go-around mode switch, it is possible to inadvertently activate the go-around mode when manipulating or holding the speed-brake lever as a result of unintended contact between the hand or wrist and the go-around switch.

(6) Convene a panel of aircraft performance, human factors and aircraft operations experts to study the benefits and risks of adapting military automatic ground collision avoidance (A-GCAS) system technology for use in civil transport-category airplanes and make public a report on the committee's findings.

The NTSB also reiterated recommendations it had made after investigations into other accidents. These recommendations went to the FAA and all but the first have been classified "Open — Unacceptable Response." They are:

- ▶Require that all existing aircraft operated under Part 121 or 135 and currently required to have a CVR and an FDR be retrofitted with a crash-protected cockpit image recording (CIR) system . . . . The CIR should be equipped with an independent power source. Require that all newly manufactured aircraft in this class also be equipped with a CIR system.
- ▶Require all Part 121 and 135 air carriers to obtain any notices of disapproval for flight checks for certificates and ratings for all pilot applicants and evaluate this information before making a hiring decision. (A-05-1)
- ▶Require Part 121, 135 and 91K operators to document and retain electronic and/or paper records of pilot training and checking events in sufficient detail so that the carrier and its principal operations inspector can fully assess a pilot's entire training performance. (A-10-17)
- ▶Require Part 121, 135 and 91K operators to provide the training records requested in Safety Recommendation A-10-17 to hiring employers to fulfill their requirement under the Pilot Records Improvement Act. (A-10-19)
- ▶Develop a process for verifying, validating, auditing and amending pilot training records at Part 121, 135 and 91K operators to guarantee the accuracy and completeness of the records. (A-10-20) **BCA**

Accident Pilots' Training

Members of the NTSB's Operational and Human Factors investigation team spent hundreds of hours looking into the backgrounds of the accident pilots with emphasis on their training records, resumes and Pilot Records Improvement Act (PRIA) reports. Here are highlights of the group's findings.

The Captain

The 60-year-old captain held an ATP and had accumulated 11,272 hr. total flight time, some 4,234 of them as PIC. He had 1,252 hr. in the Boeing 767, about 157 of those as PIC. He was rated on the Boeing 757/767 and the Embraer EMB-145. He also held a flight instructor certificate with multiengine and instrument airplane ratings.

He had flown 365 hr. in the previous 12 months and 100 hr. in the previous 90 days. Hired by Atlas in September 2015, he had upgraded to 767 captain in August 2018 and underwent his last proficiency check in October 2018. He held a first-class medical certificate.

The captain's PRIA background check for Atlas was completed by Summit Security Services Inc. on Sept. 22, 2015, and included a check of the National Driver Register, FAA records and past employers disclosed by him. His resume and job application listed previous employment with ExpressJet, CommutAir and FlightSafety International, and the PRIA background check showed all three employers.

The captain's initial 767 simulator training included stall training in a full flight simulator (FFS) on Oct. 16, 20, 29 and 30, 2015. On Oct. 31, 2015, he was not recommended for his 767 type rating ride due to over-speeding the flaps during stall recovery, consistently failing to set missed approach altitude, and missed approach procedures. The next day, he completed remedial training satisfactorily, which included speed awareness during recovery from approaches to a stall, and was subsequently recommended for his type-rating check ride, which he satisfactorily completed on Nov. 2, 2015.

On Feb. 25, 2016, the captain successfully completed recurrent Boeing 767 training, which included three stalls (takeoff, landing and clean configurations), and on May 19, 2016, Sept. 5, 2016, and Aug. 12, 2017, he successfully completed proficiency checks that included one takeoff stall in a turn. On March 7, 2017, and March 4, 2018, he completed recurrent simulator training that again included three stalls.

First Officer

The 44-year-old first officer was hired by Atlas on July 3, 2017. He held an ATP and type ratings on the Boeing 757/767 and the Embraer EMB-145, ERJ-170 and ERJ-190. He held a first-class medical certificate. He had accumulated 5,073 hr., some 1,237 as PIC. His total SIC time totaled 1,757 hr., about 520 of those in the 767. He had flown 375 hr. in the previous 12 months and 106 hr. in the previous 90 days.

The first officer's PRIA background check for Atlas Air was completed by TruView BSI Inc., on Aug. 11, 2017, and included a check of the NDR, FAA records and past employers disclosed by him. The resume and application provided to Atlas listed his employment with Mesa Airlines, Trans States Airlines, Charter Air Transport, and Air Turks and Caicos. Neither document showed employment with Air Wisconsin (April 20 to Aug. 13, 2012) or CommutAir (May 3 to June 27, 2011).

