

JULY 2019 \$10.00 www.bcadigital.com

BCA

Business & Commercial Aviation

OPERATORS SURVEY

Robinson R66

Passion,
performance
and price

ALSO IN THIS ISSUE

A Personal Medical Marathon
Sidestepping Operational
Complacency
Keeping Your Medical
Is Seeing Believing?
A Fatal Fog

AVIATION WEEK
NETWORK

Digital Edition Copyright Notice

The content contained in this digital edition (“Digital Material”), as well as its selection and arrangement, is owned by Informa and its affiliated companies, licensors, and suppliers, and is protected by their respective copyright, trademark and other proprietary rights.

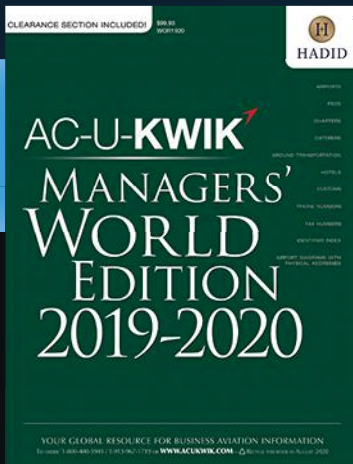
Upon payment of the subscription price, if applicable, you are hereby authorized to view, download, copy, and print Digital Material solely for your own personal, non-commercial use, provided that by doing any of the foregoing, you acknowledge that (i) you do not and will not acquire any ownership rights of any kind in the Digital Material or any portion thereof, (ii) you must preserve all copyright and other proprietary notices included in any downloaded Digital Material, and (iii) you must comply in all respects with the use restrictions set forth below and in the Informa Privacy Policy and the Informa Terms of Use (the “Use Restrictions”), each of which is hereby incorporated by reference. Any use not in accordance with, and any failure to comply fully with, the Use Restrictions is expressly prohibited by law, and may result in severe civil and criminal penalties. Violators will be prosecuted to the maximum possible extent.

You may not modify, publish, license, transmit (including by way of email, facsimile or other electronic means), transfer, sell, reproduce (including by copying or posting on any network computer), create derivative works from, display, store, or in any way exploit, broadcast, disseminate or distribute, in any format or media of any kind, any of the Digital Material, in whole or in part, without the express prior written consent of Informa. To request content for commercial use or Informa’s approval of any other restricted activity described above, please contact the Reprints Department at (877) 652-5295. Without in any way limiting the foregoing, you may not use spiders, robots, data mining techniques or other automated techniques to catalog, download or otherwise reproduce, store or distribute any Digital Material.

NEITHER Informa NOR ANY THIRD PARTY CONTENT PROVIDER OR THEIR AGENTS SHALL BE LIABLE FOR ANY ACT, DIRECT OR INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR ACCESS TO ANY DIGITAL MATERIAL, AND/OR ANY INFORMATION CONTAINED THEREIN.

AC-U-KWIK

Your Global Resource for Vital
Business Aviation Information



2019-2020 Managers' World Edition
NOW AVAILABLE to order!

Plan. Schedule. Dispatch.

Order yours at Acukwik.com/products



Keep up with all the news and blogs from BCA editors "like" us on facebook [facebook.com/aweekbca](https://www.facebook.com/aweekbca) and follow us on twitter [twitter.com/aweekbca](https://www.twitter.com/aweekbca)

46



Features

20 A Fatal Fog

Richard N. Aarons

Instantaneous disorientation on a pre-Christmas family jaunt

34 Robinson R66

Lou Churchill

Passion, performance and price

40 Is Seeing Believing?

Patrick Veillette

When visibility and ceiling reports differ from a pilot's perception

46 Drones 101, Part I

Mal Gormley

How these diminutive aircraft are revolutionizing the workaday world — including yours

52 A Personal Medical Marathon

Fred George

Confronted by the "Children of the Magenta Line" in medicine

56 Sunset for Circling?

Fred George

RNP procedures potentially eliminate need for high-risk approaches

28

28 Sidestepping Operational Complacency

James Albright

From one Challenger to another

40



11 Intelligence

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

Honda Aircraft Ups Elite Production

Uber Partners With Heliflite, Launches Uber Copter

Pre-Owned Jet Market Worth \$61 Billion Over Next Ten Years

De Havilland Name Returns to the Marketplace

Wheels Up Acquires Travel Management Co.

Tamarack Chapter 1.1 "Temporary State"



Fast Five With Bob Hobbi, President & CEO, ServiceElements, Phoenix, Arizona

71



Departments

7 Viewpoint

8 Readers' Feedback

22 Accidents in Brief

63 Point of Law

64 Twenty/20

66 On Duty

67 Advertisers' Index

68 Products & Services

71 BCA 50 Years Ago

65 Marketplace



DIGITAL EXTRAS



Tap this icon in articles in the digital edition of B&CA for exclusive features. If you have not signed up to receive your digital subscription, go to [AviationWeek.com/bccustomers](https://www.AviationWeek.com/bccustomers)

For the latest developments, go to www.bcadigital.com

Selected articles from BCA and The Weekly of Business Aviation, as well as breaking news stories and daily news updates

COVER

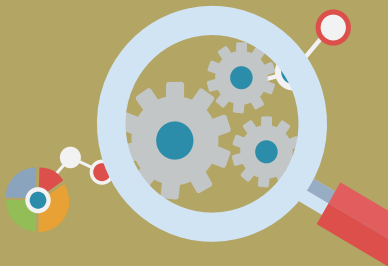
Photo of the R66 is courtesy of Robinson Helicopter



Get Key Developments and Analysis of the Business Aviation Market

Delivered right into your inbox, The Weekly of Business Aviation will provide you the data and intelligence you need to stay informed of this complex market.

Visit aviationweek.com/wba to download a complimentary edition



EMPOWER YOUR WORKFORCE WITH A GROUP OR SITE LICENSE

For more information visit: aviationweek.com/BAGroups



Editor-in-Chief
Executive Editor
Senior Editor/Chief Pilot
Safety Editor
International Operations/Features Editor
News Editor
Art Direction
Art Department
Associate Producer
Copy Editor
Contributors

William Garvey — william.garvey@informa.com
Jessica A. Salerno — jessica.salerno@informa.com
Fred George — fred.george@informa.com
Richard N. Aarons — bcasafety@gmail.com
David Esler — david.esler@comcast.net
Molly McMillin — molly.mcmillin@informa.com
Lisa Caputo — lcaputo@aviationweek.com
Scott Marshall — scott.marshall@aviationweek.com
Colin Throm — colin.throm@aviationweek.com
Theresa Petruso — theresa.petruso@aviationweek.com
Scot Greenan — smpg124@att.net
James Albright — james@code7700.com
Mal Gormley — malgormley@gmail.com
Kent S. Jackson — kjackson@jetlaw.com
Ross Detwiler — rossdetwiler.com
Patrick Veillette, Ph.D. — jumpsaway@aol.com
Ringston Media — info@ringstonmedia.com
520 Folly Rd., Ste. 238, Charleston, S.C.
(520) 638-8721 • (843) 718-2458

Editorial Offices

Publisher

Beth Wagner — beth.wagner@aviationweek.com
Phone: (202) 517-1061

Managing Director, Directories

Frank Craven — frank.craven@informa.com
Phone: (913) 967-1729

Managing Director, Business Aviation Intelligence/Data Services

Anne McMahon — anne.mcmahon@aviationweek.com
Phone: (646) 291-6353

Director of Sales, Business Aviation

Elizabeth Zlitni — elizabeth.zlitni@informa.com
Phone: (913) 967-1348

Advertising Production Coordinator

Kara Walby — kara.walby@informa.com
Informa, 9800 Metcalf Ave., Overland Park, KS 66212
Phone: (913) 967-7476 • Fax: (913) 514-7303

Senior Audience Development Manager

Tyler Motsinger — tyler.motsinger@informa.com
Phone: (913) 967-1623

Head of Business Aviation Fleet Data

Nigel Prevett — nigel.prevett@aviationweek.com
Phone: 407-314 7403

Head of Valuations, Business Aviation

Chris Reynolds — chris.reynolds@informa.com
Phone: (913) 967-1956

Subscription Information

BCA Customer Service:
(800) 525-5003; +1 (847) 9147
Email: bca@omeda.com

Manage Your Subscription:
aviationweek.com/bcasubscribers

Reprints

Wright's Media
Nick Iademarco — informa@wrightsmedia.com
Phone: (877) 652-5295 • Fax: (281) 419-5712

President, Aviation Week Network
Managing Director—Civil Aviation Administrative Offices

Gregory Hamilton — hamilton@aviationweek.com
Iain Blackhall — iain.blackhall@aviationweek.com
605 3rd Ave., New York, N.Y. 10158

By Informa Markets

BCA - Business & Commercial Aviation (ISSN 0191-4642) is published monthly by Informa Markets, a trading division of Informa PLC, 9800 Metcalf Ave., Overland Park, KS 66212-2216. 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, 12 issues): United States and Canada, \$59.00; all other countries, \$79.00. For single copies/back copies call Customer Service at (800) 525-5003 in the United States and (847) 763-9147 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.

Permissions: Material in this publication may not be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the prior written permission of the publisher.

Postmaster: Send address corrections to BCA - Business & Commercial Aviation, P.O. Box 1174 Skokie, IL 60076-8174. (Present subscribers include label)

© Copyright 2019 by Informa Markets, a trading division of Informa PLC. All rights reserved.



CAN
CORPORATE ANGEL NETWORK

CORPORATE
ANGEL AWARD

Williams®

THANK YOU, WILLIAMS, FOR GIVING CANCER PATIENTS A LIFT.

Providing The Energy To Bring Patients Closer To Their Cure.

Congratulations to Williams and its flight department, the latest recipient of the Corporate Angel Award presented by Corporate Angel Network (CAN), Phillips 66® Aviation, Safe Flight Instrument Corporation and *Business & Commercial Aviation Magazine*.



Williams, like more than 500 other major corporations, is a participant in CAN, a national public charity that arranges free passage for cancer patients using empty seats on corporate jets. Since joining CAN in 1995, Williams has transported hundreds of men, women and children to recognized cancer treatment centers across the country.

Corporate Angel Network, Phillips 66 Aviation, Safe Flight Instrument Corporation and *Business & Commercial Aviation* are proud to honor Williams for giving cancer patients a lift in both body and spirit.

**BECOME A CORPORATE ANGEL:
CALL US AT 866-328-1313 OR GO TO
CORPANGELNETWORK.ORG.**

BCA⁷

SAFE FLIGHT
INSTRUMENT CORPORATION



AirCharter

GUIDE



Know Your Options

So many destinations.
So many aircraft.
One source: aircharterguide.com.

AVIATION WEEK
NETWORK

BCA

Advertising Sales

Publisher

Beth Wagner – beth.wagner@aviationweek.com
(202) 517-1061

Director of Sales

Elizabeth Zlitni – elizabeth.zlitni@informa.com
(913) 967-1348

North America Advertising Sales

Pacific Region

Miguel Ornelas – miguel.ornelas@aviationweek.com
(661) 480-7000

Midwest Region

Rob Howlett – rob.howlett@aviationweek.com
(949) 481-4519

Eastern Region

Cheryl Mahon – cheryl.mahon@aviationweek.com
(949) 481-4519

Florida, Georgia, South Carolina

Beth Eddy – betheddy@aviationexhibits.com
(561) 279-4646

Canada

David Seaberg – david.seaberg@vicbrownmedia.com
(416) 787-0914

Strategic Account Managers

Tom Davis – tom.davis@aviationweek.com
(469) 854-6717

Matt Holdreith – matt.holdreith@informa.com
(646) 719-0767

FBO Advertising Sales

Jodi Espinoza – jespinoza@acukwik.com
(913) 967-1651

Sara Hellon – sara.hellon@informa.com
(913) 967-1833

Jennifer Shafer-Doyle – jennifer.shafer@informa.com
(913) 967-1833

Worldwide Advertising Sales

Francine Brasseur – francine.brasseur@informa.com
+(617) 649-0411

Bettina Gentile – bettina.gentile@informa.com
(617) 649-0414

Michele Markarian – michele.markarian@informa.com
(617) 649-0420

Europe

David McMullen – david.mcmullen@aviationweek.co.uk
+44 (0) 1925 596176

Andrea Prudente – andrea.prudente@aviationweek.com
+44 207 152 4524

Israel

Tamir Eshel – invision@netvision.net.il
+972 (9) 891-1792



Analyze the business aviation market to capture your next deal.

- Market and competitive insights
- Fleet data services: historical and current fleet ownership and status; forecast and valuations
- Research and analysis offerings

Take your business to the next level.

Visit pgs.aviationweek.com/GlobalBusinessAviationSolutions

or call Anne McMahon at + 1 646 291 6353 or
Thom Clayton +44 (0) 20 7017 6106

AVIATION WEEK
NETWORK

CORPORATE ANGEL NETWORK



Fund an Angel Cocktail Reception

Wednesday, October 23 | 6-8 P.M. | Wynn Las Vegas

The 10th Annual Fund an Angel Cocktail Reception, held on the second day of the NBAA Business Aviation Convention & Exhibition (NBAA-BACE), is an invaluable networking event for business aviation leaders and influencers. The reception will feature an auction to benefit Corporate Angel Network (CAN) who organizes critical flights for cancer patients to treatment centers throughout the country.



"Corporate Angel Network has helped to open up trials and treatment for Ava that we otherwise could not afford. They help to ensure she gets the medical care that she needs."

- Ava's Parents

Learn More and Reserve Tickets: fundanangel.org

A SPECIAL THANKS TO OUR CURRENT SPONSORS

Presenting Sponsor  NBAA

PLATINUM



SCHWEITZER
ENGINEERING
LABORATORIES



GOLD



TEXTRON AVIATION

SILVER



BRONZE





No Alternative

Both **the message and means** are clear

SPRINGTIME IS MARKED BY BUDDING FLOWERS, RED CARDINALS, marsh frog choruses, showers and gatherings of the air minded. This year I attended the European Business Aviation Convention and Exhibition (EBACE) in Geneva, Dassault Falcon Jet's annual hosting of suppliers, operators and maintainers in Wilmington, Delaware, and the JetNet iQ Summit in advance of the National Business Aviation Association regional meeting in White Plains, New York. All those convened within five weeks of each other. And yes, thank you, that's quite enough time logged in Seat 23A; I'm staying put for the summer.

While the subjects covered at these gatherings were manifold, with news from EBACE alone resulting in hundreds of stories in *ShowNews* and other convention publications, among others. I expected that. One thing that surprised me, however, was the notable focus on sustainable alternative jet fuel (SAJF) at nearly every one of those assemblies.

Indeed, EBACE launched with the arrival of a score of display aircraft — from Gulfstreams, Globals, and Falcons to a Diamond and TBM — powered by a blend of Jet A and SAJF. Many of those first assembled at TAG Aviation Farnborough for a “Fueling the Future” conference at which SAJF's composition and benefits were explained and then promoted.

This was the third major push for SAJF in business aviation. It was highlighted at the previous EBACE, then in early January at a day-long media event at Van Nuys Airport (KVN) in California, and most recently at the Farnborough/EBACE promotion. The Van Nuys affair — I arrived on a cross-country flight in an SAJF-burning G280 — was an eye-opener for me.

Simply put — and there's nothing simple about this — Jet A can be refined from sources other than petroleum, including municipal waste, non-food plants and used cooking oils, among other things. The process and chemistry varies by the source, but in the end, the SAJF biofuel must meet ASTM standards. The intent is for SAJF to be a drop-in fuel requiring no or little action on the part of the aircraft operator to accommodate its use, and is mixed with petroleum-derived Jet A at ratios ranging from 30:70 to as high as 50:50, depending.

The goals of the effort are several: that the process of collecting, shipping, refining, delivering and burning SAJF would eventually be carbon neutral; that its use reduces dependence on extraction of a limited natural resource; and as significantly, that it puts users in the Caring column.

You see, aviation has a problem. Despite all the current focus on aviation's electric, hybrid electric, fuel cell and drone developments, to go the distance now and in the foreseeable future, turbine-powered airplanes will remain the main transports, and they need Jet A to get them there. And while turbine-engine makers continually and admirably improve the fuel burn rates of their products, the undeniable facts are that combustion produces CO₂ emissions, and that air transport globally is increasing. As a result, some people — quite a lot of people, actually — object to aviation's increasing carbon fallout. And they're gaining voice and power.

SAJF availability is but a trickle in today's fuel stream. So, the stuff is expensive — three or more times the price of regular Jet A, if you can find it at all. As a result, I was somewhat dismissive about the emphasis business aircraft manufacturers, associations and suppliers were placing on the fuel's adoption. Our segment's consumption levels are so extremely modest when compared to that of the airlines, business aviation's use of the stuff won't move the needle at all, really.

But then in discussions with many other event presenters and attendees, another perspective dawned.

But then in discussions with many other event presenters and attendees, another perspective dawned.

I'm a total business and general aviation believer. Unlike the commercial carriers, our segment fulfills aviation's true promise of flexibility and availability, allowing us to go wherever we want, whenever we choose. But despite the industry's introduction of jet cards, fractionals, clubs, empty leggers and all the other recent use innovations, the convenience comes at a cost that not many can afford. And it is those others who are in the majority, and they vote.

So, if that group perceives business aviation users as uncaring polluters, bad things could happen. Such as? How about onerous fines, forced carbon offsets, even denied access, and, perhaps, fees based upon the amount of CO₂ generated per passenger? The list of ugly possibilities goes on and on.

Irrespective of your assessment of global environmental conditions and causes, supporting the adoption of SAJF and reducing our carbon footprint will be of ever-growing significance to business aviation's viability. Notably, just as the faithful were making their way to the NBAA regional, the French government was calling upon all European transport ministers to consider imposing significant taxes on aircraft operators to help reduce their CO₂ emissions. An unwelcome springtime meeting of minds, but just a beginning. **BCA**



Balancing Act

"Finding a Balance Between Work and a Personal Life" (April 2019) is a great article that rings true on many levels.

It is interesting how the discussion on Quality of Life swerved into a look at the current pilot shortage. In reviewing the many approaches flight departments are taking to bring in and retain pilots, one big element was overlooked.

Insurance companies rule the world and create a huge barrier to good, capable, talented professionals from entering business aviation. Even more of a stumbling block than low second in command salaries are the high arbitrary standards set by ARGUS, Wyvern, and the like. I refer to 500 hr. multiengine/1,000 hr. jet and other such minimums.

I admit, I am biased. I've run into this stonewall. With 40 years of flying, 30 years as a professional, 7,300 hr. TT, 5,000+ hr. as a CFI, ATP, CFI single and multiengine, I am still deemed an unemployable risk because of my low 200+ hr. of multiengine time and very little turbine exposure. I can train individuals from zero time and groom them into capable multiengine professionals, but I am considered untrainable myself. It's hard not to take it personally.

More to the point — I know general aviation. I've lived general aviation. There are excellent professionals working in small communities, struggling to grow aviation in their markets. As it stands, their careers suffer if their clients do not have multiengine turbines. Also true, the industry and opportunities are different today. Pilots are extracting acceptable performance and economies from single-engine platforms such as from Cirrus, Mooney and Piper. Companies are comfortable staying out of turbines. When owner-flown, these aircraft don't offer the same employment opportunities that the big twins used to in the past. And, insurance-mandated factory training often cuts out local CFIs from servicing owners when needed.

The current system promotes a gypsy existence, with pilots chasing hours, jumping from employer to employer, rather than focusing on the quality of the individual. Is there any surprise that so many look towards the brass ring of



airline employment? Throughout their budding careers it's been hammered into them that their entire value rests solely in their flight hours, and their career growth only comes from jumping ship for a bigger paycheck.

I've been an employer. I'm a business owner. First and foremost, I'm a teacher. I believe in the potential of people, if

"The current system promotes a gypsy existence, with pilots chasing hours, jumping from employer to employer, rather than focusing on the quality of the individual."

LThomas J. Nagorski, Belgrade, Monana

given a chance and properly mentored. It saddens me to read about the pilot shortage while at the same time, seeing minimums that exclude many excellent individuals. Personally, if I have to choose between flight hours and the quality of an individual, I'll vote to hire the strong personality every time. I can groom a pilot for the task at hand. I can't turn someone into a well-rounded, disciplined, thoughtful team member.

Thanks for letting me voice my opinion.

Thomas J. Nagorski, ATP, CFI-AS&ME/IA/G
Paragon Air Adventures, LLC
Bozeman Yellowstone International Airport
Belgrade, Montana

Design Flaw?

Thank you for the insightful article on the Ameristar Charters MD83 accident (**"Cause & Circumstance," May 2019**). I am rather fond of flying the MD-83 but have no love for the elevator design. The tab-driven concept was copied from a less than stellar British design: the BAC1-11. It was once described by a senior FAA engineer as "the tail that wags the dog" and probably would not be certified by today's standards.

Your assessment of the accident is spot on — conventional training

"mandates" continuing the takeoff when above V_1 as if it were cast in stone, and stone tablets are too heavy to carry around. There are circumstances that do require abstract thinking on split-second notice and current training largely fails to address this. There are a myriad of bad things that can happen when stopping a heavy aircraft at speeds above V_1 , as shown in your article.

On the plus side it is worth noting that modern carbon brakes are extremely powerful and exceeding max brake energy is not necessarily fatal. The important thing is to stay on the runway. It may also be useful in aircraft like the MD-83 to do a second control sweep at

low airspeed to check for jams that are not obvious when at rest.

David H. Gollings
MRG Associates

What Would You Do?

I just finished your lengthy and detailed account of Ameristar Charter Flight 9363 (**"Cause & Circumstance" May 2019**). It was both riveting and infor-



mative, aside from being very well written.

Our Hawker 900XP is no comparison to the MD-83 but I immediately called our pilots to determine what they do for prolonged stays on runways where wind conditions could adversely affect

the elevators.

Thanks for a great article.

Paul Nietzel
Omaha, Nebraska

Pilots Used to Do That

While reading “Improving Charter Safety” (“Point of Law” May 2019) I had to chuckle when I read Kent Jackson’s definition of TAWS: “A TAWS works by using digital elevation data and airplane instrumental values to predict if a likely future position of the aircraft intersects with the ground.”

While I really do understand the safety value of TAWS in today’s demanding environment, I still couldn’t help but think; yeah, that’s what pilots used to do!

Richard Robson, ATP
Julian, California

Remaining in Command

This is about push back, but not backing out from a gate. It’s about ensuring that a pilot in command remains pilot in command.

A few weeks back I was on an IFR flight plan in “marginal IFR” conditions flying into a small uncontrolled field with an ASOS. As I approached the airfield the approach controller asked, “What approach would you like?”

Given the conditions, and to avoid a circuitous and time-consuming instrument approach I advised, “I’d like a contact approach”.

The controller came back fairly promptly advising that a contact approach could not be approved because the airfield lacked an operating control tower. I keyed my mic and politely responded, “Well actually, that’s not true.” I confess to having silently chuckled while imagining the controller’s stunned reaction, and after a moment he responded, “I’ll have to get back to you on that.”

Having no response to my request as I approached the airfield, and with VFR conditions breaking out, I simply cancelled IFR.

Later I contact the approach facility and described the event. The supervisor immediately noted that it shouldn’t have happened, and he would take corrective action by providing additional



training to the controller.

End of story? Not quite. There’s an important point to be made. Another pilot might have believed as gospel the controller’s reasoning for denying

“Please spare us the global warming/climate change propaganda. Weather and climate are cyclical. . . . For those who insist on short-term snapshots, the numbers don’t support the climate change hysteria. . . .”

Jason Smith, McAllen, Texas

the approach requested, but so, too, would the controller! Both individuals would have had their mutual misconceptions maintained and reinforced, one fostered by the other. But it probably would not have stopped there, with each of them subsequently passing on their “knowledge” to others

So, like they say in New York City, “If you see something, say something.”

Ted Stanley
Direct Flight, Inc.

Martha’s Vineyard, Massachusetts

It’s Called Nature

Please spare us the global warming/climate change propaganda. Weather and climate are cyclical. While I don’t have the time to fully refute the incorrect assertions in “Hurricanes and Aviation” (June 2019) let’s take a breath and remember our existence on this planet is the tiniest of fractions compared to its total existence. These cycles cannot be seen or measured in a human lifetime.

For those who insist upon short-term snapshots, the numbers don’t support the climate change hysteria there, either. According to federal data, the 36 most destructive hurricanes in U.S. history show no increase in intensity over time (hat tip to Dr. Roy Spencer’s September

2018 analysis on drroyspencer.com). While the nominal monetary cost of damage has increased in recent years, that has to do with where and how many people live in hurricane-prone areas compared to decades past. It is not due to stronger storms.

We’ve had extended periods without major hurricanes. Allen, which passed directly over my house in 1980, remains the strongest Atlantic hurricane by wind speed ever recorded, but we would be foolish to think a storm of that intensity was unprecedented. Storms

come. Storms go.

Climate changes. It’s called nature. If you doubt me, ask yourself where the glaciers that covered much of Europe and North America 11,500 years ago went, and if you think they won’t come back some day. They will.

Capt. Jason Smith
McAllen, Texas

Thanks for Sharing

“Thinking Back Globally” (May 2019) was such a good read — I felt like I went along on some of those trips. My international flying has been modest, but even one Atlantic crossing gives you a good idea of how complicated things can be.

Thanks for being willing to share some of those great experiences with readers, and for being transparent too. I enjoy learning from guys like you.

Kirk Hays
North American Jet
Austin-Bergstrom International Airport
Austin, Texas

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



OPEN UP THE BOARDROOM

Work efficiently without limits.

Connect in real time with the secure, high-performance, low-latency network.

The Most Compelling User Experience • smartskynetworks.com/ATG • 800.660.9982



© SmartSky Networks, LLC 2019. All Rights reserved.

INTELLIGENCE

EDITED BY **William Garvey,**
Jessica A. Salerno and
Molly McMillin
william.garvey@informa.com
jessica.salerno@informa.com
molly.mcmillin@informa.com

NEWS / ANALYSIS / TRENDS / ISSUES

▶ **HONDA AIRCRAFT IS PREPARING** to ramp up production of HondaJet Elites by 25%, to five aircraft per month from the current four, by next year. It is hoped the transition will begin “late this year or next year,” depending on the level of automation to be incorporated in the wing assembly process, Honda Aircraft President and CEO Michimasa Fujino said in late May. **An 82,000-sq.-ft. extension of the Greensboro, North Carolina, factory is due to open in July 2020 for the automated wing assembly, along with some parts storage.** The space freed in the current building will be “needed in [the] future.” Fujino would not say whether this would be for a second aircraft in the airframer’s product line. Honda plans to deliver 50 aircraft this year.



Last year’s deliveries, at 37, were slower than those in 2017. Fujino said the decrease was due to the transition to the Elite model, the impact of the governmental shutdown and some fleet deliveries that slid to 2019. The order backlog is equivalent to one year of production, he says. The HondaJet Elite sells for \$5.2 million.

▶ **DAHER RECENTLY INTRODUCED THE LATEST VERSION** of its upgraded six-passenger TBM 940 single-engine turboprop, which succeeds the TBM 930. Upgrades include an auto-throttle, automatic deicing system, additional thermal insulation for the sidewalls, redesigned seats, a 150-volt electric power sockets, USB ports, and a new central shelf with side storage. The aircraft was on display at the European Business Aviation Convention & Exhibition, held in Geneva in late May. “TBM 940 redefines the ultimate private aircraft: user-friendly, safe and efficient for both pilots and passengers,” said Nicolas Chabbert, senior vice president of the Daher Airplane Business Unit. The aircraft has a maximum cruise speed of 330 kt. and a range of 1,730 nm, the same as the TBM 930. The TBM 940 has Garmin 3000 integrated avionics. An automated throttle is the first to be installed on a standard



pilot fails to take action and icing or ice accretion is detected, an amber alerting message comes on and the system automatically activates to deice the airframe, windshield, propeller and the engine’s particle separator. Revalidation of the TBM 700 Type Certificate to include the 940 has been slower than hoped, but was finally achieved in Europe in May, clearing the way for deliveries to begin in June 3. U.S. approval expected later, but Chabbert said, “I don’t see a problem.” Orders specifically for the TBM 940 total 25 from customers in Brazil, Germany, Japan, the U.K., the U.S. and elsewhere. Deliveries of the TBM 900 family have reached 274, from 304 on order, while the overall TBM (700/800/900) tally is 936 delivered and 1.6 million hours flown.

Jet-A and Avgas Per Gallon Fuel Prices June 2019

Jet-A			
Region	High	Low	Average
Eastern	\$8.90	\$4.45	\$6.28
New England	\$7.76	\$3.90	\$5.24
Great Lakes	\$8.40	\$3.43	\$5.57
Central	\$7.61	\$3.37	\$4.99
Southern	\$8.37	\$4.35	\$6.04
Southwest	\$6.90	\$3.30	\$5.29
NW Mountain	\$7.83	\$3.55	\$5.37
Western Pacific	\$8.53	\$4.08	\$6.11
Nationwide	\$8.04	\$3.80	\$5.61

Avgas			
Region	High	Low	Average
Eastern	\$8.71	\$4.90	\$6.59
New England	\$7.45	\$5.00	\$5.95
Great Lakes	\$8.59	\$4.59	\$6.09
Central	\$7.59	\$4.51	\$5.52
Southern	\$8.50	\$4.30	\$6.31
Southwest	\$7.19	\$4.00	\$5.65
NW Mountain	\$8.46	\$4.70	\$5.84
Western Pacific	\$8.52	\$5.05	\$6.43
Nationwide	\$8.13	\$4.63	\$6.05

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

For additional information, contact Aviation Research/U.S. Inc. at (513) 852-1010 or on the Internet at www.aviationresearch.com

✦ *For the latest news and information, go to www.bcadigital.com*

Sheltair Completes Orlando FBO



Sheltair has completed a four-story fixed base operator terminal at Orlando Executive Airport in Florida. The expansion is in addition to two new hangars with available office space. Sheltair Aviation has also opened a 144,000-sq.-ft., \$55 million FBO hangar complex at Republic Airport in Farmingdale, New York.

Desert Jet Center Waives Ramp Fees For Angel Flight



Desert Jet Center will waive ramp fees for all Angel Flight West volunteer pilots conducting missions from the Palm Springs, California, area and Coachella Valley. Angel Flight West provides free air travel for children and adults with serious medical conditions or other needs. Desert Jet Center will waive ramp fees for missions arriving at the executive fixed-base operator in KTRM.

▶ **AMONG BUSINESS AVIATION'S LEADERS** in environmental responsibility is the Platinum Flight Center FBO and campus at Appleton International Airport — LEED-certified by the U.S. Green Building Association and classified as a Class D Net Zero Emissions Building (NZEB). Appleton International in Greenville, Wisconsin, was one of 10 airports selected nationally by the FAA to participate in an initial Sustainable Master Plan pilot program in 2011. Using goals set by the program, the airport set to work creating a general aviation campus to the south of the commercial passenger terminal that was completed in 2013. Today, the finished campus is managed by Platinum Flight Center. It includes the FBO terminal, a heated corporate hangar, a storage hangar for housing multiple corporate jets, and a ramp with tie-down parking for as many as 100 aircraft. With an eye to environmental concerns, a geothermal heat pump and in-floor radiant flooring optimizes energy performance; refrigerants used in the building's HCAC systems are none-chlorofluorocarbon compound-



based; a 25 kW system mounted on the south facing portion of the roof provides approximately 29,000 kW of power a year; high-efficiency lighting is used throughout the building and well-placed skylights and windows reduce the need for artificial lighting during daylight hours. There are also occupancy sensors for lighting and mechanical systems, a rainwater catchment system for water conservation and high-efficiency electrical, mechanical and plumbing systems. In fact, using efficient plumbing fixtures resulted in a 40.23% reduction in water demand compared with a building of traditional construction. Landscaping and site work have restored the natural habitat and preserve storm water quality near the building. A light-colored roof and extensive overhangs prevent heat buildup in and around the building, and native and adapted plant species that do not require portable water are used on the building site. An annual highlight at Platinum Flight Center is participation in EAA AirVenture Oshkosh, the largest aviation air show in the world, annually drawing a half-million visitors from 80 countries and more than 10,000 aircraft to nearby Wittman Regional Airport every summer. Platinum accommodates as many as 1,000 aircraft during the show week, a camp site includes shower facilities and charging stations for electronic devices, and there are no addition fees applicable at Platinum for the duration of AirVenture. Platinum is described as a full-service FBO, including: concierge and baggage handling; plane-side access for ground transportation; potable water; laundry service; maintenance; deicing types 1 and 2; preheat and plug-in service; flight planning; passenger lounge; pilot lounge; conference room; and free WiFi access. **Kirby Harrison**



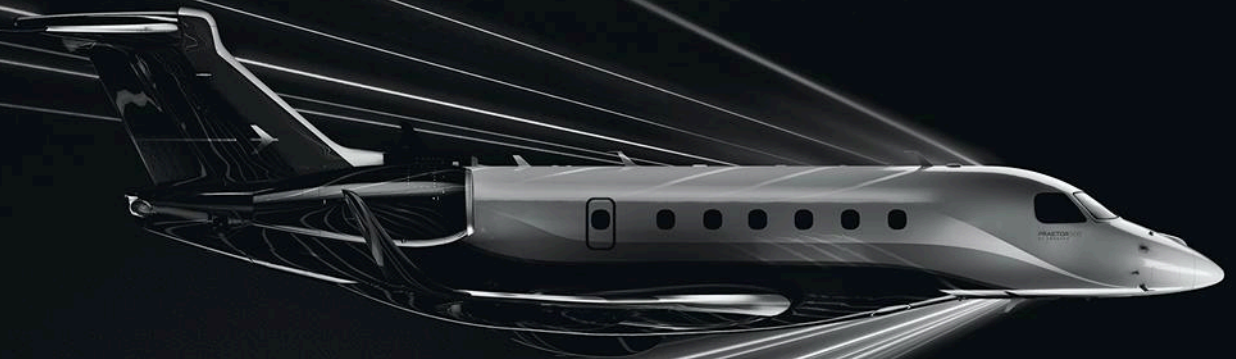
▶ **APRIL BUSINESS JET AND TURBOPROP ACTIVITY IN EUROPE** declined 12.3% compared to a year ago, according to Argus International. Large jet activity declined 16.8%, followed by turboprops with a 14.0% drop. Light jet activity declined 8.7%, while midsize activity decreased 4.3%. Compared to March, European flight activity rose 1.6%. According to Colibri Aircraft, part of the drop could be from a **decline in the number of business aircraft registered in the U.K., which fell 4.6% from January 2018 to January 2019**, it said. Increased demand for pre-owned jets from the U.S. market has meant a rise in aircraft going from Europe to the U.S., Colibri said. The reduced European fleet has led to a reduction in flights.

PRAETOR 600: CERTIFIED OUTPERFORMANCE.

Announcing the certified Praetor 600, the world's most disruptive and technologically advanced super-midsize aircraft that leads the way in performance, comfort and technology.

Unveiled at NBAA in October 2018 and now certified by ANAC, FAA and EASA, the Praetor 600 did not just meet initial expectations, it exceeded them. Named for the Latin root that means "lead the way," the Praetor 600 is a jet of firsts. It is the first super-midsize jet certified since 2014. The first to fly beyond 3,700 nm at M0.80. The first with over 4,000 nm range at LRC. The first with full fly-by-wire. The first with Active Turbulence Reduction. The first with a cabin altitude as low as 5,800 feet. The first with high-capacity, ultra-high-speed connectivity from Viasat's Ka-band. And all of this, backed by a first-placed Customer Support network.

Learn more at executive.embraer.com/prae600.



LEADING THE WAY

PRAETOR JETS



CHALLENGE.
CREATE.
OUTPERFORM.

JSSI Signs Parts Agreement With Contour Aviation

JSSI Parts & Leasing, a division of Jet Support Services (JSSI), has signed a new supply chain services agreement with Contour Aviation. Under the agreement, JSSI Parts will provide parts procurement from initial request to delivery, logistics and billing support to Contour's fleet of business jets for private charter. Contour supports more than 8,000 maintenance events for clients every year.

PrivateFly Adds Summer Routes



To keep up with customer demand, PrivateFly, a division of Directional Aviation, has added new summer routes to its schedule with fixed prices on a 13-seat Embraer Legacy 600. The new city pairs include flights between London and Mykonos, Paris and Marrakech, and Moscow and Nice. Flights follow the existing price menu for the six-seat Nextant 400XTi, which launched in April. Its fixed-price city pairs have proven popular with on-demand charter clients since their launch and now account for more than 25% of flights

▶ **ZEAN NIELSEN, AN EXECUTIVE WITH** experience in industrial building material, electric cars and luxury electronics, has been named CEO of Cirrus Aircraft. Meanwhile, Dale Klapmeier has transferred as an advisor to the company he co-founded with his brother, Alan, in 1984. "We are fortunate to have someone of Zean's caliber and experience to lead us into the next era of growth," Klapmeier said. "I am looking forward to moving into a senior advisory role and continuing to work with our exceptional team on reinventing the future of personal transportation." Rolland Vincent, with consulting firm Rolland Vincent Associates, said he was surprised at the change of CEOs. But **Nielsen assumes the CEO position at a good time.** The company has been "laid out pretty nicely," Vincent said. "I like what I see at Cirrus." In 2018, Cirrus delivered 443 Cirrus SR20, SR22, SR22T and SF50 aircraft, up from 377 in 2017.



▶ **UBER HAS PARTNERED WITH CHARTER HELICOPTER** operator **Heliflite to launch Uber Copter**, "the first consumer manifestation of Uber Elevate," the ride-hailing giant's planned urban aerial ridesharing service. Launched in New York, Uber Copter is to connect lower Manhattan with John F. Kennedy (JFK) International Airport. "We've built Uber Copter to provide us with insight and real-world experience as we continue to lay the foundation for Uber Air," says Eric Allison, head of Uber Elevate. Uber Air is the company's planned urban air-taxi service. "This is Uber's first multi-modal option, integrating an 8-min. helicopter flight with an Uber trip on both ends with a single tap of a button. **Uber Rewards Platinum and Diamond members will get the first opportunity to try this new fast and seamless way to get between Manhattan and JFK," he says.** The service was set to begin July 9, with flights available Monday through Friday during afternoon rush hours. "We will continue to expand availability over the following weeks and months," Uber says, adding the service could save an hour or more over ground transportation in rush hours. Using the company's existing network and technology, Uber Copter may be booked from five days in advance up to 1 hr. before the flight. Uber says that Heliflite will provide the service using a fleet of dual-engine, dual-pilot helicopters. *The New York Times* quotes Uber as saying flights will cost \$200-\$225.

▶ **A RECENT FAA AND EUROPEAN AVIATION SAFETY AGENCY (EASA)** grounding of all Cessna Citation Model 525, 525A and 525B business jets fitted with Atlas active winglets forced Tamarack Aerospace into bankruptcy in June. "**Tamarack believes that Chapter 11 will be a temporary state, and it is meant to ensure the long-term viability of the company,**" the Idaho company said in a prepared statement. U.S. aviation regulators on May 24 issued an airworthiness directive (AD) against the Tamarack system, which has effectively grounded the fleet of 76 Cessna CitationJets with the winglets installed. Tamarack said it has offered Atlas upgrades free of charge in the form of two Service Bulletins issued prior to the ADs. The company said, "These solutions have been proposed as the resolution of the ADs" and is working with all CJ owners to arrange for upgrades. It said the aircraft that precipitated the AD had not been upgraded. Tamarack said its goal was to complete retrofit of the Atlas systems "as soon as possible." Meanwhile, Tamarack has appointed new leadership following its Chapter 11 reorganization. Company founder Nicholas Guida, who invented the Active Winglet, has been named CEO, while Jacob Klinginsmith, former Tamarack chief engineer, has been appointed president. The Sandpoint, Idaho company said the appointments are part of a strategic reorganization to ensure its strength and viability and to offer continued operational safety of the existing fleet, as well as to develop new product lines. "We have some significant short-term challenges to overcome as a result of the ADs, but I am confident that the technical solutions we have proposed to EASA and the FAA ADs will be accepted," Klinginsmith said. "Added Guida, "I am confident that we will emerge from Chapter 11 stronger and more invigorated."

▶ **THE AIRCRAFT OWNERS AND PILOTS ASSOCIATION** (AOPA) has launched its annual survey of those who have taken flight training, including recurrent training within the past 12 months. The survey is available online until noon EDT on July 31. The survey helps AOPA identify and recognize flight schools and instructors who excel in their field. The survey also identifies and monitors trends within the flight training industry.

▶ **THE PRE-OWNED BUSINESS JET MARKET** will be worth **\$61 billion over the next five years, nearly two-thirds the value of new aircraft delivered.** And used transactions will outstrip new deliveries by four to one. That is the conclusion of the *5-Year New and Pre-Owned Business Aviation Market Forecast* by global broker and sales company Jetcraft. It is the first of its kind to predict both new and pre-owned aircraft transactions and analyze aircraft retirements. The forecast anticipates 11,765 pre-owned transactions over the next five years, compared to 3,444 new deliveries. **By 2023 it is expected that the combined industry value will reach nearly \$30 billion per annum.** New aircraft unit deliveries are predicted to stay flat throughout the forecast period while generating higher revenues, due to the increase in large aircraft transactions. Meanwhile, the pre-owned market is forecast to grow at a proportionally faster rate than new. Jetcraft's forecast also maintains the clear shift toward large aircraft, both in pre-owned and new unit deliveries and highlights. And it finds that the average retirement age of a business aircraft is 32 years. Jetcraft's full forecast is available at <https://www.jetcraft.com/knowledge/market-forecast>

▶ **WHEELS UP HAS ACQUIRED WHOLESALE LIGHT JET CHARTER OPERATOR** Travel Management Co. (TMC), which operates a fleet of 26 Hawker 400XPs. The acquisition complements Wheels Up's fleet of 93 aircraft, which includes 72 King Air 350i turboprops, Wheels Up founder and CEO Kenny Dichter said. "It firmly puts us in the light jet space," Dichter said. *The Weekly of Business Aviation* caught up with Dichter following a town hall meeting with Travel Management staff in Elkhart, Indiana. Travel Management also has a "wonderful pilot force" of more than 90 pilots, Dichter said. **Travel Management, based in Elkhart, Indiana will operate as an independent subsidiary of Wheels Up and continue its business model serving its existing clients, the company said.** Meanwhile, Gama Aviation will continue to operate the Wheels Up fleet of aircraft. Wheels



Up has the largest all-Textron Aviation fleet in the world, Dichter said, operating King Air, Citation Excel and XLS, Citation X and now Hawker 400XP aircraft. "This acquisition is a foundational piece in our continued brand

evolution and mission to provide our members with a total private aviation solution, and we are thrilled to be welcoming TMC into the Wheels Up family," Dichter said. **TMC and their light jet fleet are a perfect complement to our anchor partner, Gama Aviation, and their pilots,** who will continue to operate the aircraft in our Wheels Up fleet and provide our members with the same high level of safety and service that they do today." Founded more than five years ago, Wheels Up now has more than 5,000 members, Dichter said, and is "looking forward to partnering with industry leaders. We've got the brand. We're looking to make our membership more valuable by adding and partnering."



Custom fabricated large sapphire windows for use protecting electronics in aircraft and drones that fly in harsh weather and demanding environments have been introduced by Providence, Rhode Island-based Meller Optics, Inc. Meller Large Sapphire windows can be fabricated in different configurations and sizes up to 10-in. diameter, depending on the diameter to thickness aspect ratio. Featuring transmission from the UV to IR (270 nm to 4.7 microns), they are as clear as glass and provide a protective surface for sensors and cameras that would be exposed to sand and other high-speed particulates. Meller Large Sapphire Windows are priced according to configuration and quantity. Price quotations are available on request. Visit www.melleroptics.com

European Flight Activity Declined in April

April business jet and turboprop activity in Europe declined 12.3% compared to a year ago, according to ARGUS International. Large jet activity declined 16.8%, followed by turboprops with a 14.0% drop. Light jet activity declined 8.7%, while midsize activity decreased 4.3%. Compared to March, European flight activity rose 1.6%. According to Colibri Aircraft, part of the drop could be from a decline in the number of business aircraft registered in the U.K., which fell 4.6% from January 2018 to January 2019, it said. Increased demand for pre-owned jets from the U.S. market has meant a rise in aircraft going from Europe to the U.S., Colibri said. The reduced European fleet has led to a reduction in flights.