When asked on his Atlas application to explain any gaps in employment, the FO stated: "There were times when I was furloughed and also went to college to attend degrees." Air Wisconsin and CommutAir were not part of the PRIA-requested information for the background checks conducted for Atlas.

The Atlas training director told the NTSB that the company was not aware of the FO's employment at either Air Wisconsin or CommutAir, nor that he was unsuccessful in training programs at both carriers. He said that Atlas would have liked to have had that information for further evaluation of the FO based on a trend in his training. He added, "We would not have offered him a position" considering his failure to disclose that information on his application.

When asked on the Atlas employment application "Have you ever failed an initial, upgrade, transition or recurrent proficiency check?" the FO answered, "Yes," adding, "When I was doing my ATP check ride, I had to redo one non-precision approach. I have all documents to support this."

According to Mesa Air training records provided to Atlas, the FO was unsuccessful in his attempt to upgrade to captain on the EMB-175 in May 2017 after being graded unsatisfactory after two simulator sessions.

The Atlas human resources director told the NTSB that the FO's failure to upgrade at Mesa did not "red flag" as a training failure through the PRIA process. When asked how Atlas classified an unsuccessful attempt to upgrade to captain, she said, "If I had seen that, we probably would have asked him about it and then he would 'have to explain what it was.'" The Atlas training director, who was also part of the interview process, did not recall PRIA showing the failure to upgrade as a red flag, and thought the information provided by Mesa was vague and should have been identified for additional follow-up.

According to Trans States training records provided to Atlas, the FO was graded unsatisfactory on his EMB-145 type-rating oral examination on April 22, 2014, was graded unsatisfactory on his EMB-145 ATP check ride on May 11, 2014, and was graded unsatisfactory on his EMB-145 line checks on Aug. 15, 2014, and Sept. 8, 2014. The Atlas training director did not recall seeing the FO's Trans States unsatisfactory line checks in his PRIA documentation during the interview process. BCA

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Pilot Records Redux

If adopted, this iteration will last a lifetime

THE PILOT RECORDS IMPROVEMENT ACT (PRIA) REQUIRES AIR carriers, prior to hiring a pilot, to request and receive: from the FAA, records pertaining to the individual's certificates, ratings, medical certificates and summaries of legal enforcement actions; from other air carriers, FAR Part 91 and other operators who employed the pilot in the previous five years, records pertaining to the individual's training, competency, disciplinary actions, and/or terminations or other causes for separation; and from the National Driver Register, pertinent records concerning the individual's motor-vehicle driving history.

Congress inserted the PRIA into the 1996 Federal Aviation Reauthorization Act following airline accidents in which the NTSB found error by pilots with a history of poor performance, and the current employers had not checked and were unaware of the pilots' backgrounds. The death of a congressman in one of the accidents spurred Congress to write the new statute, rather than direct the FAA to formulate a regulation.

The next pilot records milestone followed the February 2009 crash of Colgan Air Inc. Flight 3407, which was operating for Continental Airlines Inc. According to many observers, the families of those who perished on that flight were instrumental in the passage of the "Airline Safety and Federal Aviation Administration Extension Act of 2010." This was not an FAA Reauthorization bill, but rather an extension of the agency's funding. The extension came with an extra 50 pages of "Airline Safety and Pilot Training Improvement."

At the time, most industry observers focused on the new requirements for all airline pilots to hold air transport pilot certificates, and few commented on its requisite for the creation of a new Pilot Records Database (PRD).

The next event in this decades-long pilot records saga resulted from the Feb. 23, 2019, crash of Atlas Air Flight 3591. As noted in this "Wrong Right-Seater" (*Cause & Circumstance,* page 52) the NTSB found that the first officer (FO) had fundamental weaknesses in his flying aptitude and a stress response that further degraded his ability to accurately assess the airplane's state and respond appropriately. The Safety Board also pointed to the FO's long history of training performance difficulties and his tendency to respond impulsively and wrongly when faced with an unexpected event during training scenarios at multiple employers.

The NTSB went on to state that had the FAA met the deadline and complied with the requirements for implementing the PRD ordered 10 years ago, that database would have provided hiring employers relevant information about the FO's employment history and training performance deficiencies. The Safety Board discovered that the FO had deliberately concealed his history of performance deficiencies.