De Havilland Name Returns to the Marketplace



The de Havilland name has returned to aircraft manufacturing with the completion of the \$300 million sale of the Dash 8 program by Bombardier to Canada's Longview Aircraft Capital. Production of the Q400 regional turboprop and support for the Dash 8-100/200/300 has been transferred to De Havilland Aircraft of Canada, a new subsidiary of Longview.

► **DAHER, THE PRODUCER OF TBM** single-engine, pressurized turboprop, is expanding its product line with the **acquisition of Quest Aircraft Company, manufacturer of the Kodiak 100, a bushplane also powered by a single PT6 engine. The acquisition is expected to close by the end of 2019.** Based in France, the Daher Group ultimately plans to introduce technologies and function into the Kodiak aircraft that “have contributed to the successes achieved by TBM,” it said. It also plans to enhance and expand Kodiak’s services and sales network. More than 270 Kodiak aircraft are in operation. The 6/9-passenger aircraft has been certified in 67 countries and is used by air taxi, recreational and leisure operators, businesses, pilot-owners and humanitarian organizations. Quest was started in 2001 in Sandpoint, Idaho. In 2015, the company was sold to Setouchi Holdings of Japan, a former Quest dealer. It employs 240 people. “The Quest Aircraft Co.’s acquisition represents an additional step in our development in the United States and an overall strengthening of our aircraft manufacturing business,” Daher CEO Didier Kayat said. “This key acquisition for Daher is perfectly aligned with the strategy of intensifying our company’s links with the North America market’s leading aerospace players.” The Kodiak 100 complements Daher’s line of TBM products, added Daher Chairman Patrick Daher. “As a powerful and maneuverable aircraft, used particularly for humanitarian missions to provide aid to isolated communities, the Kodiak 100 perfectly complements our TBM product range and is fully in line with Daher’s long-term vision as a company committed to the future of aviation.”

Meanwhile, Daher is also acquiring KVE Composites, a Dutch company skilled in induction welding of thermoplastic composite components. The process paves the way for a reduction of around 75% in the number of rivets traditionally used in the assembly of fuselage structures, according to Daher. In addition to a 15% weight saving, the removal of some fasteners makes production faster. According to Kayat, the technology is already part of some of the EASA-certified aircraft but did not name which ones.



► **SWISS HELICOPTER DEVELOPER KOPTER GROUP** is conducting flight tests of its SH09 single-engine light helicopter in Sicily and hopes to earn certification by the European Aviation Safety Agency next year. Since transferring flight testing this March from Switzerland to the more weather-conducive Pozzallo Heliport, the company’s third prototype, P3, has completed 100 flight hours across 34 flights in two months. The company says it has opened the flight envelope, taking the aircraft up to 10,000 ft.

and speeds of 135 kt. Michele Riccobono, the company’s executive vice president for Technology and Flight Operations, said despite the good weather, the conditions challenged the aircraft with hot temperatures, high humidity and strong winds, all of which “are quite common in those operational environments [in] which the SH09’s customers operate.” **The Honeywell HTS900-powered helicopter is the first clean-sheet, new single-engine flight helicopter in the 2.5 metric ton-class in about two decades.** It is intended to compete with the Airbus H125 Ecureuil/AStar and H130 and Bell Model 407 and could also chip away at some of the market share of the light-twin engine types due to the economics of single-engine operation.



► **IN A RECENT INTERVIEW** with Molly McMillin, editor in chief of the *Weekly of Business Aviation*, David Coleal, president of Bombardier Aviation, said his company is going to **continue to support Learjet and the light business jet segment**. Specifically, Coleal said, “We are committed to Learjet and the light jet market. It’s here to stay. It’s very important



to note that we’re investing in Learjet. We added a pocket door, and we have a new Garmin offering later this year. We’re very pleased with the product. It has best-in-class performance, and it’s an iconic brand. We’re very excited about this market space, and we’re not going to relinquish this space to any competitor.”

And asked if any new Learjet models will be forthcoming, he responded, “The current Learjet offers everything the market needs — space, speed, comfort, technology. And the Learjet 75 is a new aircraft compared to others in the same segment. It was introduced in 2014 and it’s been upgraded every year. Every one of our platforms has the latest technology and we continue to refine them. We won’t divulge our product strategy, but there is something new for every one of our programs.”

► **A FULL-SCALE PASSENGER AIR VEHICLE (PAV)**, an electric vertical-takeoff-and-landing (eVTOL) prototype developed by Aurora Flight Sciences, a Boeing subsidiary, crashed during unmanned flight testing in June in Manassas, Virginia. No one was hurt in the crash, and no damage resulted other than to the aircraft itself, BoeingNeXt vice president and general manager Steve Nordlund said. Boeing, through Aurora, is an Uber Elevate vehicle development partner and the two-seat PAV is being developed to support experimental urban air mobility flights in 2020. **The PAV first flew in January and the accident occurred during its fifth test flight at Aurora’s Manassas headquarters, Nordlund said.** Flights of



the battery-powered vehicle so far had been relatively short, consisting of hovers and low-speed maneuvers. After completing several hovers and recoveries and beginning maneuvers up and down the taxiway at Manassas, the eVTOL had started to descend when, at about 20 ft. above the surface, one of its six

electric lift motors cut out and the aircraft “came straight down,” Nordlund said. There is damage to the rear of the aircraft, but it is “a lot more limited than what we thought it would be,” he added. **The NTSB is investigating the accident as the PAV is an experimental-category aircraft.** A preliminary report is expected “in the coming weeks,” he said. The PAV has six lift rotors mounted on two rails below the fuselage, plus a pusher propeller on the rear of the fuselage for propulsion in forward flight. Testing has not reached the stage of engaging the rear propeller. Aurora has several PAV test articles, but testing “slowed down a bit” because of the accident, he said, in part because one of the available test aircraft has been shipped to France to appear on static display at the Paris Air Show. “Our approach to this early-stage prototyping is you have to prepare for failure. The way we get safe is to prepare for failure so that we can fix and implement the right solutions for safety of flight,” Nordlund said.

► **BOEING HAS LAUNCHED A NEW BOEING BUSINESS JET** services bundle and signed the first multi-year agreement for the service with Hong Kong-based business jet services provider Metrojet. The new package provides essential digital aviation tools for BBJ flight and maintenance crews which includes 24/7 technical support, onboard performance tools and maintenance planning data. Metrojet’s five-year agreement for the bundle will streamline procurement of the products and services needed to operate its BBJ fleet, Metrojet says.

HK Bellawings Signs for New Globals



HK Bellawings, a Hong Kong-based aircraft management company, recently signed a letter of intent for five new Bombardier Global 7500 business jets and also exercised options for two additional Global 7500s as part of the initial agreement signed in May 2018.

AviationManuals Offers Free Guide for LOA Applications



AviationManuals has released a guide for operators to understand various requirements for Letter of Authorization (LOA) applications. The guide outlines which LOAs are required based on flight parameters and geographic areas of flight. It highlights approximate application turnaround time lines and elements to keep in mind when submitting the application. The guide is free to download at www.aviationmanuals.com



Bob Hobbi

President and CEO
ServiceElements
Phoenix, Arizona

After studying in Switzerland and Scotland, Hobbi won a soccer scholarship to the University of Evansville, from which he graduated. Not long thereafter, he and his young wife moved to New York where she worked for a law firm and he won a position at FlightSafety International's headquarters at LaGuardia Airport helping in its business office. He remained with the company for 15 years, rising steadily in its executive ranks before taking charge of Honeywell's training program in Phoenix.

He next served briefly as a senior executive at MedAire before finally launching his professional and organizational development and coaching firm.

Hobbi holds a private pilot's license and speaks four languages (but admits his mastery of French is fading).



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

Questions for Bob Hobbi

1 How did you get involved in coaching and organization development?

Hobbi: At one point during my years at FlightSafety I was put in charge of the company's several hundred people involved in scheduling, accounting and other customer handling functions at its various centers and at headquarters. These were the people who, in addition to the instructor corps, actually interacted with the customers. I got that assignment because I had a knack and passion for identifying and resolving issues. My unofficial title was "The Fixer" and that part of the organization needed those talents. I started to reshape the way our customers were handled and began by rebranding those colleagues under "Customer Support" at each center. It dawned on me then that while we and the business aviation industry as a whole was technically proficient – we knew what we were doing – but there existed serious deficiencies on the people side. That's when I started training people and ultimately put together a team of eight.

2 How'd that work out?

Hobbi: Pretty well, I'd say. In fact, NetJets, a sister Berkshire Hathaway company, asked us to train their pilots, technicians, accounting and client services personnel, which we did, for a fee. Then I got approached by Honeywell to lead its Aerospace Academy, a big job. The company trains some 15,000 people annually from all segments of aviation in all of its products. The experience further validated to me that our people were technically competent, but had a difficult time communicating properly and getting their points across. I saw an opportunity.

3 And that was . . . ?

Hobbi: Helping business with what I call "core skills." These include leadership, service value and culture, organizational and resource management and communication. The pace of change in our industry right now is astronomical. The airlines are sucking up pilots, technicians and other personnel while baby boomers are retiring at an accelerated rate. It's critical to maintain the people you've got and doing so means providing training and development so they become further engaged. It's a key to loyalty. Some company leaders are reluctant to sponsor training out of fear of turnover. Sure, they could leave, but what if they stay? They're the ones dealing with your customers and if they stay for another six months, that's another half year of positive interaction. One mistake by an unskilled employee can chase away a customer representing tens of thousands of dollars.

4 This applies just to customer service personnel?

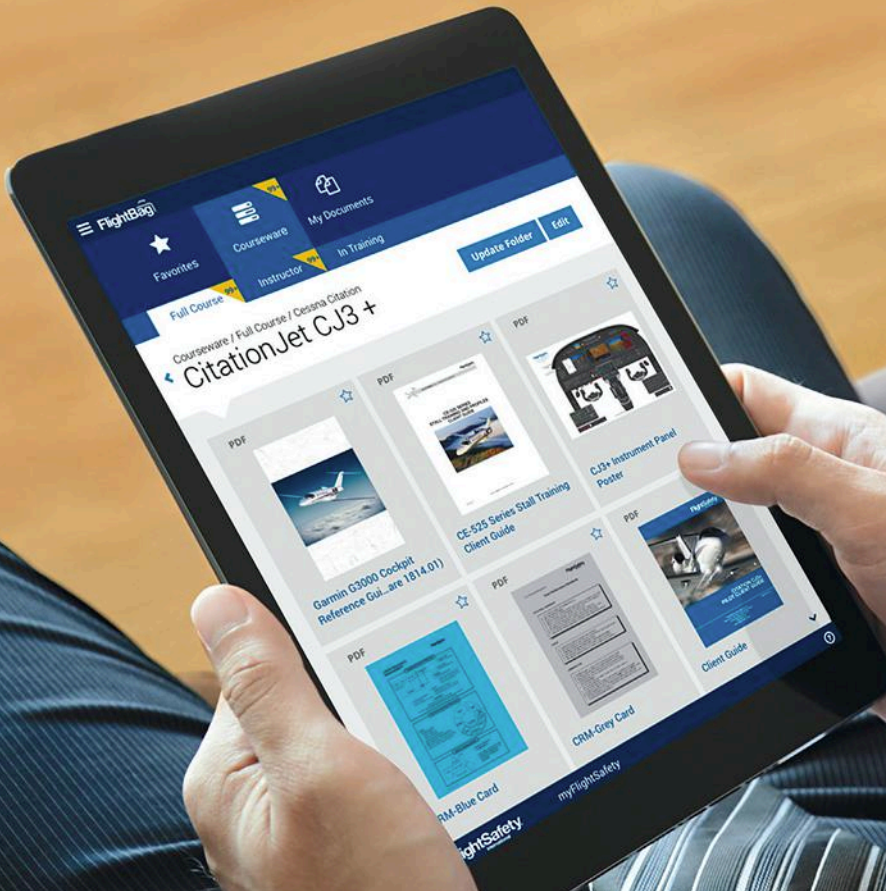
Hobbi: Oh no. I've asked pilots and mechanics what they do for a living. And they invariably reply they fly or fix the airplane. I explain that, no, you provide a service that involves flying or fixing. It's an entirely different perspective. I once interviewed an executive who said that his company's flight department didn't understand the challenges confronting him. In charge of new product development, he said in years past it took nine months from product inception to market delivery. Today, it's three weeks. So, he said, "I don't want whining because I fly to China, am on the ground for six hours, and then fly back." The business focus is shifting fast and we all need to understand that. The question is how does the airplane produce value for the organization?

5 So, core skills training should go how high up in an organization?

Hobbi: To the top. We need to train and coach the leadership in the value of these skills and in culture enhancement. Organizations continue to evolve and become more complex at people issues. And therefore, the future requires us to invest heavily in our people on an ongoing basis. One-off training in core skills is not going to do the trick. If an organization engages in just one training event, it simply annoys the employees and causes the leadership to lose credibility. If the leadership is not prepared to elevate the level or investment, it's better not to do it at all. **BCA**

Online Tools That Support Your Training Needs Anytime

FLIGHTSAFETY
IS HERE FOR
YOU



Your Preparation

Get ahead of your training. FlightBag is the interactive app that allows 60 days' advance access to training materials.

Your Convenience

Learn on your schedule. FlightSafety eLearning offers self-paced online courses that allow instruction from any online portal.

Your Flexibility

Interact online. LiveLearning gives you a front-row seat to instructor-led, web-based courses without leaving your home or office.



flightsafety.com • 314.785.7815 • A Berkshire Hathaway company

FlightSafety
international



A Fatal Fog

Instantaneous disorientation on a pre-Christmas family jaunt

BY RICHARD N. AARONS bcasafety@gmail.com

Visibility in central Florida on the morning of Dec. 24, 2017, was nil. The National Weather Service (NWS) area forecast for the region identified widespread shallow fog and included a “dense fog” advisory for Polk County. Ceilings would be below 500 ft. AGL and visibilities below 1 mi. in fog and mist. An AIRMET for IFR conditions was in effect.

The NWS discussion stated: “Widespread IFR or lower visibility in shallow fog is now in place from Sarasota/Bradenton to Tampa/St. Pete/Lakeland airports. Passing cirrus may cause visibility to bounce up and down at times, but the potential for periods of very low visibility will continue at these terminals through the middle morning hours. NWS will be watching for the possible sea-fog later today. . . .” Civil twilight began about 0650 EST and sunrise occurred about 0716 EST.

Bartow Executive Airport (KBOW) sits pretty much in the middle of Polk County and is host to a large general aviation fleet. Its tower operates from 0730 to 1800 daily. KBOW has an Automated Weather Observing System (AWOS). On that morning the AWOS reports from 0635 to 0715 included visibility less than one-quarter mile, fog, an overcast cloud layer at 300 ft., temperature of 56F, and an altimeter setting of 30.18.

Among the 95 based aircraft was a 1973 Cessna 340 (N247AT) cabin-class twin owned by an area attorney. He had planned to take four family members to Key West for breakfast and then return to Bartow for Christmas Eve dinner.

The family gathered at the T-hangar sometime about 0615 and commented on the fog. Indeed, it was so thick that the pilot decided to board his passengers while the aircraft was inside the hangar. He then called the FBO for a tow to the ramp because he worried that the visibility was too poor for him to taxi from the hangar without wandering off the relatively narrow paving. By 0645, all five members were on board the airplane and FBO employees

towed the twin Cessna to the ramp.

The pilot had filed an IFR flight plan, but no record could be found that he had checked weather reports through any of the usual services.

The FBO employees watched as the pilot started the engines and then taxied very slowly to Runway 9L. Later, those witnesses would tell investigators that the fog limited their visibility to about 400 ft. They repositioned themselves on the ramp closer to the runway in a failed attempt to keep the airplane in sight in the dense fog.

The pilot contacted Tampa Flight Data Radar (FDR) at 0710 for his IFR clearance. Here’s the transcript:

0710:26 (TPA FDR): Tampa approach.

0710:28 (N247AT): Yes sir, this is two four seven alpha tango; I’m at uh, I’m number one runway nine Bartow; would like to pick up my departure clearance to Key West.

0710:38 (TPA FDR): November two four seven alpha tango hold for release; you’re cleared to the Key West airport via radar vectors to crowd . . . to rogan . . . direct charo . . . then as filed; enter controlled airspace heading two zero zero; climb and maintain two thousand; expect one six thousand one zero minutes after departure; departure frequency one one niner point niner; squawk four six four zero hold for release. Go ahead with your read back.

0711:17 [Pilot reads back clearance.]

0711:46 (TPA FDR): November seven alpha tango read back is correct; you said you’re number one ready to go right now.

0711:49 (N247AT): I am number one, ready to go.

0711:53 (TPA FDR): November seven alpha tango roger you are released for departure; clearance void if not off in five minutes; advise no later than ten minutes of intentions; time now is one two one two.

0712:04 (N247AT): Uh, roger and uh, after departure I turn right to a heading of two zero zero correct.

1212:11 (TPA FDR): November seven

alpha tango that’ll be traffic permitting uh, your discretion when able heading.

0712:14 (N247AT): OK.

0712:16 (TPA FDR): Two zero zero.

0712:20 (N247AT): Roger that and I’m cleared to release. Thank you.

0712:24 (TPA FDR): Seven alpha tango we’ll talk to you on the way out. Good day.

The FBO employees heard an increase in engine noise consistent with an engine run-up, and at about 0715,

they heard the airplane begin its takeoff roll, but they could not see the 340 because of the dense fog.

“The engines sounded strong and were operating at full power during the takeoff,” they would tell NTSB investigators later. The employees heard two tire “chirps” on the runway, then the sound of the airplane that was consistent with a climb.

Seconds later they heard an explosion on the east side of the airport and drove toward the explosion to find the airplane on fire. They circled the aircraft in search of survivors, but there were none.

The accident site was located on airport property about 190 yd. east-northeast of the departure end of Runway 9L and 10 ft. south of Taxiway Delta.

The debris path was about 230 ft. long and oriented northeast. The beginning of the debris path was defined by several ground impact craters in a line

perpendicular to the debris path and the main wreckage.

The middle impact crater contained pieces of the airplane’s nose cowling and baggage door. Immediately to the right was the left engine’s propeller. To the left of the middle crater was the right engine’s propeller. A portion of the left wingtip fuel tank was found on the far-right side of the initial impact area, and a portion of the right wingtip fuel tank was found on the far-left side of the initial impact area.

The main wreckage was upright and oriented southeast about 30 ft. from the initial impact craters. The fuselage was mostly consumed by fire and the empennage remained mostly intact with significant thermal damage. Both engines separated from the airplane and were near the main wreckage. Airplane debris was found on the taxiway northeast of the main wreckage. The nose landing gear was separated from

the airplane and found about 200 ft. northeast of the main wreckage.

The Investigation

The investigation initially focused on aircraft integrity. Trim tabs, flight controls, engines, vacuum systems, autopilot, avionics — all had to be eliminated as the accident cause before turning attention to the pilot and his decision to depart using instrument takeoff techniques.

The flight controls exhibited impact and thermal damage but revealed no preimpact anomalies. The wing flap position could not be determined due to the extensive damage. The elevator trim tab was found beyond its full-up limit. The trim cable and chain on the top side of the actuator sprocket was pulled during the examination to test its functionality and the actuator retracted and the trim tab lowered from its full-up position.



Accident airplane taxiing . There is dense fog behind and surrounding the airplane.



A screenshot from a cell phone video that depicts the accident airplane taxiing on the ramp at BOW.

The landing gear actuator and the left and right main landing gear were all retracted.

Two attitude indicator gyros and one directional gyro were disassembled and examined. All three gyros exhibited rotational scoring inside the housings and along the circumference of the gyros. An electric turn-and-bank indicator gyro was disassembled and examined;

it also exhibited rotational scoring.

The two vacuum pumps were separated from the engines and sustained significant impact damage. The right-engine vacuum pump drive remained attached to the right engine and was melted by the postimpact fire. The left-engine vacuum pump was separated from the engine, and the pump body and drive were intact. A portion of the

vacuum manifold, which consisted of one of the end caps but no flapper valves, was found in the wreckage.

The left engine was separated from the airframe and was identified based on the data plate and maintenance records. The crankshaft was completely fractured at the nose oil seal and the propeller flange remained attached to the propeller hub. The crankshaft fracture surface displayed tearing, shear lips and discoloration consistent with an overstress separation on impact. No anomalies were noted with the spark plugs.

The return line from the fuel pressure regulator to the fuel pump remained in place and, when removed, residual fuel poured from the pressure regulator. The pump was disassembled, and the pump vanes were intact with no anomalies noted with the internal components.

Fuel nozzles were free of obstructions. The fuel manifold screen was clear of contaminants and residual fuel was observed in the manifold housing.

Accidents in Brief

Compiled by Jessica A. Salerno

Selected accidents and incidents in May 2019. The following NTSB information is preliminary.

► **May 27 — About 1548 EDT, a Piper**

PA18 150 (N70699) hit ground objects during a forced landing following an inflight loss of engine power near Palm City, Florida. The private pilot and passenger were uninjured. The airplane sustained substantial wing and fuselage damage during the landing. The airplane was registered to Blazie Marketing Services Inc. and was operated by the pilot personal flight. The local flight originated from the Witham Field Airport (SUA), near Stuart, Florida, about 1500. According to initial information from the pilot, he advised SUA tower that the flight was inbound to SUA when the airplane was over Naked Lady Ranch Airport, near

Stuart, Florida. He was told to enter a right downwind to Runway 12. The pilot started a decent and switched to the right fuel tank. For several minutes all was “normal.” About a minute later, the engine started popping like a “bad” magneto drop. The pilot checked the magneto switches and pumped the throttle. He indicated that the engine “reeved slightly” then quit. He assessed the situation, called the tower, and reported an engine out. The pilot informed the tower that the airplane could not make the airport and that he was going to land the airplane in a field. He landed the airplane in an area under construction and ran out of space before he could get the airplane stopped. The pilot indicated that he used a chain link fence to stop the airplane.

► **May 27 — At 1000 EDT an Aeronca**

7AC (N1797E) was heavily damaged when it hit trees shortly after landing at Windrift Aerodrome (2GA5), Concord, Georgia. The private pilot was not injured. The airplane was privately owned and operated as a personal flight under Part 91. It was VFR at the time of the accident

and no flight plan was filed for the local flight that originated from 2GA5 about 30 min. earlier. According to the pilot, he landed uneventfully on Runway 35 and applied left brake to initiate a left turn off the turf runway; however, the brake did not function. He then applied the right brake, which “stuck” and would not release. He attempted to pump the right brake to release it with no effect. The airplane veered right, departed the runway, crossed a gravel road and collided with trees.

► **May 26 — About 1430 PDT, a**

Cessna 150F (N8746S) collided with a tree while on approach to the Garberville Airport, Garberville, California. The private pilot, the sole occupant, was seriously injured; the airplane sustained substantial damage. The purpose of the flight was for the pilot to perform touch-and-go practice takeoffs and landings. The pilot completed one landing and was departing from Runway 36. After reaching about 200 ft. AGL, the engine experienced a loss of power. The pilot banked the airplane to the east (right) in an attempt to make an

Aerial image depicts the accident site and the end of Runway 9 at BOW.



The pistons, valves and valve seats were unremarkable.

The left propeller hub remained intact and the piston was compressed aft. All three blades remained attached to the hub, but they were free to rotate in the hub, indicative of pitch change link fractures.

The right engine was separated from the airframe and was identified based on the data plate and the maintenance records. The crankshaft was fractured at the nose oil seal and the propeller flange remained attached to the propeller hub. The crankshaft fracture surface displayed tearing, shear lips and discoloration consistent with an overstress separation on impact. The engine sustained thermal damage.

Inspections of the right engine and findings were similar to those uncovered with the left engine.

Thus, after examination in the field by experts from Textron, Continental Motors and the FAA, nothing could be found in the airframe, engines or

propellers that had malfunctioned prior to impact.

On the other hand, it was determined that the airplane's maximum gross takeoff weight of 6,390 lb. had been exceeded by 105 lb. Due to the excessive weight, the airplane was outside of its center of gravity moment envelope.

One of the FBO employees recorded a video of the airplane taxiing on the

ramp toward the runway and another video of the takeoff. The employee was located near the middle of the ramp and about one-half mile from the end of Runway 9L.

The video was 46 sec. long. The accident airplane is not visible due to the dense fog; however, the sound of the engines is audible. The video pans from right to left and appears to follow the

emergency landing on the river gravel/sandbar. The airplane hit a tree and descended through the tree canopy. The pilot climbed out of the wreckage under his own power and hiked to the road.

► **May 25, — About 0923 EDT, a**

Cessna TR182 (N6123T) was destroyed when it crashed during a visual approach to McKinnon St. Simons Island Airport (SSI), St. Simons Island, Georgia. The commercial pilot was fatally injured. The personal flight was operated under Part 91. VFR prevailed and an IFR flight was filed for the flight that originated from Savannah/Hilton Head Island Airport (SAV), Savannah, Georgia, about 0859. According to preliminary information from the FAA, the flight was cleared by Jacksonville Approach Control at 0919 for the visual approach to Runway 22 at SSI, and instructed to switch radio frequency to the SSI common traffic advisory frequency, which the pilot acknowledged. No further communications were received and radar contact was lost at 0923, when the airplane was about 5 mi. northeast of SSI at an altitude of 1,300 ft. MSL.

That altitude and below is usually were Jacksonville Approach Control loses radar coverage in that area. A witness subsequently observed a fire in a wooded area of a sparsely populated section of residential development and notified law enforcement. The wreckage came to rest nose down in an approximate 3-ft. crater, oriented about a heading of 210 deg. and most of it was consumed by post-crash fire. No debris path was observed, with the exception of two tree strikes immediately above the wreckage. The pilot, age 80, held a commercial pilot certificate, with ratings for airplane single-engine land, airplane multiengine land, and instrument airplane. He also held a flight instructor certificate, with a rating for airplane single-engine and instrument airplane. His most recent FAA second-class medical certificate was issued on March 1, 2017. At that time, the pilot reported a total flight experience of 4,600 hr. The pilot also had a Basic Medical date of Feb. 27, 2018.

► **May 24 — About 1755 EDT, a**

Cessna 560 (N832R) was destroyed

when it crashed into the Atlantic Ocean. The airline transport pilot was not found and is presumed dead. The airplane was privately owned and operated, and the flight was being conducted as a Part 91 positioning flight. VFR conditions existed near the accident site at the time of the accident, and an IFR flight plan had been filed. The flight originated from St. Louis Regional Airport (ALN), Alton, Illinois, about 1430 and was destined for Fort Lauderdale Executive Airport (FXE), Fort Lauderdale, Florida.

According to the owner of the airplane, he purchased the airplane two days prior to the accident. The airplane had recently undergone a progressive inspection, which was completed on May 22, 2019. The owner then hired a contract pilot to fly the airplane to FXE to have some avionics work done. On the day of the accident, the owner tracked the progress of the flight using an online commercial service once it departed ALN about 1430. Shortly after 1700, he received a call from the avionics shop at FXE telling him the airplane did not arrive. He then reviewed the airplane's online flight track again

Cause & Circumstance

sounds of the airplane during the takeoff roll. At 26 and 28 sec., two distinct chirps are heard. The video ends while the engines are still audible.

A helicopter pilot based at KBOW observed the Cessna on the ramp. He recorded a video of the airplane taxiing in the dense fog, and he heard the airplane take off about 12 min. later. During the takeoff, he heard a “pop” similar to an engine backfire and about 3 sec. later, heard the explosion near the end of Runway 9L. He and a colleague drove to the accident site, where they found the airplane engulfed in flames and saw the FBO employees nearby. He estimated that the runway visual range at the time was 600 to 800 ft. due to the fog.

The Pilot

The instrument-rated private pilot was 70 years old and held airplane multiengine land, single-engine land and single-engine sea ratings. He had a valid third-class medical certificate with waivers and limitations. He had accumulated an estimated 1,600 hr. total time. His logbooks — usually kept in the



Internal view of the right elevator control sprocket chain and control cable. The chain is still wrapped around the sprocket.

always flew with his feet flat on the floor and not on the rudder pedals. He added that the pilot never flew dangerously or recklessly.

An acquaintance of the pilot, who had been the pilot's flight instructor in 2002, recounted flying the accident airplane with him. He said the pilot mentioned an inflight engine failure he had experienced in the accident airplane. The pilot told him that he continued to his destination rather than making a precautionary single-engine landing because the logistics of diverting were too difficult.

The acquaintance also stated that he and the pilot were supposed to fly the accident airplane together in early 2017. On the morning of the planned flight, he checked the weather conditions, which were about one-quarter-mile visibility and 100-ft. ceilings with dense fog. He told the pilot that they could not complete the flight because of the weather, and the accident-pilot responded that,

aircraft — were not located; therefore, his instrument currency of proficiency could not be determined.

The mechanic who maintained the airplane told investigators the pilot

Accidents in Brief

and saw that it had overflown FXE at FL 390 and was heading toward the Atlantic Ocean. According to preliminary ATC radar and radio communication information provided by the FAA, the pilot established communications with the Atlanta Air Route Traffic Control Center and reported he was level at FL 390, and that the air was smooth. Later, the controller tried to communicate with the pilot to tell him to contact the Jacksonville ARTCC, but the controller was unable to make contact with the pilot.

The controller made several attempts to contact the pilot on different radio frequencies, to no avail. The controller then advised Jacksonville ARTCC that communications with the flight had been lost. The Jacksonville controllers then continued to monitor the flight via radar. The flight transitioned through Jacksonville and Miami ARTCC airspace

without any radio contact. The U.S. Air Force dispatched two aircraft to intercept the accident airplane. One of the interceptor pilots reported that he could see the pilot unconscious and slumped over the controls. The intercept airplanes followed the accident airplane until it descended and impacted the Atlantic Ocean about 310 mi. east of FXE. The U.S. Coast Guard initiated a search after the accident, which was suspended on May 25, 2019. The pilot and the airplane were not recovered.

The pilot held an ATP certificate with ratings for airplane single-engine land and multiengine land. His most recent FAA first class medical certificate was issued on June 26, 2018. He reported 9,016 total hours of flight experience. He held numerous type ratings including a type rating for the Cessna 560 and had a certification for single pilot for the Cessna 560.

The airplane was manufactured in 2001. According to the airplane's owner, all of the airplane's maintenance logs were onboard the airplane during the accident flight.

► **May 24 — About 1122 MDT, a Cirrus SR22 airplane (N809SR) crashed about 6 mi. southeast of Grover, Utah. The private pilot and passenger were killed and the airplane was destroyed. The airplane was registered to Tierra Grande Aviation LLC, and operated by the pilot Part 91 personal flight. VFR prevailed in the vicinity of the accident site, and the flight was operated on an IFR flight plan. The flight departed Canyonlands Field Airport (CNY), Moab Utah, about 1042 and was destined for Henderson Executive Airport (HND), Las Vegas, Nevada. Witnesses reported that they heard the airplane and when they looked up, they observed it nose down descending like a corkscrew. The airplane descended behind a hillside; shortly thereafter they heard an explosion and saw smoke rise from the area.**

At 1055 the Hanksville Airport (HVE), Hanksville, Utah, located about 30 mi. northeast of the accident site reported wind from 170 deg. at 6 kt., clear skies, 10 sm visibility, temperature 15C, dewpoint 2C and an altimeter setting of 30.05 in. of mercury. A high-resolution rapid refresh numerical model over the

legally, they were allowed to fly under FAR Part 91. The acquaintance had not talked to the accident pilot since that canceled flight.

Another local airplane mechanic — a business acquaintance of the pilot— told investigators that he flew with the pilot one time and then refused to fly with him again. The mechanic stated that he was not a safe pilot and took unnecessary risks.

The mechanic who maintained the airplane stated that, two days before the accident, at the request of the pilot, he moved the copilot seat aft (to accommodate the pilot's tall son-in-law) and adjusted the rear seats forward to keep the cg in range.

This mechanic also stated that the accident airplane had a known autopilot issue. If the autopilot was engaged (for preflight test) on the ground, it would command the elevator trim full nose-down. He understood this issue was a result of the autopilot's gyros not being level on the ground, which caused the autopilot to sense and attempt to compensate for a high pitch attitude. He stated that the accident pilot was aware of this autopilot issue.

The airplane records revealed no past maintenance discrepancies or write-ups related to the autopilot or elevator trim. The records also revealed that the most recent IFR certification for the transponder and pitot static system was completed on June 20, 2014. To fly in IFR conditions the system must be inspected and certified every 24 calendar months.

A post-mortem examination attributed the cause of the pilot's death to blunt impact. The FAA's Bioaeronautical Sciences Research Laboratory conducted toxicology testing, which revealed 20 mg/dL of ethanol in muscle, ibuprofen in the muscle, and no ethanol detected in the kidney. (After absorption, ethanol is uniformly distributed throughout all tissues and body fluids; therefore, the finding in one tissue but not another is most consistent with post-mortem production.)

Analysis

In its analysis, the Safety Board discussed the witnesses' videos and statements.

The pilot requested that the airplane be towed from the hangar to the ramp

(with all souls on board), because he did not want to hit anything on the ramp while taxiing in the dense fog.

Witnesses heard the pre-takeoff engine run-up toward the end of the runway but could not see the airplane as it departed; the engines sounded normal during the run-up and takeoff. A witness video recorded the takeoff, but the airplane was not visible due to the dense fog.

During the takeoff roll the airplane's tires chirped, which is consistent with the wheels touching down on the runway with a side load, said the Safety Board. The video ended before the accident occurred.

The witnesses stated that the takeoff continued and then they heard the airplane impact the ground and saw an explosion. The weather conditions at the time of the accident included visibility less than one-quarter mile in fog and an overcast ceiling at 300 ft. AGL.

At the time of the accident, the aircraft was about 105 lb. over the maximum takeoff weight, which exceeded the center of gravity moment envelope. "The excess weight would have likely extended the takeoff roll, decreased

altitude of about 1,400 ft. MSL, the airplane descended until it disappeared from the radar. A witness on the ground at MQJ reported seeing the airplane in an estimated 90° left bank with the nose parallel to the horizon shortly after departure. He observed the airplane's nose lower slightly before rising again to a level attitude. At no point did he observe the nose of the airplane rise above the horizon. The nose of the airplane again lowered and the airplane impacted the ground.

► **May 22 — At 1245 EDT, a twin** engine, turbofan-powered, Cessna Citation S-550 (N311G) crashed in a flooded corn field about one-half mile northeast of Indianapolis Regional Airport (MQJ) Greenfield, Indiana. The airplane was owned and operated by the pilot as an IFR flight under Part 91 when the accident occurred. The Airline Transport rated pilot and the sole passenger were fatally injured and the airplane was destroyed.

It was VFR and an IFR flight plan had been filed and activated. The flight departed MQJ about 1243 destined for Minden-Tahoe Airport (MEV), Nevada. Archived FAA radar data showed the airplane departing from Runway 7 at MQJ. Shortly after departure, the airplane began a left turn toward an assigned heading of 320 deg. After reaching an

altitude of about 1,400 ft. MSL, the airplane descended until it disappeared from the radar. A witness on the ground at MQJ reported seeing the airplane in an estimated 90° left bank with the nose parallel to the horizon shortly after departure. He observed the airplane's nose lower slightly before rising again to a level attitude. At no point did he observe the nose of the airplane rise above the horizon. The nose of the airplane again lowered and the airplane impacted the ground.

The airplane hit a flooded cornfield and exhibited significant fragmentation. The wreckage and debris field covered an area of about 270 ft. long and 103 ft. wide. The initial ground scar was aligned on about a 327 deg. heading. The nose of the airplane came to rest on a 268 deg. and the tail came to rest on a 182 deg. Both engines separated from the airplane and were located about 197 ft. from the point of initial impact, roughly aligned with the ground scar. A post-impact fire incinerated about 80% of the airplane. Detailed engine and wreckage examinations are pending.

► **May 21 — About 1300 Alaska** daylight time, a float-equipped Cessna A185F (N5457X) nosed over during a water landing in Cascade Bay near Whittier, Alaska. The private pilot sustained minor injuries, one passenger sustained serious injuries, and another passenger was killed. The privately owned airplane was operated by the pilot under Part 91 as a personal flight. The cross-country flight departed Wasilla Airport, Wasilla, Alaska, about 1210 with a planned destination of Cascade Bay. It was VFR and no flight plan had been filed. The pilot reported that he planned to fly with the two passengers for a sightseeing trip in the Prince William Sound area, and then land on the water in Cascade Bay to view a waterfall. He was an acquaintance with both passengers, and had flown them in the same airplane a few years prior.

The preflight inspection and takeoff were uneventful, and the pilot reported that both passengers were talking throughout all stages of the flight. They approached Cascade Bay for a landing to the west, and the pilot performed his before-landing checks. Confirmation of

Cause & Circumstance

the climb rate and increased the amount of elevator pressure required to lift off of the runway,” said investigators.

A majority of the airplane was consumed by post-crash fire. The ground impact marks and wreckage distribution were consistent with the airplane rolling left over the departure end of the runway and impacting the ground inverted in a nearly vertical, nose-low attitude.

Examination of the engines revealed operating signatures consistent with takeoff power at the time of impact. The elevator trim tab and actuator were found beyond their full-up travel limits and the trim cable exhibited tension overload separations near the actuator. According to the Safety Board, “It is likely that, when the cable separated in overload, the chain turned the sprocket and extended the actuator rod beyond full travel.”

No anomalies were observed with the airframe, engines or cockpit instrumentation that would have precluded

normal operation, said the Board. The investigation was unable to determine the status of the autopilot during the accident takeoff.

“Based on the evidence,” said the Safety Board, “it’s likely that when the airplane entered instrument meteorological conditions the pilot experienced spatial disorientation, which resulted in a loss of control and descent into terrain.”

The Safety Board determined the probable cause of this accident was “the pilot’s loss of control due to spatial disorientation during takeoff in instrument meteorological conditions.”

Spatial Disorientation

The Safety Board added a note in its report that pilots flying under both instrument and visual flight rules are subject to spatial disorientation and optical illusions that may cause a loss of aircraft control.

FAA literature states that sight,

supported by other senses, allows a pilot to maintain orientation while flying. However, when visibility is restricted (i.e., no visual reference to the horizon or surface detected) the body’s supporting senses can conflict with what is seen. When this spatial disorientation occurs, sensory conflicts and optical illusions often make it difficult for a pilot to tell which way is up.

Contributing to these phenomena are the various types of sensory stimuli: visual, vestibular (organs of equilibrium located in the inner ear) and proprioceptive (receptors located in the skin, muscles, tendons and joints). Changes in linear acceleration, angular acceleration and gravity are detected by the vestibular system and the proprioceptive receptors, and then compared in the brain with visual information.

“In a flight environment,” it noted, “these stimuli can vary in magnitude, direction and frequency, resulting in a sensory mismatch that can produce illusions and lead to spatial disorientation.” **BCA**

Accidents in Brief

the landing gear position was included in the checklist, and while he could recall performing the check, he did not have a specific recollection of the landing gear status. The water was rough, so he planned to land the airplane slightly faster than normal. However, as soon as the floats touched the water, he felt a jolt, and the airplane then violently nosed over. The cabin immediately filled with water, and he was able to egress by forcing out the door window. After spending a moment at the surface, he swam back down into the airplane and was able to pull the passenger located in the aft seat free. He attempted to free the passenger in the front right seat, but he appeared to be already unconscious.

Review of photographs taken a few hours after the accident revealed that the airplane had come to rest inverted, with the entire fuselage submerged and only the floats remaining above water.

► **May 18 — About 1417 local time, a** Piper PA-32-260 airplane (N260TM) hit the

water after takeoff from the Juan Manuel Gálvez International Airport (MHRO), Roatán, Honduras. The pilot, a citizen of Canada, and the four passengers, citizens of the U.S., all died in the crash. The airplane sustained heavy damage. The airplane was equipped with a Lycoming O-540 series engine. The accident investigation is under the jurisdiction and control of the government of Honduras.

► **May 17 — About 1034 MDT, a** Robinson Helicopter Company R44 II helicopter (N744TW) crashed mountainous terrain about 4 mi. north of Alpine, Utah. The private pilot and passenger were fatally injured. The helicopter sustained substantial damage. The helicopter was registered to Tumbleweed Leasing Company and operated by the pilot as a Part 91 personal cross-country flight. It was IFR in the vicinity of the accident site about the time of the accident and no flight plan was filed. The flight originated from the pilot’s residence near Myton, Utah about 0924 and was destined for South Valley Regional Airport (U42), Salt Lake City, Utah.

A family member of the pilot reported that at 1027 she received a video from one of the helicopter occupants. A review

of the 19 second video revealed that the helicopter was at 13,600 ft. MSL, just above a cloud layer. The time and place stamp on the video indicated that the video was taken at 1026 in the vicinity of accident site.

► **Preliminary radar data provided by** the Federal Aviation Administration (FAA) showed the first radar target about 0956 about 52 mi. east of the accident location. Further review revealed that the helicopter began a climb from 10,400 ft. MSL, 37 kt. groundspeed, in a west-northwest direction. At 1009, the data showed the helicopter leveled off at 13,300 ft. MSL and varied in altitude between 12,700 ft. and 13,300 ft. MSL for about 30 mi. At 1029, the helicopter began a descent from 12,700 ft. to 11,000 ft. Two minutes later, the helicopter began a right descending turn from an altitude of about 11,500 ft. The data further depicted the helicopter completed two 360 deg. right turns, before radar contact was lost. The last radar target was at 9,200 ft., on a heading of 166 deg., and a groundspeed of 99 kt., or about 1,160 ft. east of the accident site. The wreckage was located in mountainous terrain, about 7,656 ft. MSL, about 4 mi. northeast of Alpine, Utah. **BCA**

FL450 ADVANCED SILENT TOUGH EFFICIENT RELIABLE

Accelerating Innovation: The All New HF120

Two names synonymous with invention have joined forces to create unprecedented performance—a product igniting change in the industry—the all-new 2,000-pound thrust class turbofan power plant. Built to last, the HF120 delivers advanced technology designed for speed, endurance, and the smoothest ride.

FL450: The fastest engine in its class, the HF120 enables effortless climb to FL450 and beyond. Its high fan and core pressure ratio provides increased aircraft speed and reduced climb time to higher cruising altitudes. With a low thrust lapse rate, the engine allows for initial climb in excess of 4,000 feet per minute and reduces time to climb by 40%.

ADVANCED: The engine represents decades of research and development. A wide-chord, swept titanium blisk fan with composite fan outer guide vanes and the use of innovative turbine blade and combustor materials are just some of the unique features the HF120 brings to the light jet market.

SILENT (Inside & Outside): Smart placement of the rotor dynamic resonant frequencies outside of the engine taxi and flight settings minimizes unwanted cabin noise. Tight tolerance controls and exceptional build quality deliver low fan and core vibration levels. Low levels of vibration transmission to the fuselage result in a quiet cabin and the smoothest flying ride in its class.

TOUGH: Setting new standards for durability and efficiency, superalloys used in the hot section permit a higher operating temperature with extended parts life. All HF120s are monitored closely via proven large aircraft engine proactive diagnostic systems to minimize downtime and enable longer uninterrupted service.

EFFICIENT: Using innovative aerodynamic designs, the HF120 delivers greater cycle efficiency while optimizing operability. Unique airblast fuel nozzles provide better fuel atomization yielding superior fuel-to-air combustion to minimize fuel burn. Laser drilled combustor liner holes ensure minimum pressure drop across the combustor, enabling optimum transfer of compressor energy

to the turbine side. This unique design offers outstanding overall environmental benefits, including low NO_x, CO, and HC emissions.

RELIABLE: All of these amazing features combine to create an engine that redefines dependability. Extensive testing in excess of 23,000 cycles and simulated 5,000 flight cycles run on a single engine reveal proven reliability and readiness for longer uninterrupted operation.