In addition, the NTSB criticized Atlas Air's pilot screening process, which relied on designated agents to review pilot background records and flag significant items of concern. In this instance, the screening process missed the fact that the FO had tried and failed to upgrade to captain at his last company.

The Safety Board proposed the establishment of a confidential voluntary data clearinghouse to share deidentified pilot selection data among airlines. The intent of the proposal was to help predict pilot success in training and on the job and in the doing would benefit the safety of the flying public.

However, not everyone agrees that a pilot database that never forgets a single failed check ride would automatically prevent accidents. The FAA issued a Notice of Proposed Rulemaking in March of this year, not quite a decade after the congressional mandate for the PRD. The NPRM requires Part 135 and 121 operators to report historical records dating back to Aug. 1, 2005. Operators will be required to upload employment, training, checking, testing, currency, proficiency and disciplinary records for every pilot under their employment over the last 15 years.

Notably, the proposal also defines a "corporate flight department" and imposes significant recordkeeping and reporting requirements on those Part 91 operators of two or more airplanes that require type ratings.

Comments to the NPRM by the business aviation industry pushed back on the FAA's proposal and reasoning. The NBAA and others argued that instructor and check pilot comments should be used to help direct additional opportunities for training, and not to prevent a pilot from being hired.

Doug Carr, NBAA vice president of regulatory and international affairs, called the proposed rule a "full frontal assault" on business aviation, highlighting three significant concerns. First, the NPRM's requirement that certain Part 91 operators report substantial training, employment, disciplinary and proficiency-related events would impose a considerable burden. For example, proficiency could mean recording day and night takeoffs and landings, instrument currency requirements and more. Second, the FAA proposes to include all check pilot comments associated with training and checking. Finally, he said, the FAA's attempt to define "corporate flight department" introduces untold unintended consequences for future regulations.

And by statute, a pilot's records could not be removed from the PRD without a death certificate. While nearly every state allows a felon's records to be expunged with a showing of good behavior, a pilot will have to live with a failed check ride for the rest of his or her life. BCA

ADVERTISERS INDEX

On Duty

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

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

▶ **Aviation Clean Air,** Pooler, Georgia, announced that **Jonathan Saltman** is now a member of its ownership group. Saltman is president and founder of International Aero Companies, which includes International Aero Engineering. ACA and IAE have partnered to produce a portable unit for disinfecting aircraft while on the ground.

▶ **Aviation Personnel International,** San Francisco, California, promoted **Jennifer Pickerel** to vice president. Pickerel, who joined the company in 2015, will continue to serve as senior aviation recruiter. She previously served as director of client and candidate services.

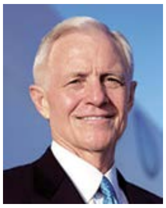
HENRY JOHNSTON

▶ **Dowty Propellers,** Brockworth, UK, named **Henry Johnston** president. Johnston succeeds Oliver Towers, who retired after 12 years at the UK-based company. Towers previously held positions at Smiths Aerospace, Rolls-Royce and International Aero Engines. Johnston joined Dowty as a sales director in 2011. He most recently served as Dowty Propellers' service executive. He was formerly with BAE Systems, working in engineering, supply chain and business development.

WAYNE OEDEWALDT

▶ **GlobalParts.aero** announced that **Scott Toom** has rejoined the company as its new director of business solutions. Toom joined the company in 2012. Most recently, he served as a sales engineer with Electromech Technologies.

▶ **EaglePicher Technologies,** St. Louis, Missouri, announced that **Steve Carrington** has been vice president of business development and marketing. Carrington most recently served as vice president of sales and programs at Norsk Titanium.



ROGER SPERRY

▶ **AvAir,** Chandler, Arizona, promoted **Robert Knox** to chief accounting officer. Knox joined AvAir in 2016 and most recently was senior vice president of finance.

▶ **Gulfstream Aerospace,** Savannah, Georgia, promoted **Wayne Oedewaldt** to regional senior vice president of international sales for Asia Pacific. **Kirsten Krueger** replaces Oedewaldt in his former position as regional vice president of sales for California's central coast. **Roger Sperry,** formerly regional senior vice president of international sales for Asia Pacific, has been named regional senior vice president of international sales for Europe, the Middle East and Africa and the Indian subcontinent. **Brent Monroe,** regional senior vice president for the western U.S., is now also head of international sales for Latin America. Oedewaldt joined Gulfstream in 2001. Krueger joined the company in 2017 as regional sales manager for the northwest and west central U.S. **Josh Thompson** has been appointed chief financial officer of Gulfstream Aerospace, replacing **Dan Clare** who is retiring at the end of September. Thompson has been chief financial officer at General Dynamics Ordnance and Tactical Systems since 2018.