The HF120 enjoys enviable operational success. It's an incredible machine built to set a new standard for the light jet market—ready for applications beyond its current aircraft installation. ■

Sidestepping Operational Complacency

From one Challenger to another

BY JAMES ALBRIGHT james@code7700.com



Like most people my age, I can recall exactly where I was on Jan. 28, 1986, when I heard the news that the space shuttle Challenger had exploded and broken apart just 73 sec. after liftoff, killing all seven crewmembers. I was driving onto a U.S. Air Force base getting ready for instrument instructor pilot training. The guard at the gate asked if I had heard. I didn't even realize there was a launch that day. The shuttle launches had become, in a word, routine.

Most space aficionados of the time could give you exact details of the O-rings used to seal the three sections of the solid rocket boosters (SRBs) and the temperature tolerance of the rings (no colder than 53F) and the temperature at the moment of launch (36F). They could tell you that the manufacturer (Morton Thiokol) designed the SRBs without meeting the temperature range of the space shuttle itself (31F to 99F). All that is true and is interesting in and of itself. But I remember there was much more to it than that. NASA had been steadily reducing the minimum temperature for launch since the first orbital mission in 1981. I also recall that NASA had established as a goal for 1986 that the shuttle was to become "operational." Gone were the days of test flights. The space shuttle was to become a viable commercial enterprise. Space travel, the agency said, had become routine.

After the Challenger explosion, the initial focus was on the SRB's O-rings. Theoretical physicist Richard Feynman demonstrated the fragility of the O-rings at cold temperatures during a televised hearing by simply dropping a sample of the material into a glass of ice water. The O-ring lost all of its resiliency. I didn't fully understand the real cause of the Challenger disaster until 10 years later, when I read *The Challenger Launch Decision: Risky Technology, Culture and Deviance at NASA* by Diane

Black smoke from an O-ring seal in the right solid rocket booster of the space shuttle Challenger, Jan. 28, 1986.

A “high-tech” cockpit in the year 2000, Challenger 604.

Vaughan, a professor of sociology at Columbia University. Managers at NASA had learned to accept deviations from their own Standard Operating Procedures (SOP) from the very start of the program and increased those deviations with just about every launch until that fateful day in 1986. If 53F was the stated limit, going a few degrees lower should be OK. Until it wasn't. The O-rings were installed in pairs and both were required by SOP for redundancy. No O-ring damage was allowed. Until it was. Slowly but surely, NASA moved the goal posts to the very SOPs they had designed.

Vaughan coined the term “The Normalization of Deviance” to describe what happened at NASA. That makes her book an excellent case study for all pilots, even those of us who confine our aviation to the atmosphere.

Since that day in 1986 I have added many more type ratings and with each new aircraft I noticed my tendency to normalize my own deviance after I had become, well, bored with the novelty of the new jet. It is a tendency I have only recently learned to anticipate and sidestep. All of this self-discovery happened in the five years I flew my own Challenger, the Bombardier Challenger 604. That five-year span seemed to be a moment of discovery for many Challenger pilots.

Step One: Accepting Unanswered Questions

In the year 2000, the Challenger 604 had one of the sexiest cockpits I had ever seen. There was glass — and lots of it. The switches and buttons all turned black when everything was good; I had never seen a flight deck that more fully embraced the idea of a “dark cockpit.” I felt fortunate that my first civilian job was flying this airplane and I showed up at FlightSafety International Tucson, Arizona, energized and motivated to learn. That was on day one.

As ground school progressed, I realized the classroom was paced for the proverbial “lowest common denominator” and the course objective was aimed more toward passing a type rating evaluation than it was learning



ROBERT FROLA

my 604 career in a large flight department with pilots and mechanics who had several years of experience with the jet. But even these experts were often stumped. Why can't the airplane continue fueling under some conditions when the fuel truck pauses? Don't know. Why is fuel ejected from the wingtips when it is nowhere close to full? Don't know. I started combing through the maintenance manual but

to master the airplane. While the most challenging part about flying this Challenger was the avionics, all that was left for when we got to our flight departments. I finished school with my new CL-604 type rating with a list of unanswered questions and theories that ran contrary to what I had learned in school. All of this, I knew, was par for the course. As I finally became operational in the jet, I expected to have all of these questions answered and to be proven wrong about many of my preconceived notions. That is what happened, except for four of my complaints.

Complaint No. 1. I left initial training with a long list of complaints, the first of which was the superficial coverage of the aircraft systems. We were taught the bare minimum to understand and with some success to troubleshoot the aircraft. You might as well explain that “magic happens” when the subject gets too deep to teach. For example, the CL-604 has more fuel tanks — eight of them — than any two-engine aircraft I've ever flown. Fuel loading and consumption patterns were not a part of the curriculum. Relax, I was told, that's something you will learn once operational.

But out in the field the questions only got worse. I was fortunate to start

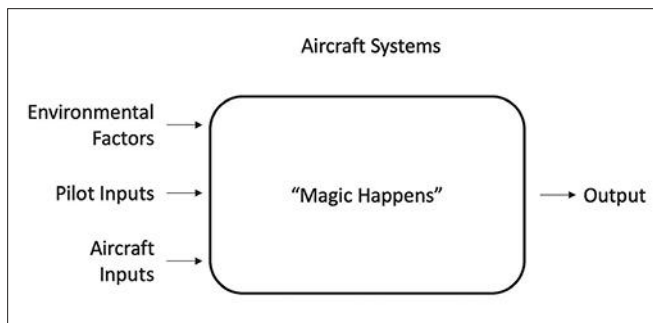
came up empty. After a while I stopped asking and like the rest of our pilots, accepted the quirky fuel system as just “one of those things” we pilots had to accept in the “magic” category.

Then, on Oct. 10, 2000, the Challenger 604 world was given the biggest fuel system mystery of them all. How can fuel that is properly loaded prior to takeoff suddenly shift aft so quickly that pitch control is lost? Don't know.

Two Bombardier production test pilots, flying Challenger 604 C-FTBZ, discovered the problem while demonstrating aft center of gravity takeoffs from Wichita-Mid-Continent Airport (KICT). The pilot lost control of the airplane during takeoff, stalling it, rolling it on a wing, and killing all three people on board. The Transport Canada accident report blamed fuel migration from the forward auxiliary tank, to the center auxiliary tank, to the aft auxiliary tank, exceeding the test pilot's ability to maintain pitch control. The 604 had been operational for five years at this point and this had never before happened. Bombardier immediately placed narrower CG limitations on the airplane while we operational CL604 pilots were left wondering about those fuel tanks. Reading the report, we for the first time learned those tanks were un baffled and the pipes between each

allowed rapid fuel migration. None of us operational pilots had ever heard about the problem, but none of us had ever felt such a shift in CG, either. A part of the puzzle was missing. We had no choice but to accept the curtailed CG and move on. I moved on.

A general idea of how aircraft systems are taught.



Step Two: Accepting Non-Standard Procedures

Complaint No. 2. My second complaint centered around non-standardized stick and rudder procedures. However, having grown up in large Boeing 707s and 747s, rotation rates were critical to avoid tail scrapes and wing stalls. Of the eight pilots in my new flight department, the three Air Force veterans all used the same 3-deg.-per-second rate. Two of the other pilots favored a slower rate to keep the nose lower to scan for traffic. The three remaining pilots insisted a much faster rate was needed to get away from the ground, where the danger awaited. Nobody seemed to care that the operating

manual specified the 3-deg. rate. This, too, I learned to accept as “one of those things.”

One year later, a Boeing BBJ sliced into one of our parked 604’s horizontal stabilizers, damaging it beyond repair. Bombardier replaced the stab for us and agreed to have one of the company’s test pilots fly the airplane provided I sat in the right seat. On initial takeoff the pilot snatched back so hard on the yoke I felt the wing shudder. I took the airplane with the “I’ve got it” honed from years as an Air Force instructor pilot and the test pilot immediately let go of the yoke, as if he had a lot of practice doing that. After the flight, I asked the pilot why he was so aggressive with the pitch, especially given our newly installed stabilizer. His answer, “That’s

the way I fly,” was hardly sufficient.

I thought that would rekindle our flight department debate, but the rapid rotation pilots assured the rest of us that they were doing it safely, had been doing it safely for years, but thanked us for our concern. They were our most experienced pilots, each having flown the airplane since its first year of operational service, nearly five years earlier. I had yet to attend my first recurrent. Once again, I decided to move on.

Step Three: Ignoring Common Sense

Complaint No. 3 . . . well, perhaps the word “complaint” is too strong. I was uncertain about deice/anti-ice procedures

Twenty-Five Case Studies Worth Your While

- (1) Air Canada Flight 797, June 2, 1983, cabin fire, NTSB AAR-86/02.
 - (2) Air Cargo Carriers Flight 1260, May 5, 2017, complacency, NTSB DCA17FA109.
 - (3) Air France Flight 296, June 26, 1988, complacency, Bureau d’Enquetes et d’Analyses (BEA) published April 1990.
 - (4) Air France Flight 447, June 1, 1990, loss of control, BEA published July 2012.
 - (5) Alaska Airlines Flight 261, Jan. 31, 2000, improper maintenance practices, NTSB AAR-02/01.
 - (6) American Airlines Flight 965, Dec. 20, 1995, CFIT, Flight Safety Foundation’s Flight Safety Digest, May-June 1998.
 - (7) Bombardier BD-700 C-GXPR, Nov. 11, 2007, eye-wheel-height, Transportation Safety Board of Canada (TSBC) A08A0134.
 - (8) Bombardier Challenger 600 N370V, Feb. 2, 2005, weight and balance, NTSB AAR-06/04.
 - (9) Challenger 604 C-FTBZ, Oct. 10, 2000, complacency, NTSB AAB-04/01.
 - (10) Challenger 604 N90AG, Jan. 4, 2002, icing, U.K. AAR 5/2004.
 - (11) Colgan Air Flight 3407, Feb. 12, 2009, improper stall recovery, NTSB AAR-10/01.
 - (12) Comair Flight 5191, Aug. 27, 2006, situational awareness, NTSB AAR-07/05.
 - (13) Eastern Air Lines Flight 401, Dec. 29, 1972, crew resource management, NTSB AAR-73-14.
 - (14) Gulfstream GIII N303GA, March 29, 2001, CFIT, NTSB AAB-02/03.
 - (15) Gulfstream GIV N121JM, May 31, 2014, intentional noncompliance, NTSB AAR-15/03.
 - (16) Gulfstream GV N777TY, Feb. 14, 2002, NTSB MIA-02LA060.
 - (17) Learjet N47BA, Oct. 25, 1999, hypoxia, NTSB AAB-001/01.
 - (18) Pilatus PC-12 N128CM, March 22, 2009, complacency, NTSB AAR-11/05.
 - (19) Pinnacle Airlines Flight 3701, Oct. 14, 2004, intentional noncompliance, NTSB AAR-07/01.
 - (20) Qantas Flight 72, Oct. 7, 2008, crew coordination, Australian Transport Safety Bureau AO-2008-070.
 - (21) Sabreliner N442RM and Cessna N1285U, Aug. 16, 2015, midair collision, NTSB WPR15MA243A/B.
 - (22) Southwest Airlines Flight 1248, Dec. 8, 2005, situational awareness, NTSB AAR-07/06.
 - (23) Southwest Airlines Flight 1455, March 5, 2000, situational awareness, NTSB.
 - (24) Swiss Air Flight 111, Sept. 2, 1998, cabin fire, TSBC A98H0003AAB-02/04.
 - (25) United Airlines Flight 173, Dec. 28, 1978, crew resource management, NTSB AAR 79-7.
- ▶ Australian Transport Safety Bureau reports are available at <https://www.atsb.gov.au/>
 - ▶ BEA reports are available at https://www.bea.aero/index.php?id=17&no_cache=1
 - ▶ Flight Safety Digest is available at <https://flightsafety.org/aerosafety-world/publications/flight-safety-digest/>
 - ▶ NTSB accident reports are available at <http://www.ntsb.gov> under the “Investigations” tab.
 - ▶ TSBC reports are available at <http://www.bst-tsb.gc.ca/eng/aviation/index.html> under the “Investigations” tab.
 - ▶ U.K. accident reports are available at <https://www.gov.uk/aaib-reports>

AircraftBluebook

PRINT & DIGITAL SUBSCRIPTIONS | APPRAISAL SERVICES | DATA LICENSING

CONVERSIONS &
MODIFICATIONS

SERIALIZATION
BY MODEL YEAR

MAINTENANCE PROGRAMS

NEXT GEN AVIONICS

TRUST

Know the Value

For over 65 years, Aircraft Bluebook has been the industry's go-to source for reliable and accurate aircraft valuations, providing in-depth data and information to the global business and general aviation community.



AVIATION WEEK
NETWORK

Visit aircraftbluebook.com for more info.

for the Challenger 604 because I had never been taught and I never had the experience. By the time I attended my first recurrent I had yet to need a deice truck when operating the 604. During my first recurrent at the simulator, the syllabus item was considered complete if I managed to notice the synthetic snow blowing across the synthetic ramp and called for some synthetic deice. After the sim period, I asked, "How does she fly with ice on the wing?" The question was considered a strange one. "Why would you do that?"

I heard from another instructor that a brand-new Challenger 604 flunked its initial airworthiness test flight because it rolled rapidly to one side during full flap stall checks. The only thing wrong with the airplane was a 6-in. strip of paint left on the leading edge of a flap. They removed the paint and the roll tendency went away. I decided that any contamination on the Challenger 604's wing should not be taken lightly.

I finally got my chance in Anchorage, Alaska, where, with a full coat of Type IV anti-ice fluid, the airplane seemed to fly without complaint even in lightly falling snow. A month later I was in Seattle where an overnight freeze left my wings with a sandpaper-like coating of frost. The other pilot got his vote in early. "It's nothing a little sunrise can't take care of." I was the pilot in command, but he was senior to me. I asked for a truck with Type I. As we taxied from the ramp I noted, with no small degree of self-satisfaction, that the other aircraft were still frost covered. When we got home the chief pilot asked me about the bill, which was around \$400. I explained the frost situation. "OK," he said. "But keep in mind we don't waste the client's money just to make ourselves feel good."

I was thinking about this one month later, the day of President George W. Bush's inauguration on Jan. 20, 2001. We had flown into Washington Dulles International Airport (KIAD), Virginia, the previous night. It had been snowing heavily, but all that had turned to rain the next day. When it was time to leave, our wings appeared clean from a distance but there was clearly a coating of frost on the leading edges. We had two 604s parked side-by-side and the other three pilots agreed the frost wasn't going to be a problem. I was in the process of talking myself into doing something I knew was wrong when the other aircraft's passengers showed up. We watched as they attempted and failed to start their engines. A pool of frozen water in both engines kept both spools of their engines from

rotating. I crawled onto our frost-covered wing and discovered the same problem in our airplane. We towed both aircraft into a warm hangar to thaw out our engines; my frost on the wings argument was postponed.

I managed to avoid frost until the next winter, when another Challenger ended the debate once and for all. On Jan. 4, 2002, Challenger 604 N90AG took off from Birmingham International Airport (EGBB), U.K. Both pilots commented about the frost on their leading edges, even as other aircraft were deicing for amounts of frost reported to be between 1 and 2 mm. Immediately after takeoff the 604 rolled sharply to the left, despite the crew's application of full opposite aileron and rudder. Six seconds after liftoff, the bank angle reached 111 deg. as the aircraft impacted 13-deg. nose down; both pilots and all three passengers were killed.

The accident surprised everyone in our flight department. Half of us wondered why two pilots would blatantly ignore the flight manual limitation requiring a wing clear of any contamination, including frost. The other half wondered how these pilots lost control of the aircraft when they had seen the airplane fly just fine with a little frost. The answers to both questions were surprising. Both pilots were suffering from the combined effects of jet lag and a non-prescription drug. While one of the pilots appeared to be concerned about the frost, he didn't take any steps other than commenting. But why did they lose control immediately after takeoff? The accident report speculates that the hot APU exhaust melted the frost on the right wing only. The aircraft it seemed, had enough lift to fly but not enough roll authority with frost on one wing only. Our chief pilot issued his first ever "all hands" email. We were instructed that under no conditions would we be allowed to take off with anything less than a clean wing.

With three years of operational experience, nearly all of my complaints had been answered. I had learned to accept that I would never understand the fuel system and that stick and rudder procedures were more about technique than procedures in this airplane. It was an unhappy result, but I had learned to accept both unhappy answers.

The next year, the NTSB reopened the investigation into the Wichita fuel migration crash. In 2004, it concluded this second accident investigation and determined that although fuel migration was a problem, the crash was caused by the pilot's aggressive rotation of 9.6 deg. per second. Had the pilot observed the

operating manual's 3-deg.-per-second procedure, the crash would not have occurred. This served only to solidify positions in our flight department and, in the end, no positions had changed.

Step Four: Learning the Hard Way

Complaint No. 4. The last remaining complaint was really the first I had noticed during training: None of our pilots had a firm grasp on the airplane's weight and balance. During initial training the instructor handed us a workbook with step-by-step instructions that we used during an open book exam. I used the workbook to complete the exam and forgot about CG problems until given the task of cleaning out our cockpits of anything extraneous. I found something buried underneath the many manuals, charts and checklists in the cabinet meant for such things. The mystery item was a piece of metal with three holes cut out meant for a weight and balance chart.

A few of the older pilots recognized the piece of tin immediately and we found the paper chart meant to go with the template. One of the pilots taught me to use it and I realized it did what it claimed. The template allowed us to trace the impact of loading passengers, bags and fuel onto the chart without any math at all. "Why don't we use this?" I asked. "It isn't necessary," the veterans said. We never had a CG problem, so using it was a waste of time. Everyone agreed we needed to keep the template in the cockpit, in case anyone asked, but we shouldn't use it because the paper charts cost money. I stuffed one template and one paper chart into envelopes and ensured each aircraft had a set. That task done, I returned to the business at hand: flying the Challenger 604 all over the world.

As my fifth and last year of flying the 604 opened, I was starting to feel bored with the jet, despite still having a few unanswered questions about aircraft systems and procedures. I was no longer troubled with my less than perfect state of knowledge. In fact, most of my effort was steered toward finding another jet to become excited about. But before I could do that, I was reminded about one of my complaints that I had dismissed and forgotten.

On Feb. 2, 2005, the crew of a Challenger 600, N370V, failed to rotate from Runway 6 at Teterboro Airport (KTEB), New Jersey. The aircraft ran off the departure end of the runway at

a ground speed of about 110 kt. through an airport perimeter fence, across a six-lane highway (where it struck a vehicle), and into a parking lot before impacting a building. The two pilots were seriously injured, as were two occupants in the vehicle. The cabin aide, eight passengers and one person in the building received minor injuries. The airplane was destroyed by impact forces and postimpact fire.

Of course, we Challenger pilots were concerned and speculated about something falling between the pilots' seats and the yoke, or perhaps a control jam. Early accident reports focused on the nature of the operator's charter business and the aircraft's CG. It took more than a year for the official accident investigation to conclude, and in that time, I left the Challenger world for a return to Gulfstreams. While the fate of the Teterboro Challenger was old news to me, the findings served as a wakeup call about my path to operational complacency.

The pilots of N370V did not compute their takeoff weight and balance for their flight from Teterboro to Chicago-Midway Airport (KMDW). The planned fuel and passenger loading would have been within limits, but the pilots asked for a fuel "top off," as is a common practice in the airplane when stopping distance isn't

its maximum allowable takeoff weight but also moved the aircraft's CG well beyond its forward limit.

Reading the report, I realized that I could have been guilty of the same offense many times during my Challenger 604 career. Asking for a full load of fuel wasn't uncommon in the limited range jet. As many fighter pilots have said over the years, "You can never have too much gas, unless you are on fire." When I started

flying the airplane, one look at the fuel tank layout and the weight and balance chart told me I needed to get smarter on the subject. The fun and excitement of actually flying the airplane — being operational — allowed me to forget my list of complaints and get on with the business of flying. I had become complacent and my complacency grew with each year of operational flying. It was a pattern I was guilty of many times over the years.

Step Five: The 'Sidestep' — Anticipate It Before It Happens

As with many who have come face-to-face with repeated failure, I vowed to do better. I thought that the causes of my operational complacency were inevitable,

The weight and balance envelope for Challenger 600, N370V.

they were headed my way no matter what I did. What I needed was a way to get out of the way, to sidestep the causes before they had a chance to damage my psyche. My method has taken shape over the 15 years that have elapsed and seems to work for me. You might give it a try as a starting point.

(1) Approach initial training with an open, but skeptical mind. Make note of things you learn as an instructor's opinion until you can get verification from a manual or actual experience. Keep notes and keep a record of unanswered questions.

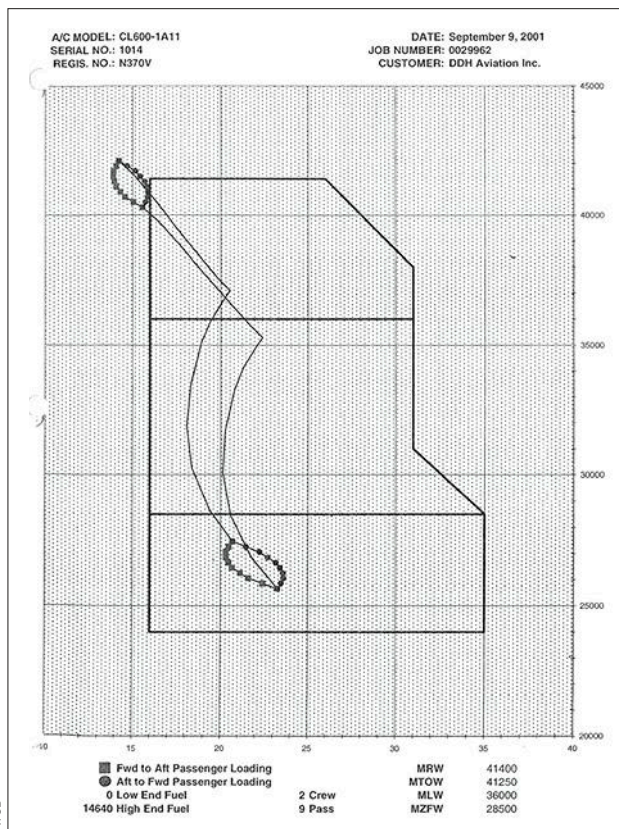
(2) Treat operational experience as another learning opportunity. Your fellow pilots, mechanics and other technicians are instructors

of a sort. Make notes of what you learn "out there" while also keeping track of who said what. You will soon learn who is espousing reliable knowledge and who is just making it up.

(3) Develop a network of like-minded peers who value understanding aircraft systems and procedures as much as you do. Trade questions and answers. Collect source material.

(4) Study accident case studies with a few questions in mind: How would this problem manifest itself in my aircraft? What would I have done in that situation? What resources do I have in the cockpit to deal with these issues? Go beyond a cursory mind game; dig into your manuals and follow the checklists to become familiar with them and to spot problems where you might need a little more knowledge. See the sidebar, "Twenty-Five Case Studies Worth Your While" for a good place to start.

In the years since my Challenger weight and balance epiphany I've upgraded airplanes four times. I've managed to avoid the boredom that has plagued me in the past, though I've probably bored some of my peers with my incessant questioning about aircraft systems and procedures. I am no longer flying a Challenger, but with every new airplane I've learned to accept each challenge and remain motivated to learn. Even operationally, the learning never stops. **BCA**

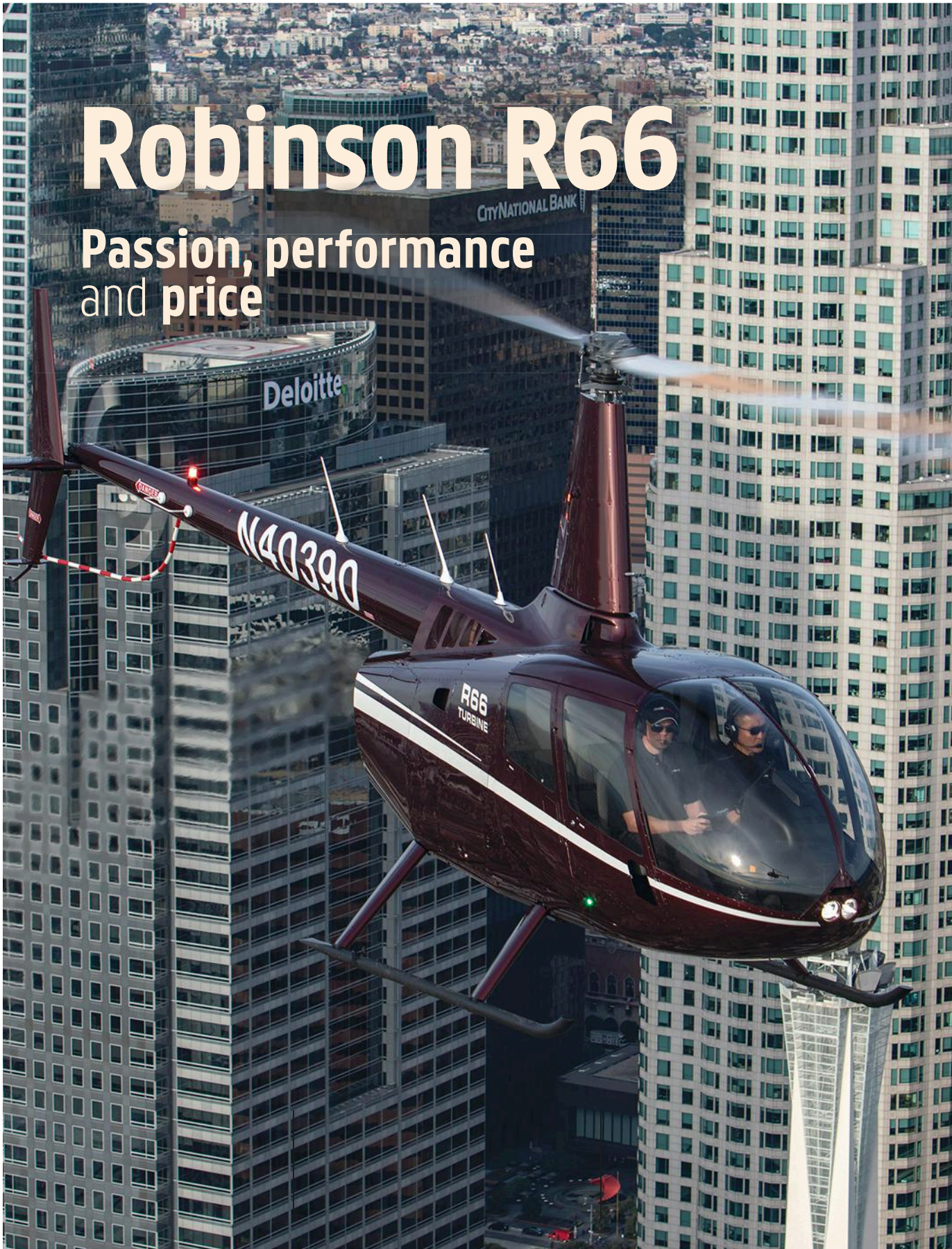


Challenger 600, N370V crash site

a concern. What these Challenger pilots didn't understand was that the Byzantine layout of their fuel tanks meant their CG tended to migrate forward once a certain amount of fuel was uploaded. Going from their planned fuel load of 13,900 lb. to 14,600 lb. not only put the aircraft above

Robinson R66

Passion, performance
and price



BY **LOU CHURCHVILLE** lou@churchoaero.com

Robinson Helicopter Co. delivered its first FAA-certified model 40 years ago and not only is it still in production, but early on it became the world's foremost light helicopter. The 1,370-lb. MGTOV R22, two bladed, semi-rigid design was initially powered by a normally aspirated, legendary and ubiquitous Lycoming O-320 engine, which was succeeded by the O-360, both of which were derated to 124 hp (continuous). The Lycomings were proven, bulletproof, mature, mechanically simple, reliable and inexpensive to operate and own. Thus they fit Robinson's keep-it-simple design philosophy perfectly.

Although it's the leading civil helicopter trainer globally, the R22 has a reputation for being "touchy," even "squirrely." But many instructors say those characteristics provide trainees with seat-of-the pants mastery of the machine and finely honed operational instincts — particularly wind wisdom — that helps them become truly competent and confident aviators. In excess of 4,800 R22s have been delivered since serial number 001, and production continues at around 40 aircraft per year.

R22s have no life-limited parts less than 2,000 hr. They are good to go for 2,000 hr., with only routine on-condition maintenance. At the 2,000-hr. mark, the airframe, engine and major components must undergo overhauls, and then the diminutive two-seater is good for another 2,000 hr. ad infinitum. In fact, some flight school R22s have exceeded 20,000 hr. total, with many logging around 1,000 hr. a year.

While the marketplace embraced the R22 right from its launch, some operators also wanted more payload, seats and power, but in a similarly affordable, reliable and simple machine.

In 1993, three years after it was announced, Robinson delivered its first R44. The new model offered four seats, a bigger avgas-fueled piston engine and better performance while incorporating all of the design principles of the R22, but with some upgrades. A welcome addition? As of this writing, 7,000 R44s have been delivered.

Early revisions to the R44 design included hydraulic boost for the controls, rupture-proof fuel tanks and fuel injection. Otherwise, except for its size and an enclosed cooling fan shroud, the R44 exterior and flight deck mirrored those of the R22, leaving no doubt it was a Robinson.

With the millennium's arrival, Robinson eyed a new opportunity. The long-established helicopter makers were becoming fixated on twins, heavy lifters and military programs, and the relative newcomer from Torrance, California, decided a lightweight, inexpensive, turbine-powered Robinson might fill a market void. So, it approached Rolls-Royce, entreating it to develop a turbine engine "to power a larger version of the R44."

After considering the expense and market prospects involved, Rolls, which acquired the Allison Engine Co. in 1995, agreed. Guided by Robinson's fundamental design principles of simple, lightweight, reliable and affordable, Rolls redesigned its legacy, proven RR/Allison M250 with a new centrifugal compressor and eliminated the axial compressor stages. It was designed to perform to a 2,000-hr. TBO while attaining

Robinson's 300-shp (derated to 270 shp for takeoff and 224 shp continuous) output target.

The new engine, designated the RR300, was key to the launch of the R66 in 2007. That third family member arrived in 2010, featuring five seats, an autopilot and air conditioning, and was then priced at \$814,000 (today it's \$906,000).

The standard aircraft is VFR and fitted with Garmin com, transponder and audio panel. IFR equipment with Garmin, Avidyne and Aspen units is offered as an option.

The company reports the fixed annual cost for the model, including depreciation, liability and hull insurance, works out to \$21,075 and per-hour DOCs are \$110 to \$160. Two Airworthiness Directives have been issued for the R66. One called for inspection of the main rotor blade and the second was for inspecting and possibly replacing the oil tank.

Installation in the R66 of the Rolls-Royce RR300 gas turbine enables a direct engine shaft drive to the main rotor gear box, further simplifying the power train.

Pilot flight experience in our survey ranged from 6,000 to 20,000 hr. of rotary-wing time.





The Robinson R66 flight deck family resemblance is strong as evidenced by the cyclic arrangement. Integrated avionics are tucked into a newly designed instrument panel, concise and easy to reach.

So, after nearly a decade, how does the R66's in-service performance match its intended operational and economic promise? We asked those who operate the aircraft to find out.

Owner/Operator Comments

As it happens, and perhaps unsurprisingly, every R66 operator we surveyed had significant prior experience in the R44 and often in the R22 as well. Brand loyalty at its best.

Pilot flight experience ranged from 6,000 to 20,000 hr. of rotary-wing time. Two pilots we interviewed were rated in airplanes and helicopters, but their fixed-wing time became incidental early in their careers as their helicopter capability was more in demand — more varied and fun, according to the respondents. About three-quarters of those we surveyed had significant experience in “competitive” helicopters like the Bell 206 and 505, the MD 500 and Eurocopter EC120.

And about the same amount learned to fly in an R22, moved into an R44, and now concurrently operate an R66. This implies that the R44 and R66, while very similar in form and function, are complementary and stand on their own in specific flight operations and in economic performance.

Respondent comments seemed balanced and, frankly, quite similar.

For example, one pilot — citing the JetRanger in which he has logged several thousand hours — stated about the single-engine Bell, “Look, it's 1960s technology, but it's a proven design. All the big bugs worked out long ago. But the most reliable performance metric is [its] high maintenance costs and low dispatch reliability compared to the R66. One thing I noticed right away, compared to the 206, the 66 had no “two-per” shake — it was smooooth.”

A pilot/operator comparing his R66 to one of the categorically equivalent alternatives said, “A new R66 costs about \$1 million and includes a glass panel, autopilot and air conditioning — all with superior visibility. A new, similar competitive helicopter will set you back three times as much for a helicopter with free trim [i.e. no hydraulics], without the autopilot, air conditioning and integrated avionics. And the reliability just isn't there compared to our R66.”

He went on to state, “I get the same performance burning 18 to 22 gal. per hour in the R66 that the other machine



Left to right, the Robinson family — R22, R44 Cadet, R44 Raven 1, R44 Raven 11; R66

gets burning 32. Plus, the 300-lb. capacity baggage/cargo area is large and thoughtfully designed. Yeah, the other machine has a similar baggage compartment, but the door is so small a suitcase won't fit through it. That may not be considered 'performance,' but it is to me on charter flights with passengers."

One operator who has been working R44s and an R66 for several years in airways and approach guidance and heliport design said, "Heck, this thing [R66] flies from scheduled check to check. It never breaks, not in four years of constant use. [It's] just routine maintenance. Our experience is it is a high reliability, high performance and extremely cost-effective helicopter."

Another contractor, who hops between his fuel-injected R44 and the turbine-powered R66, observed that the flight deck layouts are so similar, he has to hesitate during the start sequence in the latter to avoid a hot start. "I got so used to the R44 starting right up," he commented, "that in the R66 I have to pause and remember to accommodate N1 spool-up before adding fuel. It flies like the R44 — only stronger and smoother."

He compared the two Robinson models to cars: "The R44 is like a Toyota or a Honda; the R66 is like a Lexus or Acura."

When operators were asked what improvements they would like made to the R66, virtually everyone paused and had no suggestions. Two volunteered that the interior could be upgraded. For example, "Contrast stitching on the seats would be nice," one operator responded, "especially since we charter some very-high-end passengers. They can see and feel plush. But as for the performance, not so much. That's mine to enjoy."

The R66's extra windows and additional rear seat were noted by several operators as a very positive enhancement. "We get much fewer airsick events," said one. "The visibility inside and outside from the right seat is the best in class," commented another turbine veteran with over 20,000 hr. in virtually every major helicopter in the category.

One Texas responder operates 24 helicopters including four R22s, 15 R44s and three R66s. He takes the R66s coast to coast fairly regularly on patrol. Of those, he noted, "They are so reliable and with the power available over the mountains, I don't sweat it. They perform as advertised."

Clearly, Robinson has done its



R66 External Load option includes right seat solo, bubble window, side-mounted instrument cluster (EGT, torque and sling-load weight gauge), and optional load mirrors.

homework on applications for the R66 and offers options and features that broaden its operational performance for end users. Popular ones operators mentioned were the removable "pony" auxiliary fuel tank providing about an additional 5 hr. aloft — an especially useful capability in law enforcement and extended survey flight ops. All operators surveyed liked the air conditioning.

Product support can be a tough area to spot check since good and bad experiences can be episodic or systemic. The assessment seems even more challenging with the Robinson as was best illustrated by one R66 operator's response: "I don't know about AOG support. We are coming up on our second 2,000-hr. overhaul period and we have never had an AOG or unscheduled maintenance

support issue." That position was echoed by the majority of operators questioned.

Engine support did receive some down marks. For example, one operator reported difficulty in getting an issue resolved and cited confusion over part numbers between Rolls-Royce and Robinson that caused delays in his aircraft's return to service. His impression was that the problem was at the factory, and not the supplier, and opted to go direct.

That overall customer satisfaction is reflected in Robinson's delivery summation last year: "Overall production in 2018 was 316 helicopters, a slight increase compared to 2017's production of 305. The R44 topped the list at 209 and again ranked as the world's best-selling helicopter according to GAMA's General Aviation Aircraft Shipment

Performance Comparison

	R22 Beta II	R44 Raven II	R66 Turbine
Engine	Lycoming O-360 Carbureted	Lycoming IO-540 Injected	Rolls Royce RR300 Turbine
Horsepower	Derated to 131 hp TO/124 hp continuous	Derated to 245 hp TO/205 hp continuous	Derated to 270 shp TO/224 shp continuous
Max. Gross Weight	1,370 lb. (622 kg)	2,500 lb. (1134 kg)	2,700 lb. (1225 kg)
Approx. Empty Weight	880 lb. (399 kg)	1,505 lb. (683 kg)	1,290 lb. (585 kg)
Standard Fuel	101 lb.(46 kg) (16.9 gal)	177 lb. (80kg) (29.5 gal)	493 lb. (224 kg) (73.6 gal.)
Auxiliary Fuel	56 lb. (25 kg) (9.4 gal)	102 lb. (46kg) (17.0 gal)	NA
Pilot, Pax & Baggage*	389 lb. (189 kg)	818 lb. (371 kg)	917 lb. (416 kg)
Max Airspeed (VNE)	102 kt. (189km/h)	NA	NA
Cruise Speed @ GW	Up to 96 kt. (178km/h)	Up to 109 kt.(202km/h)	Up to 110 kt. (204 km/h)
Max Range (no reserve)	Approx. 250 nm (460 km)	Approx. 300 nm (550 km)	Approx. 350 nm (650km)
Hover Ceiling IGE (1,370 lb.)	9,400 ft.	8,950 ft. @ 2500 lb.	Over 10,000 ft.
Hover Ceiling OGE (1,300 lb.)	8,000 ft.	7,500 ft. @2300 lb.	Over 10,000 ft.
Rate of Climb	NA	Over 1,000 fpm	Over 1,000 fpm
Max. Operating Altitude	14,000 ft.	14,000 ft.	14,000 ft.
Electrical System	14 V	28 V	28 V

*With Standard Fuel



New removable aux. fuel tank for baggage compartment carries 43 USG, weighs 37 lb., and provides a total endurance of about 5 hr.

Shown here is the five passenger seating configuration. A thoughtful touch – the center seat is raised to provide slightly more shoulder room.

The R66 baggage compartment door opens wide to ease loading and unloading. Weight limit is 300 lb.



2018 Year End Report. Production of the R66 and R22 were consistent with 2017, finishing at 74 R66s and 33 R22s. For 2019, Robinson continues to work on technological enhancements and foreign validations for the slew of new options introduced last year.”

Since its certification in 2010, Robinson has sold 945 R66 helicopters, with about 60% of those operating internationally. Its record of reliability and popularity underscore the fact that a company — in this case a family owned one — with the passion, intelligence and capability for producing an affordable performance product consistently is likely to prevail in the marketplace. Just ask those who operate them. **BCA**

R66 Operations and Upgrades

- ▶ Removable 43-gal. auxiliary fuel tank; with a 23-gal. aux tank in the works.
- ▶ 1,200-lb. cargo hook.
- ▶ TB-17 lithium-ion battery.
- ▶ Heated seats.
- ▶ Wire-strike protection provisions.
- ▶ A newly designed, quieter tail rotor; available this summer.
- ▶ Pop-out, six-chamber floats.
- ▶ Air conditioning.
- ▶ Aft-seat USB charge ports.
- ▶ Garmin GDU 1060 TXi display system.

The Man Behind the Name

A native of Carbonado, Washington, Frank Robinson became fascinated with helicopters at age nine when he saw a news photo of Igor Sikorsky hovering his VS300 prototype. That image, he recalled, “blew me away,” with the aircraft representing “the ultimate freedom” and fixed his life’s course.

Working his way through the University of Washington, Robinson earned a mechanical engineering degree and later attended graduate school at the University of Wichita, a city where he launched his career working on Cessna’s CH-1 Skyhook helicopter.

Though ill-starred, the project was a great experience for the eager helo-head, who then moved on to gyroplanes, to a gyrodyne, to Bell and, finally, Hughes Helicopters.

Throughout, he advocated building a simple, low-cost, everyman’s helicopter, but he was out of sync as his employers moved to produce ever-larger machines powered by expensive turbine engines. Frustrated and by then middle-aged, in 1973 Robinson took matters into his own hands. He quit Hughes and formed his own company with the goal of designing and building the machine he had championed so long.

Working out of his home, he began designing a two-seater with a two-blade rotor, simple systems and powered by a piston engine. He named it the R22. Two years later, he flew it for the first time, and three and a half years after that, the FAA presented him with a type certificate. And then the hard work began.

Production was modest at first, and money was always tight. A major appeal of the R22 was its \$40,000 base price,

an extraordinarily modest sum for a helicopter, and so low that margins, if any, were paper thin.

In 1979, the company produced just eight aircraft, but the following year output increased to 78, and the year after that it doubled. But then a fuel crunch and an industry-wide run-up in general aviation liability litigation combined with some rotor failures with fatal consequences to put Robinson’s company in a bad way. He fixed the rotor problem, chucked his insurance, pleaded patience with his suppliers and kept building.

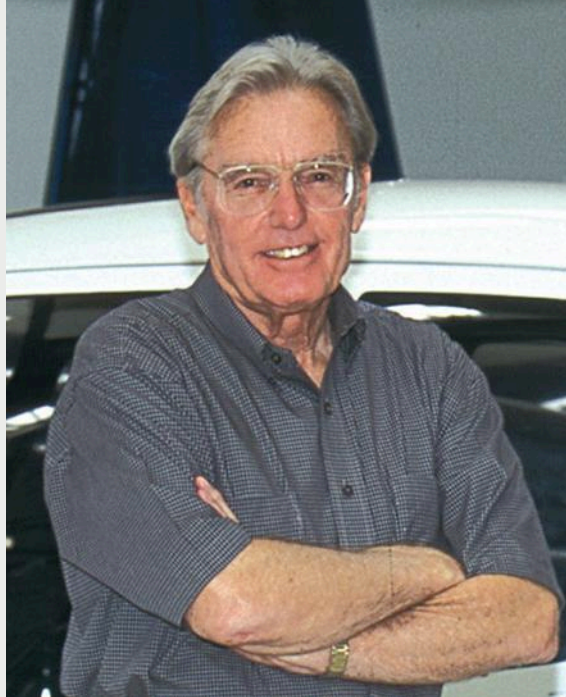
“We came awfully close to going under on several occasions,” Robinson recalled. “But we hung on.”

His tenacity, frugality and passion were to be handsomely rewarded.

Robinson remained as head of his eponymous company until the R66 neared its certification in 2010, at which time he turned over control to his son, Kurt, then a 23-year veteran in the family business, who continues in that role today.

For his vision and signal accomplishments, Frank Robinson has received a litany of awards and honors from a host of organizations including the American Helicopter Society, the American Society of Mechanical Engineers, the American Institute of Aeronautics & Astronautics, the Royal Aeronautical Society, the Federation Aeronautique Internationale, the Society of Experimental Test Pilots, and Aviation Week & Space Technology, among the many.

A generous contributor to a variety of aviation-related organizations, Robinson Helicopter’s founder, inspiration and chairman emeritus will celebrate his 90th birthday in January 2020. **BCA**



Flight Training

Pilots looking to check out in the R66 can find training through a Robinson dealer or by contacting the factory directly. The company holds monthly Pilot Safety Courses at its factory in Torrance, California, for operators of all three models and at select international dealers on a schedule that is posted on the Robinson website:

<http://www.robinsonheli.com>

R66 Airworthiness Directives

► AD 2016-26-04 Alter F016-2 Rev A-E MR blades (SB-13)
Link: <https://bit.ly/2WYyFBn>

► AD 2019-07-02 Remove oil tank, or modify tank outlet, as specified (SB-21A)
Link: <https://bit.ly/2WztB4R>

Is Seeing Believing?

When visibility and ceiling reports differ from a pilot's perception

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

Maybe you've had the situation in which the automatic terminal information service (ATIS) at Colorado's Aspen-Pitkin County Airport/Sardy Field (KASE) indicated "clear," yet when you tried the approach, you found yourself in solid instrument meteorological conditions (IMC) at the missed approach point (MAP). Consequently, you went missed approach and landed at an alternate and when you made contact with your frustrated passenger back at KASE, he roared on the phone, "I'm looking straight up at blue sky! What's your problem?"