BOB RUFLI

TRAVIS MARSHALL

▶ **Pentastar Aviation,** Waterford Twp., Michigan, announced that **Bob Rufli,** vice president and director of flight operations at Pentastar Aviation, has been named chairman of the Air Charter Safety Foundation. Rufli succeeds Joshua Hebert, CEO of Magellan Jets, whose term expired June 30.

▶ **SterlingRisk Aviation,** Destin, Florida, announced **Travis Marshall** has joined the company as vice president and senior account executive. Marshall most recently was commercial account manager at HUB International Northwest. **BCA**

Fred George
Senior Editor
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Nextant 400XTi

Lean inventory, strong value

THE ECONOMIC DOWNTOWN OF 2020 HAS BEEN TOUGH ON THE light jet market, flooding the field with used aircraft. But you might not know that if you're looking for a Nextant 400XT/400XTi; as this is being written, there are just seven offered for sale. These aircraft originally sold for $5 million, or more. Now, the scant few on the market sell for $1.8 million to $2.4 million. That's a lot of value for a transport category aircraft that can fly three passengers 1,900 nm at Mach 0.70 long range cruise.

Nextant built the XT from 2011 to 2015. The newer XTi, having a more space-efficient interior, super sound proofing and plusher passenger seats, among other upgrades, sold from 2015 to 2019.

Most of these aircraft originated as Flight Options Beechjet 400A/Hawker 400XP aircraft that were "remanufactured" by Nextant Aerospace with reconditioned airframes, overhauled rotable components, new primary wiring harnesses and Pro Line 21 avionics. Most notably, Nextant swapped out the original PWC JT15D-5/-5R engines for 3,052-lb. thrust Williams FJ44-3AP turbofans, providing improved climb performance, a 1/3 reduction in cruise fuel consumption and considerably higher TBOs.

The cabin has a flat floor and the fuselage has a squared oval cross-section, similar to that of the Bombardier Learjet 45 series, providing more head and shoulder room than a circular structure. Nextant gutted the interiors, installed new acoustical insulation, added a more volumetrically efficient interior shell, LED lighting, a right side three-place forward divan and redesigned left side galley, four new club chairs aft of the door and an upgraded lavatory with optional belted potty seat. The result is one of the quietest, most comfortable and space efficient cabins in the light jet class.

The cabin luxury kit offsets the weight savings associated with the FJ44 engine upgrade, so typical BOWs are close to 11,000 lb. Most operators seldom carry more than 3 to 4 passengers, so the 600-lb. max payload doesn't pose a significant limitation. Each additional passenger costs about 100 nm of range.

Hot and high runway performance, while best in the light jet class, is improved over Beechjet 400A/Hawker 400XP. Departing *BCA*'s 5,000-ft. elevation, ISA+20C airport, 400XTi can launch at MTOW, a 470-lb. improvement over the original aircraft.

Assuming ISA conditions, the aircraft can climb directly to FL 430 in 30 min., but most operators initially level off at FL 410 until burning down 2,000 lb. of fuel. Then, they'll climb as high as FL 450. At Mach 0.70 long-range cruise, first hour fuel burn is about 1,200 lb., second hour is 900 lb., third and fourth hours are 800 lb. and fifth hour is 700 lb. Normal cruise speed is Mach 0.73, but many operators push up the throttles to cruise at Mach 0.76 to Mach 0.78 redline on shorter range missions.

The semi-super-critical airfoil has 20 deg. of sweep and only 241 sq. ft. of area. That yields a hefty 67.6 lb./sq. ft. wing loading for a comfortable ride in turbulence. Nearly full span fowler flaps enable the aircraft to have respectably low V speeds. Manually actuated spoilers provide roll control and heavy roll control forces at high speeds. But operators also say the aircraft could use more roll control authority at low speeds in gusting wind conditions.

The wing's drag divergence Mach number is a respectable 0.84M and transonic pitching moments are moderate, according to *BCA*'s September 1982 report. The aircraft can cruise as fast as 0.78M, but that's only in the high twenties. Normal cruise speed is 0.73M and long-range cruise is 0.69 to 0.71M in the high thirties to low forties, depending upon aircraft weight.

Wheel brake life never was one of the aircraft's assets. But operators say they fly at lighter weights because they need less reserve fuel.