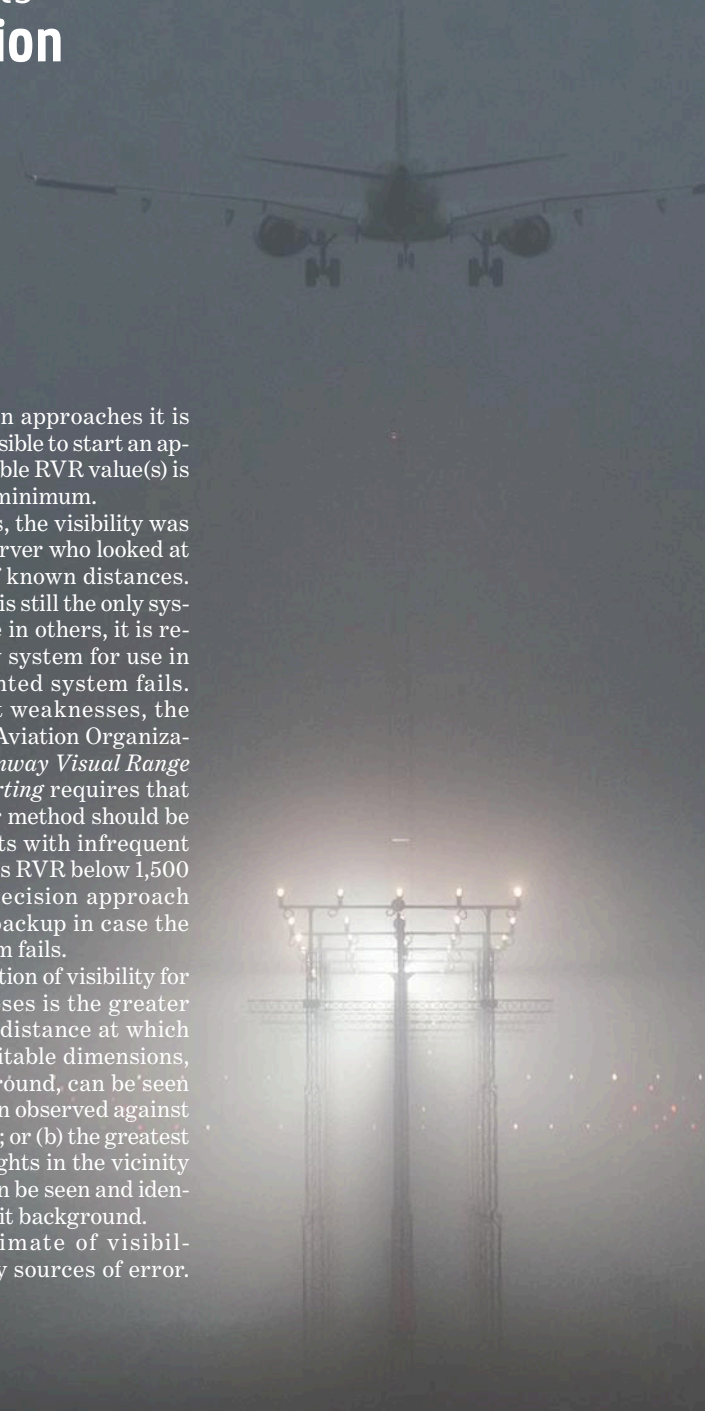
The differences between what a human would "see" versus an automated reporting station's report can be significant when it comes to measuring ceiling and visibility. Having an accurate runway visual range (RVR) is important for many reasons. The main purpose of RVR is to provide pilots, air traffic control and other aeronautical users with information on runway visibility conditions during periods of low visibility, whether due to fog, rain, snow or sandstorms. RVR is required to assess whether conditions are above or below the specified operating minima for takeoff and landing. Its values supersede the reported visibility and in


the case of precision approaches it is normally not permissible to start an approach if the applicable RVR value(s) is below the required minimum.

In earlier decades, the visibility was reported by an observer who looked at visual references of known distances. In some countries it is still the only system available, while in others, it is retained as a standby system for use in case the instrumented system fails. Due to its inherent weaknesses, the International Civil Aviation Organization's *Manual of Runway Visual Range Observing and Reporting* requires that the human observer method should be employed at airports with infrequent weather that reduces RVR below 1,500 meters, for non-precision approach runways and as a backup in case the instrumented system fails.

The official definition of visibility for aeronautical purposes is the greater of: (a) the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background; or (b) the greatest distance at which lights in the vicinity of 1,000 candelas can be seen and identified against an unlit background.

The human estimate of visibility is prone to many sources of error.





Visibility can often be different in various directions from an airport. Significant differences may occur in the background luminance and extraneous lights to which an observer and a pilot are exposed. This can be important where observations are not made at the runway center line. A group of observers may have different distant visual acuity, significant variations in the visual threshold of illumination in different background luminance conditions or other degraded vision characteristics. Pilots must check their eyesight periodically and generally place high demands on their vision, but this does not necessarily apply to personnel making RVR assessments. ICAO's manual recommends that observers should meet a specified vision standard and be subject to periodic vision checks.

If observers are exposed to high levels of illumination just before making visual observations using lights, as would be the case when they leave a lighted area to make night observations, without sufficient time for their eyes to the darker environment, their visual acuity would be degraded. In such cases the RVR values would be underestimated, which could result in the unnecessary deviations of aircraft to alternative airports.

Runway edge lights are intentionally directed with the beam intensities pointed toward the runway center line while the light intensity falls off rapidly toward the edges. This is done purposely to enhance a pilot's ability to see the runway edge lights when aligned with the runway for takeoff and landing. However, for safety reasons, human RVR assessments cannot be made from the runway itself. And so positioned, an observer will sense lower light intensity and hence report poorer visibility.

Instrumented RVR systems have been developed that are more accurate and consistent, thereby allowing monitoring multiple locations along the runway simultaneously, and are able to provide more rapid updates. In order to meet requirements for the rapid updating of information on RVR changes, the trend has been toward automatic systems capable of giving digital readouts.

RVR is defined in ICAO Annex 3, Chapter 1, as: "The range over which the pilot of an aircraft on the center line of a runway can see the runway surface markings or the lights delineating the runway or identifying its center line." The two commonly used instruments for measuring visibility are either a

transmissometer or a forward-scatter meter.

RVR is sometimes used by pilots as an indication of the visual guidance that may be expected during the final approach, flare, touchdown and roll-out. It is tempting to assume that the RVR will provide an indication of the overall visual range conditions. However, RVR applies only for the visual range on the runway as the conditions during approach may be significantly different. Until the pilot is actually on the runway, the view from the cockpit down to the ground represents a slant visual range (SVR) and may be affected by fog densities varying with height.

Since RVR cannot be measured directly on the runway, the error caused by the difference in conditions at the runway and at the location where the RVR is assessed can have an operational impact. The ICAO manual on the subject provides a comprehensive and validated review of these sources of error. For instance, the RVR systems are usually installed up to 120 meters from the runway center line on a grass or sand surface, which in winter might be covered with snow. In contrast, the runway is made of concrete or asphalt, which may warm more rapidly than the surrounding grass, snow or sand surfaces. The resulting temperature difference between the runway and surrounding area will affect the distribution of fog and may result in a greater RVR along the runway than that assessed by the instruments. This effect may be enhanced by aircraft movements on the runway that, in the short term, can cause the dissipation of fog due to the hot exhaust gases and turbulence generated. However, the exhaust gases also contain condensation nuclei and water vapor that may lead to the thickening of fog in a longer term. In cold climates, during surface inversions, only one flight operation may be enough to cause fog formation because of the turbulence generated.

If the fog is caused by advection, the wind direction and obstacles may lead to patchy fog where the instrument may be completely covered by it while at the same time the visibility on the runway is relatively good, or vice versa.

It is usual to make the observations near the touchdown zone and at selected additional sites, normally the midpoint and stop-end. This may, of course, sometimes lead to contradictory results, particularly in the case of patchy fog where, for example, one instrument near the



GETTY IMAGES/MENTINA

A pilot's ability to see the runway environment is affected by many things. Rain on the windshield and resulting compromised light will degrade vision of the runway environment.

touchdown zone could give an RVR of 2,000 meters, while a second instrument near the midpoint of the runway 1,500 meters from the touchdown-zone instrument, could indicate an RVR of 500 meters.

A pilot's ability to see the runway environment is affected by many things. Rain on the windshield and resulting compromised light will degrade vision of the runway environment. When the line of sight passes through a single sheet of uncolored glass at perpendicular incidence (as when a pilot looks at the touchdown zone), the loss of light transmittance is small, about 9%. Most of this loss is caused by reflection at the two air-to-glass surfaces. The windshield of a transport aircraft usually has two or more such surfaces, and two or more glass-to-plastic surfaces.

Additionally, the line of sight is not perpendicular to the windshield and the latter may have an electrically conducting film to provide deicing heat. It is estimated that the angle of incidence of the windshield to the line of sight for typical transport category aircraft is likely to be in the range of 45 to 70 deg. At 45 deg., the transmittance of two sheets of clear glass is approximately 0.82, and at 70 deg. it is 0.54. In these cases, the reduction in light transmittance runs from 18% to 46%. In other words, the intensity of the runway lights is degraded by this amount by the time the light reaches a pilot's eyes.

The backscatter of aircraft landing lights, especially when flying in snow, will also decrease a pilot's viewing ability versus the RVR reading. Stress and fatigue will significantly degrade flight crew physical and psychological condition. Bright cockpit lights, or flight crewmembers exposed to bright lights in the previous time period (think apron flood lighting or flying over bright approach

lights) lessens a pilot's ability to adequately sense the dim environment of a fog-enshrouded runway threshold.

Mountain bowl approaches create a situation in which pilots' eyes are unable to fully adapt to rapidly changing light illumination. The sky above the alpine landscape during civil twilight can be much brighter than terrain features, and pilots are exposed to higher ambient light levels at altitude before descent. Pilots then experience rapid decreases in ambient illumination during the approach to a mountain bowl airport where terrain features rise far above the horizon and reduce the amount of ambient illumination at lower elevations, especially when combined with inclement weather conditions.

The basic equipment of a transmissometer system consists of a transmitter, receiver and a registration control unit. The optical axes of the transmitter and the receivers must be precisely aligned with each other. The transmitter radiates short light pulses with a frequency of approximately 180 flashes/minute. The receiver responds to these and measures their intensity. The ratio of the transmitted energy and the detected energy is a measure of how much light is absorbed in the fog. From this, the RVR is calculated.

The transmitter and the two receivers are optically aligned to each other and located within a precisely measured distance. The use of narrow beam angles and the resulting need for fine optical alignment makes it necessary for the units to be mechanically rigid and mounted on firm foundations since small changes in any alignment can cause large changes in receiver output and can be wrongly interpreted as variations in the atmospheric conditions. Various light sources are used, including tungsten filament lamp, xenon pulse discharge tube,

modulated tungsten halogen lamp and amplitude modulated light emitting diode (LED).

The RVR transmissometer is a technologically advanced instrument; however, it does have some disadvantages. To preserve alignment in locations with unstable ground (e.g. tundra, frost heaves) can be difficult. And since it is located close to a runway, it must be frangible in case of an aircraft's runway excursion. Such factors make the design challenging. Moreover, transmissometer measurements are particularly sensitive to errors caused by window contamination, especially in the upper range of transmissivity. So, covering the complete RVR range from 50 to 2,000 meters is no simple matter.

The forward-scatter visibility sensor utilizes a projector and a detector to measure the amount of light received when light passes through a relatively small air (only three-quarters of a cubic foot) volume. This type of sensor can be mounted on a single mast. The measurement is taken every 30 sec. and averaged over a 10-min. period. Because of its small size and light weight, a forward-scatter meter can be mounted on a single frangible pole. It is not affected by unstable ground conditions. A forward-scatter meter can readily cover the full RVR range with a single instrument. It is relatively insensitive to window contamination and normally does not require frequent cleaning. Moreover, look-down scattering geometry reduces the chances of window contamination or precipitation hitting the windows. A forward-scatter meter can be repaired, recalibrated and restored to service under most weather conditions, including low visibility — with the exception of blowing precipitation or high winds.

The accuracy of the visibility reported

AC-U-KWIK[®]



Know Before You Go

THE DATA YOU TRUST
IN A CONVENIENT, EASY-TO-USE APP

DOWNLOAD YOURS AT:

acukwik.com/products

AVIATION WEEK[®]
NETWORK

by a forward-scatter meter depends on the nature of the phenomenon reducing the visibility, particularly if the weather phenomenon “absorbs” light. This variation may be corrected if the sensor can accurately identify the thing reducing the visibility. However, such corrections may be inaccurate for mixed phenomena (e.g. rain and fog, rain and snow). Strict manufacturing tolerances on scattering geometry must be maintained to prevent calibration variations. Undetected obstructions of the sensor windows, such as snow, can result in reporting RVR values higher than actual. Snow clogging represents the worst case and must be avoided or detected to assure that misleading

microclimatology — or, in other words, the visibility over one part of the runway may differ from the location of the measuring device because of localized weather. For instance, one of these measuring devices located along the slightly lower ground to the south of the Gunnison, Colorado, runway along Tomichi Creek is likely to report a localized fog band while the opposite runway threshold is completely clear.

The ceilometer, which measures sky conditions, is also prone to error. It uses a laser beam shot upward. If there is a cloud layer located directly above the ceilometer, the beam reflects that back. The ceilometer’s narrow laser beam is directed in only one direction to the

An unforeseen overcast layer may take 2 min. for the ASOS to report as a scattered layer and may take up to 10 min. for it to report a broken layer. Secondly, as it takes subsequent readings, the software algorithms “time-average” the readings. “Detection cycles” can be as brief as 12 sec. (during which thousands of pulses are sent) and these are averaged over 30 min., with a double-weighted average over the last 10.

Ceilometers may also report cloud layers inaccurately when there is precipitation in the path of the laser beam. A laser beam is a light wave and refracts when it travels into a medium with a different refractive index. When the beam hits rain, it refracts and hits the cloud layer at a different angle of incidence, resulting in the ceilometer not being able to capture the signal. This results in an inaccurate sky condition report.

On a positive note, ceilometers can measure the height of clouds more accurately at night than human eyes, which are affected at night and cannot distinguish layers of clouds accurately. And human observers are not able to detect multiple layers of clouds when the cloud bases appear to merge with other layers of clouds.

When high winds exist or dynamic snowstorms are moving through, blowing snow and snow squalls can cause the ceiling and visibility to change on each cycle. The rapid changes coupled with the built-in time delay make it difficult to determine if minimums actually exist to continue an instrument approach. Continuous AWOS monitoring to determine a trend — nearly impossible in variable weather conditions with the time delay — can interfere with essential cockpit communications, which can be especially critical on an approach in IMC in mountainous terrain.

With increased operating costs and lower operating minima, much higher degrees of precision sophistication and timeliness are needed in meteorological observations and processed information feeding the aviation sector. Every method used to estimate visibility and ceiling is susceptible to errors. It’s likely that there will always be inherent limitations with automated weather measurement equipment, and interpretation of the weather based on these sources can be fraught with pitfalls.

Wise pilots should understand the fallibilities and limitations of this critical information and proceed accordingly. **BCA**

GETTY IMAGES/TONCH



The RVR systems are usually installed up to 120 meters from the runway center line on a grass or sand surface, which in winter might be covered with snow. In contrast, the runway is made of concrete or asphalt, which may warm more rapidly than the surrounding grass, snow or sand surfaces.

RVR values are not reported. “Look-down” scattering geometry devices significantly reduce the chances of snow clogging.

Field studies in the U.S. have shown that forward-scatter meters and transmissometers have comparable capabilities at 150 meters distant from the instrument. Computer simulations in the U.S. suggest that, with close production tolerances and good scattering geometry design, the unit-to-unit variations in the median fog calibration of a forward-scatter meter can be controlled to +/-7%. Not all forward-scatter meters achieve such close tolerances.

The RVR reported by either transmissometers or forward-scatter meters is susceptible to error caused by

sky, and thus can only detect clouds that pass directly over the beam. To put it in more simple terms, it’s looking up through a narrow straw. The laser beam is so narrow that its detection circle diameter at 12,000 ft. above the station is only 60 ft. Thus, it is very possible for the ceilometer to report “clear” when the single blue hole in the sky happens to be right above it while a human observer looking at the rest of the sky would report an overcast. Rapid formation and dissipation of cloud layers directly above a ceilometer may not be adequately reported because of the algorithms in the automated surface observing system (ASOS), which require 60 samples in a 30-min. period to calculate the percentage of cloud layer.

AVIATION WEEK
NETWORK

Aviation Week Continues the Urban Air Mobility Series.

Seize the Opportunity and Join the Conversation!

AVIATION WEEK
UAM
ASIA-PACIFIC

September 25, 2019
Singapore

uamap.aviationweek.com
#UAMAP

AVIATION WEEK
UAM
EUROPE

October 16, 2019
London, UK

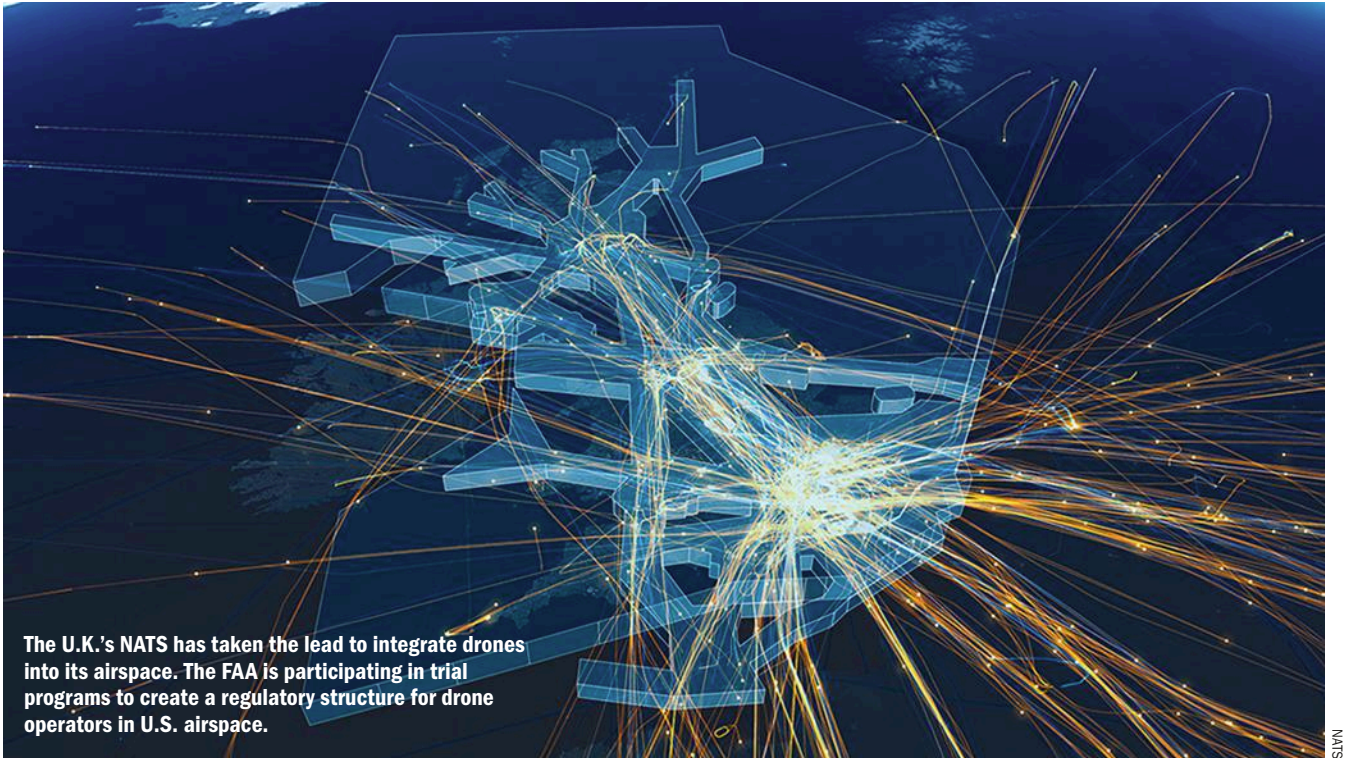
uameurope.aviationweek.com
#UAMEU

Aviation Week's UAM series brings together manufacturers, regulators, technology innovators, disruptors, municipal leaders, and the infrastructure & investment community; all working together to create on-demand aviation for smart cities and a new future for manned and unmanned air transportation.

Attend. Sponsor. Exhibit. events.aviationweek.com

Drones 101, Part 1

How these diminutive aircraft are **revolutionizing the workaday world** — including yours



The U.K.'s NATS has taken the lead to integrate drones into its airspace. The FAA is participating in trial programs to create a regulatory structure for drone operators in U.S. airspace.

NATS

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

We've entered the age of the drone — formally called unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UASes). Drones can be any aircraft operated without a human pilot aboard and have been around since World War II when they were first used for military tasks. But here we're focused on small, multirotor aircraft weighing less than 55 lb. and used for commercial purposes.

The global drone market is expected to reach \$15 billion within three years, up from just \$1.3 billion in 2016. This includes revenues from hardware, software/analytics and drone services. It is no longer hyperbolic to say that drones are as big a tech milestone as digital avionics and GPS.

Their growth is the result of myriad creative drone applications and is limited only by the imaginations of developers seeking fortunes in industrial and governmental needs.

If you're in flight department management or aspire to be, now is the time to start paying attention to those devices. Their larger, more advanced versions are starting to play a role in business aviation. And while the number of air, sea and land applications is exploding, and regulators are scrambling to work out how to safely incorporate drones into the world's airspace, the need for drone-related skills is attracting those who see exciting new employment opportunities. The flight training sector has responded by quickly developing sophisticated drone degree programs.

Now is a great time to become a commercial drone pilot. According to Precisionhawk UAV, demand for drone pilots is spiking as more and more companies realize the benefits of aerial intelligence, with savings and safety at the top of the list. Signaling a move upward, the FAA predicts the demand for commercial UAV pilots will quadruple by 2020, with more than 300,000 new pilots needed to meet future demand.

Meanwhile, a shakeup is underway in the drone industry. Drone service companies are in trouble. Those providers that aren't bought or folded into larger companies face an even more difficult uphill battle. The market is moving in-house and the influx of newly minted commercial drone pilots is putting undue downward pressure on service costs.