Refueling the aircraft is not easy. Each wing has a fuel port, plus a third port, high in the right, aft side of the fuselage, that is used to refill the five fuselage tanks.

NEXTANT

The optional vapor cycle air-conditioner is a virtually must, as the original air cycle machine offers little cooling during ground operations in hot climates.

Scheduled maintenance inspections are 200 hours for A-checks, 400 hours for B-checks, 1,200 hr. for C-checks and 2,400 hr. for D-checks. The latter two inspections can cost upwards of $70,000 to $140,000. Landing gear overhauls are required at 4,500 hr. or 3,000 cycles. Check for compliance with AD 2014-15-15 regarding horizontal stabilize rib fatigue cracks and AD 2014-21-06 that calls for stabilizer pitch trim actuator replacement. Also peruse aircraft logs to verify that Nextant installed brand new FJ44-3AP engines, not loaners, at time of conversion.

Aftermarket services from Constant Aviation, the sister company to Nextant Aerospace that provides product support, is excellent according to operators. Williams' TAP Blue power-by-the-hour program costs about $166.24 per engine. Aircraft enrolled in TAP are eligible for 5,000-hr. TBOs.

Principal competitors for the Nextant 400XTi are Citation CJ3 having comparable range and better runway performance, but a smaller cabin cross-section; Embraer Phenom 300 having a larger cabin and better runway performance, but slower cruise speeds; and Bombardier Learjet 40/70XR having a larger cabin, higher cruise speeds, better runway performance and more range.

The choice depends upon your budget. If you're in the market for a quiet, commodious cabin, rock-solid reliability and 400+ kt. block speeds, but you can afford to give up some runway performance, it's tough to beat the value of Nextant 400XT/XTi. **BCA**

AVIATION WEEK Marketplace

Aerospace Cleaning and Sanitization Guide

During the COVID-19 pandemic, passengers and operators alike have focused more attention on hygiene and health in the aircraft environment. These cleaning and sanitization products and services can help your operation protect your passengers, your crews, your assets and your business.

Find more information, and contact suppliers directly at **marketplace.aviationweek.com/acsg.**

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Advertise on the Marketplace: Contact **Elizabeth Zlitni** at **913-967-1348 or elizabeth.zlitni@aviationweek.com.**

AEROCLAVE

RDS 3110 Portable Decontamination System

The RDS 3110 is a durable (yet weighs only 48 pounds) portable decontamination system that can treat areas up to 5,000 cubic feet (larger areas may be treated with multiple units). The 3110 is easy to use and operators need only minimal training. Fully self-contained, the 3110 can be ready to go and operating within minutes, and the small size allows for easy transport and storage. Two application modes allow users to disinfect rooms, vehicles, and equipment with an EPA-approved, hospital-grade disinfectant that is 100% biodegradable and non-corrosive, making it safe for use on custom surfaces and avionics found in business aircraft.

www.aeroclave.com

https://marketplace.aviationweek.com/product/rds-3110

HONEYWELL AEROSPACE

Portable Ultraviolet-C Solution for a Cleaner Cabin

The Honeywell UV Cabin System is a portable ultraviolet-c light (UVC) system that, when properly applied, reduces certain viruses and bacteria on airplane cabin surfaces. Efficient and cost-effective, the system covers an entire mid-sized airline cabin in less than 10 minutes. It can easily be transferred on and off the aircraft to maximize fleet efficiency. The extendable arms treat both sides of an aisle at once, minimizing aircraft downtime.

Disclaimer: These product concepts are currently under development. No testing has been done specifically as to protection against COVID-19. As with all of our products and services, Honeywell will adhere to its commitment to integrity and compliance within its global supply chain; meet relevant legal, scientific and industry standards; substantiate claims; and obtain necessary regulatory approvals as products progress through the development process.

aerospace.honeywell.com

https://marketplace.aviationweek.com/product/portable-ultraviolet-c-solution-cleaner-cabin

SIMONA BOLTARON

Boltaron® 9815N Cleanable and Cost Effective 65/65 Rated Sheet

Seat and tray table materials need to be able to withstand evolving plane interior cleaning practices. New Boltaron® 9815N is formulated with advanced chemical resistance and durability and is safe to clean regularly with aviation cleaning products, electrostatic fogging, and UV-C disinfection.

www.boltaron.com

https://marketplace.aviationweek.com/product/boltaron%C2%AE-9815n-cleanable-and-cost-effective-65-65-rated-sheet

ORAPI

NOVIRUCLEAN – 3471 – Concentrated Disinfectant Cleaner and Deodorant

NOVIRUCLEAN 3471 disinfectant cleaner can be used on a wide range of surfaces for bactericidal, yeasticidal and viricidal applications. Aircraft cabins, galleys, tabletops, and lavatories can all benefit from NOVIRUCLEAN 3471. It reduces surface contamination and makes turn times faster as it does not need rinsing. Effective against Influenza A, Severe Acute Respiratory Syndrome (SARS), coronavirus, MERS and surrogates. Conforms to: AMS 1453 (1:30) and Boeing D6-7127 (1:30)

orapiasia.com

https://marketplace.aviationweek.com/product/noviruclean-3471-concentrated-disinfectant-cleaner-and-deodorant

FDA AEROSPACE SOLUTIONS

Galley and Lavatory Deep Cleaning

Clean and sanitary aircraft are more important to the flying public than ever. Spray disinfection makes aircraft surfaces sanitized and safe, but do they actually look that way? FDA Aerospace Solutions specializes in breathing new life into any aircraft's Food and Drug Administration regulated areas quickly and affordably. Our Deep Cleaning and Decorative Repair process, combined with a total FDA Seal Refurbishment, will have your galleys, lavatories and even entry mats shining like new. Stains and cosmetic damage are removed and repaired, giving a clean look for your customers and vastly easier cleaning for your turnaround teams.

www.fdaaerospacesolutions.com

https://marketplace.aviationweek.com/product/galley-and-lavatory-deep-cleaning-decorative-repair-and-fda-sealant-refurbishment

Go to marketplace.aviationweek.com/acsg for more information.


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September 1970 News

We in this sizable sector of aviation have to live with downturns that seem to occur i**n regular four-to-five- year cycles** to airplane sales, pilot support jobs and flying activity. – *BCA Staff*

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Despite the present doldrums, the long-term picture for business aviation looks good. Its vicissitudes and attritions notwithstanding, business aviation, after years of healthy growth is surviving.

Either in spite of or because of the most serious recession in the last two decades of general aviation, this year's convention will have the largest number of exhibitors and most exhibits in the convention's 23-year history.

Who Knew — that you could rent a Falcon, by the mile, by the hour, by the month or buy the plane? (and save over $60,000 in the deal).

Pilots are being hired by Delta and Eastern airlines, while some 1,200 pilots and flight engineers from other major U.S. carriers remain furloughed.

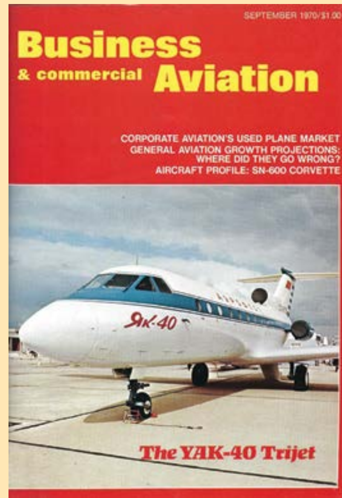
Hoover's Yellow Mustang bleew up in a ramp accident at Oshkosh, Wisconsin, en route to Abbotsford. The accident, which is believed to have totaled he airplane, occurred whole Hoover was at a motel in town. The plane was being serviced with oxygen when the bottle exploded. No one was hurt.

The general aviation industry used 20 million pounds of aluminum in 1969, according to the Reynolds Aluminum Company. The metal was in the form of sheet, plate and various extrusions.

Go Fly a Kite but don't break any FARs. The FAA has adopted new rules which prohibits all kites and balloons (any size) from being operated in a manner that creates a hazard to persons, property or other aircraft. Formerly, The FAA claimed authority only over kites weighing over five pounds and flown at the end of a rope or cable or moored balloons exceeding six feet in diameter.

An FAA study has uncovered direct relationship between faulty preflight procedures and accidents. The FAA says they were a major cause of accidents in 1968 (survey year) – 619 accidents of which 84 involved fatalities. **BCA**

THE ARCHIVE



Russia' Yak-40 didn't make it to the Abbotsford Airshow as planned, thus disappointing BCA flight crew who were promised sufficient time at the controls for a thorough evaluation. Though slow and short-legged for a bizjet, the three-turbofan, 30,000-lb. transport has some highly interesting features, such as a Gulfstream II-sized cabin and a price of $775,000. TWA captain Barry Schiff took the photo.

High flying answers from GECC who were asking readers to join the team at NBAA in Denver to talk about leasing plans.

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