Not surprisingly, businesses and other organizations are increasingly turning to their flight departments and third-party providers to conduct their drone operations. Keeping up with drone trends and developments could be advantageous to flight department personnel if and when company leadership calls to see if your team is ready to support its dronish needs. Conversely, being drone savvy could be a persuasive asset if you or your flight department sees an opportunity and recommends drone services the company might not have considered.

Applications

The commercial drone industry is rapidly maturing from proof-of-concept projects and pilot programs to large scale, production deployments of autonomous drone fleets. Any one of these following types of applications could conceivably become a significant component in your parent organization's affairs — and your flight department's responsibilities.

Drones are quickly becoming essential for a variety of applications. Among them are as tools for disaster relief and search-and-rescue efforts. Drones' nimble capabilities are making an impact that will grow as operators learn how best to coordinate with rescue and recovery providers on the ground.

Whether it's air-dropping cheeseburgers and beer to hungry North Dakota golfers (Google it) or making critical medical deliveries, drone package delivery now exists.

In May, the first air carrier FAR Part 135 certificate for a commercial drone delivery service in the U.S. was awarded by the FAA to Wing, a subsidiary of Google's parent company, Alphabet. That service is underway in western Virginia. A month earlier, Wing launched its first commercial drone delivery service in a suburb of the Australian capital of Canberra after more than four years of testing with selected customers Down Under. The company plans to launch its first European trial later this year in Helsinki. Award of the Part 135 certificate means the entire Wing organization, and not just the drone itself, has met the FAA's requirements for operating for hire, including economic authority, documentation and training.

Previously, Wing had been flying drones in the U.S. beyond visual line of sight and over people under waivers

to Part 107 rules, but these exemptions cannot be combined with commercial delivery operations, so Wing had to secure an air carrier certificate, previously only granted to operators flying manned aircraft.

As in Australia, U.S. delivery operations will use Wing's unmanned aircraft

Hundreds of thousands of transmission towers span the U.S., with greater than 3,200 electric utilities adding more each year to the ever-expanding American grid. When it comes to electrical transmission management, drone-based technology can provide higher accuracy of inventory and tower health



DUKE ENERGY

Keeping up with drone trends and developments could be advantageous to flight department personnel if and when the downtown office heads call to see if your team is ready to support its dronish needs.

system traffic management (UTM) platform to integrate drone flights into the national airspace.

In May, DHL-Sinotrans, China's international express company, and intelligent autonomous aerial vehicle maker EHang entered into a strategic partnership to jointly launch a fully automated and intelligent smart drone delivery solution to tackle the last-mile delivery challenges in urban areas of China. Smart drone delivery service will enhance DHL's delivery capabilities and create a new customer experience in the logistics sector and open up even more economic opportunities.

When it comes to delivering organs for transplants and medicines, the African nations of Rwanda, Ghana and Tanzania are already way ahead of U.S. drone operators. Ghana formally launched the world's largest nationwide medical drone delivery service in April.

Also in April, an eight-rotor custom drone transported a donor kidney from St. Agnes Hospital in Baltimore to the University of Maryland Medical Center, 2.7 mi. away.

measurements, reduce inspection costs, increase tower production and ensure a higher margin of safety.

Other drone applications include real estate sales, property management, news reporting, entertainment (remember the stunning Super Bowl halftime drone light show?) and filmmaking. Developers of artificial intelligence are also looking at ways to expand drone utility. Watch this space.

Play by the Rules

Before widespread commercial drone operations become commonplace, some significant legal and technical hurdles remain to be overcome, including the refinement of drone regulations, autonomous flight and how to safely include drones in airspace management. Nevertheless, progress is advancing rapidly. If you're considering becoming drone-ready, get familiar with the rules and its culture.

The drone legal landscape is still in its Big Bang stage, so watch for changes, particularly from the FAA. In the U.S.,

drones are sanctioned under FAR Part 107. To see a summary of this regulation, search online for the “Small Unmanned Aircraft Regulations (Part 107)” Fact Sheet at <http://www.faa.gov/news>

Here are a few aspects of Part 107 you must know before launching your UAS.

Essentially, to operate the controls of a small UAS (sUAS) under Part 107, you must be at least 16, have a remote pilot certificate with an sUAS rating or be under the direct supervision of a person who holds such a certificate. And yes, there’s a written test to be taken and plenty of online prep courses. For more advanced aspects of droneology (even advanced degrees).

You’re required to keep your drone within sight at all times. Alternatively, if you use first person view (FPV) via a video feed or similar technology, you must have a visual observer always keep your aircraft within unaided sight (for example, no binoculars). Neither you nor a visual observer

can be responsible for more than one unmanned aircraft operation at a time.

You can fly during daylight or in twilight with appropriate anti-collision lighting. Minimum weather visibility is 3 mi. from your control station. The maximum allowable altitude is 400 ft. AGL or higher if your drone remains within 400 ft. of a structure. Maximum speed is 100 mph (87 kt.).

Currently, you can’t fly a drone over anyone not directly participating in the operation (including outdoor stadiums), nor under a covered structure, or inside a covered stationary vehicle. No operations from a moving vehicle are allowed unless you are flying over a sparsely populated area.

Also, you can carry an external load if it is securely attached and does not adversely affect the flight characteristics or controllability of the aircraft. You also may transport property for compensation or hire within state boundaries provided the drone, including its attached systems, payload and cargo, weighs less than 55 lb. total and

you obey the other flight rules. But to do this, you’ll also need a Commercial Drone license.

You can request a waiver of most restrictions if you can show your operation will provide a level of safety at least equivalent to the restriction from which you want the waiver (i.e, night flight),

between \$1,000 and \$4,000. The company has aggressively cut its prices, and its products can be found in Apple stores. In May, DJI announced that all of its drone models released after Jan. 1, 2020, that weigh more than 250 grams will include AirSense technology, which receives ADS-B signals from nearby



DUKE ENERGY

Electric power provider Duke Energy used this drone and others to help powerline crews restore power in Puerto Rico following Hurricane Maria.

but for the time being, such waivers are difficult to obtain.

Again, see the entire Fact Sheet on the FAA website mentioned earlier.

Bear in mind that not everyone loves drones. Be observant of local drone limits (they’re sometimes banned from public parks, for example) and the unwelcoming population.

Drone Makers

The drone manufacturing industry is still nascent and its market is growing; consolidation will likely result in a few companies fighting for market share.

China’s DJI has been rising to the top in many industry categories, with few serious competitors. According to internet media company Vox, DJI commands a major share of the North American market for drones priced

airplanes and helicopters and warns drone pilots if they appear to be on a collision course. The effort is part of a 10-point plan to help ensure safe operation as the proliferation of drones continues. The AirSense announcement has received kudos from aviation industry organizations.

In addition to DJI, the list of global commercial drone manufacturers includes 3D Robotics, AeroVironment, Aeryon Labs, Aurora Integrated Systems, Bae Systems, Boeing Corp., Chalis Heliplane, Denel SOC, Draganfly Innovations, DroneDeploy, Elbit Systems, General Atomics Aeronautical Systems, Insitu, Israel Aerospace Industries, Kespry, Leonardo S.p.A., Lockheed Martin, Northrop Grumman, Safran, Textron, Thales Group, The Turkish Aerospace Industry and Yuneec. Intel and Qualcomm are building drone hardware for advanced on-board processing, machine learning and 4G data, which may help DJI’s competitors.

Commercial drone sales still

represent a relatively small share of market sales, but their higher costs — some can reportedly cost in excess of hundreds of thousands of dollars — mean OEMs are focused more on selling their industrial-strength models.

There's an App for That

Commercial drone management apps (we quickly found a half-dozen providers online) can make operations far simpler. You can code it yourself, farm it out to your corporate IT folks — or buy it. These apps enable drone program managers and operators to maximize aircraft utilization, input flight logs, keep

to allow drones to fly at night and over people without waivers under certain. The project, running through September, is intended to develop and demonstrate a traffic management system to safely integrate drone flights within the nation's airspace system. It also will create a shared information network and gather data that can be used for future rulemakings.

The participating providers were selected based on the strength of industry partnership, the maturity of the technology offered and overall cost. The effort is to evaluate mature technologies for unmanned aircraft traffic management including flight planning, com-

Among key technologies underpinning the UTM system is a prototype Flight Information Management System that would be operated by the airspace regulator, a USS interface for multiple, independent service providers, and air vehicle detect-and-avoid, vehicle-to-vehicle communications, and automated safe landing capabilities, NASA said.

Meanwhile, the Unmanned Aircraft Systems Traffic Management System Pilot Project (UAS IPP) is distinct but complementary to the FAA's traditional air traffic management system. Officials involved are hopeful the effort will result in a framework of repeatable processes for approving complex drone operations in the national airspace.

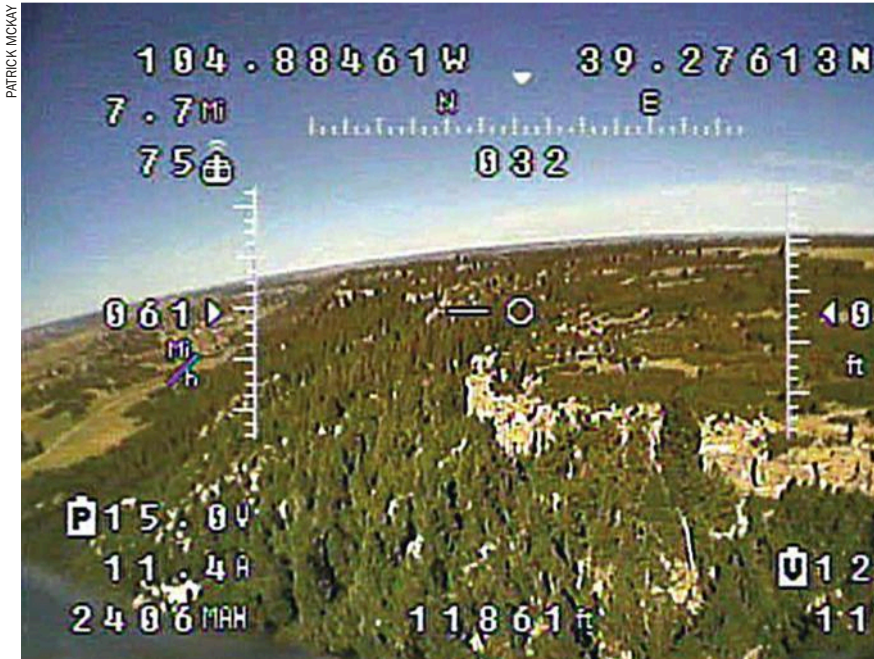
It's also hoped that the IPP will leave behind viable drone operating businesses that will continue long after the pilot program has ended. One of the 10 IPPs, led by the North Carolina Department of Transportation, expects its program to result in Part 135 air carrier certificates for three different drone delivery services.

The goal of the IPP was to involve all the stakeholders in projects that would demonstrate the benefits of complex drone operations and generate data to enable the FAA to move from the waiver process to regulations for operations such as beyond visual line of sight (BVLOS). Each of the four IPP teams took on a different combination of use cases and demonstration tasks.

The North Dakota team, for example, led by the Northern Plains UAS Test Site focused on operations with people, demonstrating that drones operated by first responders and news media could safely share airspace over a tailgate event at a sporting venue.

The IPP led by the Kansas DOT, meanwhile, has focused on the BVLOS operation of drones for precision agriculture and inspection of long linear infrastructures such as power lines, solar panel arrays and pipelines. The pilot program, led by the University of Alaska Fairbanks has concentrated on pipeline inspection and package delivery.

The North Carolina team has begun delivery of medical samples by drone under its IPP. A second medical delivery service and a food delivery operation are planned to begin later this year. The team also is demonstrating infrastructure inspection using the DOT's own fleet of 30 drones. In March, drone maker Matternet and UPS launched a service flying medical samples by quadcopter between a surgical center and



A typical video feed of a drone on-screen display readout showing navigation data.

maintenance records, ensure regulatory compliance, view personnel qualifications, document incidents and better protect the safety of their team.

Trials

To advance drone use by hobbyist and commercial operators alike, the FAA is participating in trial programs to create a reasonable regulatory structure for the drone-sphere.

The agency's most recent drone initiative, announced in January by Transportation Secretary Elaine L. Chao, proposed new rules and a pilot project

munications, aircraft separation and weather services for these drones operating under 400 ft. Here's a summary of developments since the initiative's announcement:

NASA and the Nevada Institute for Autonomous Systems (NIAS) demonstrated drone flights in downtown Reno, Nevada, on May 21 as part of the final phase of development of a UTM capability. The UTM Technical Capability Level (TCL) 4 test phase caps a four-year series of increasingly complex operations, placing drones in high-density urban settings. Testing aims to demonstrate drone operations including flights beyond visual line of sight of ground operators, with participation by multiple organizations and UAS Service Suppliers (USSes) in a federated air traffic management architecture.

the main laboratory at WakeMed Hospital in Raleigh. This involved obtaining a waiver for operations over people and over moving traffic — a first. The service is operating five days a week, making seven to 10 flights a day.

Currently, however, the drone issue of greatest concern is rogue drone sightings and incursions near aircraft and airports. Two lawmakers from the U.S. Senate Commerce Committee are calling on the FAA to publish a proposed rule for remotely identifying drones by July 21, saying that recent drone sightings at airports and sporting events in the

FAA released in February containing amendments to its Part 107 regulation that would allow drone flights over people and at night. ALPA contends that Part 107 in certifying drone operators “falls short of the necessary aeronautical experience, demonstrated flight proficiency, and flight proficiency needed to serve as a commercial sUAS pilot,” experience that is especially significant for flying drones over people. The pi-



Drones' nimble capabilities will grow as operators learn how best to coordinate with other organizational units.

Drones are a **very real concern** for ag pilots



Beyond visual line of sight (BVLOS) capability enhances the utility of drones, particularly for distant services like power-line and railroad inspections.

U.S. and Europe “underscored the need to quickly adopt and implement” the proposed rule.

In a parallel development, associations representing airports and the drone industry have formed a high-level task force to address the challenge of drone incursions at U.S. airports, similar to rogue-drone incidents that forced London’s Gatwick Airport to close repeatedly last December, and suspended flights at Newark Liberty International Airport in New Jersey in January.

The Airports Council International-North America (ACI-NA) and the Association for Unmanned Vehicle Systems International (AUVSI) announced a blue-ribbon task force on drone mitigation at airports in April, during the AUVSI conference in Chicago. Former FAA Administrator Michael Huerta and Deborah Flint, CEO of Los Angeles World Airports, serve as the task force co-chairs.

Not all professional pilots are comfortable sharing the skies with drones. For one, the Air Line Pilots Association commented on a Notice of Proposed Rulemaking (NPRM) that the

lots’ union recommends the FAA develop comprehensive requirements for commercial sUAS pilots “that are more aligned with manned commercial certificate requirements,” including knowledge tests, practical flight evaluations and recurrent flight-training requirements.

And drones are a very real concern for agricultural pilots. The aerial application industry has over 3,500 ag pilots who frequently operate just 10 ft. above the ground at 100 kt. Drones are nearly impossible to see or avoid.

Lawyer Up

There are drone regulations. And litigation. And lawsuits. People do stupid things with drones. Neighbors object to them. Regulators can overreact. Manufacturers sue each other. Operating a commercial drone requires an astute awareness of the legal environment to which your commercial drone operation may be exposed.

Ensuring that you identify all potential hazards and sufficiently mitigate your operational risk may require some outside help. Unsurprisingly, the legal community already is rife with lawyers knowledgeable on drone legalities, and a quick online search will uncover many such firms and their resources.

One of the more comprehensive websites we found is Rupperecht Law (<http://www.jrupprechtlaw.com>), owned by Palm Beach, Florida-based Jonathan Rupperecht. He’s a practicing aviation attorney and commercial pilot, CFII, a former professor at Embry-Riddle Aeronautical University and a contributor at Forbes.com for aerospace and defense. The site offers a wealth of material, including a blog, Part 107 written test

prep materials, comprehensive guides, articles, and an extensive database of drone lawsuits and litigation. One article, “5 Problem Areas When Integrating Drones Into Large Companies” seems especially pertinent. The article covers a number of topics of relevance to business flight departments such as internal corporate department relationships, legal department oversight, maintenance, flight manual responsibilities, ops manuals, data management, battery safety procedures, and much more.

Mixing With Heavy Iron

The full financial and practical benefits of routine flights by drones in national airspaces with other, larger aircraft will be realized only when operators have a file-and-fly capability as easy and quick to access as that enjoyed now by pilots of conventional aircraft. Airspace intelligence and management are seen as a critical enabler for scalable, safe, BVLOS enterprise drone operations.

One encouraging development of air traffic management/drone detect-and-avoid technology is a U.K. partnership between Altitude Angel, a London-based aviation tech startup, and NATS Holdings Ltd. (formerly the National Air Traffic Services), the U.K.’s air navigation service provider. As with the FAA’s air traffic control system, NATS’ primary role is to ensure safe operation within Britain’s airspace.

Recognizing that the flight control systems for many small drones reside on the aircraft owner’s smartphone, NATS and Altitude Angel (<http://www.altitudeangel.com>) began developing an app in 2016. Publicly launched online in April, Altitude Angel now enables commercial and recreational users of

small drones to easily access real-time air-navigation information and to present data about their own flights. The app gives pilots a better understanding of what is happening in the airspace in which they're operating and makes other air users aware of the drone's flight taking place. The company opened a Vienna, Austria, office in March, and has teamed up with DJI to incorporate the software interface.

Breakthroughs

Some recent avionics and satcom certification developments provide examples of how rapidly the drone industry is evolving.

In 2018, satcom service providers Inmarsat and Cobham released a global BVLOS satcom system for drones weighing just 3.197 lb. and offering streaming capability. A recent BVLOS conference at Inmarsat's London headquarters explored the benefits of satellite-enabled UAVs for commercial end-users. Attendees heard how six drone companies are using the service with a range of customers from sectors including oil and gas and disaster relief, as part of Inmarsat's UAV Pop-up Lab trial program.

Meanwhile, Bigfork, Montana-based uAvionix (<http://www.uavionix.com>) is developing a new line of certified avionics designed to enable drone type certifications and BVLOS mission capabilities. The new products include the ping200X Mode S automatic dependent surveillance-broadcast (ADS-B) transponder and the truFYX satellite-based augmentation system (SBAS) GPS navigation source. Weighing only 50 grams, the Ping200X is a 250-watt Mode S transponder being certified to TSO-C112e (Mode S), TSO-C166b (ADS-B Out), and TSO-C88b for the internal altitude encoder. Certification is expected to be complete by this month.

The FAA recently confirmed new technology developed in collaboration between the U.S. Air Force Research Lab and the state of Ohio — called Sky-Vision — to safely, accurately and effectively enable drones to detect and avoid other aircraft while in flight. Such a capability could be a game changer.

Meanwhile, Riga, Latvia-based SPH Engineering has developed a new, accurate terrain following solution for UASes that removes the need to rely on map data. With the help of a proprietary data logger and a laser altimeter, the new solution solves the problem of how

to follow terrain without compromising effectiveness and precision.

And Paris-based SBG Systems' new Quanta UAV Series inertial navigation systems are designed for system integrators of drone-based surveying platforms.

But wait, there's more. One company has developed a long-duration fuel cell power system for drones, while another is touting its new solar-panel power system for high altitude long endurance (HALE) platforms used for cellular and "internet of things"

connectivity. The sky's the limit, folks.

To learn how one flight department played a major role in disaster relief following the 2017 devastation in Puerto Rico after hurricane Maria, as well as an interview with the individual in charge of the company's drone operations, be sure to read Part 2 of this story, which will describe how Duke Energy helped Puerto Rico recover from the storm. You'll also find resources for drone training, drone manufacturers, organizations and more. **BCA**

Drone Dialect

► **BVLOS:** Beyond visual line of sight, which has only rarely been approved by aviation regulators for non-military operations but is seen as critical for commercial drone success. The capability would obviously enhance the utility of many operators' drones, particularly for distant services like power-line and railroad inspections.

► **Drone:** Dynamic remotely operated navigation equipment.

► **FPV:** First person view lets the operator of the drone view what the drone is capturing on camera at that exact moment via a live feed from the drone camera.

► **Geofencing:** GPS programming that creates a virtual boundary and a predetermined response when the drone flies into or out of a particular area. If the drone flies toward a "fenced" or restricted area, it will stop mid-flight. If you try to take off from a restricted area, the drone will not start up at all. Geofences can be placed to keep drones out of certain fields, from flying over a particular building, and prevent them from entering no-fly zones.

► **LAANC:** Low altitude authorization and notification capability, a collaboration between the FAA and industry. Still under development, it provides access to controlled airspace near airports through near-real-time processing of airspace authorizations below approved altitudes. LAANC will enable drone operators and manned aircraft to share controlled airspace by automating the application and authorization process. Requests are checked against multiple FAA and National Airspace System (NAS) data sources. If approved, pilots receive their authorization via LAANC in near-real time. Beginning in September 2019, all drone operators, including hobbyists who want to fly in controlled airspace around airports, will be required to file using LAANC.

► **Miniature UAV:** An unmanned aerial vehicle small enough to be man portable.

► **Passenger drone:** A type of unmanned aerial vehicle that carries passengers. The first passenger drone was introduced at the 2016 Consumer Electronics Show (CES) by Chinese entrepreneurs and is called the EHang 184. Think George Jetson.

► **ROV:** Remotely operated vehicle.

► **sUAS:** Small UAS.

► **UAS:** Unmanned aerial system.

► **UAV:** Unmanned aerial vehicle.

► **UGV:** Unmanned ground vehicle.

► **USV:** Unmanned (water) surface vehicle.

► **UTM:** Unmanned aircraft system traffic management.

► **UUV:** Unmanned underwater vehicle.

A Personal Medical Marathon

Confronted by the “**Children of the Magenta Line**” in medicine

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

Oh, that painful, arthritic swelling in my right hand. I couldn't write. I couldn't type. I couldn't use both hands to lift eating utensils or hand washing. And the pain and swelling in my hand and wrist were getting worse by the day.

The inflammation had occurred previously on occasion but never so severely. To treat it at flare-ups, I was taking indomethacin, a prescription-grade nonsteroidal anti-inflammatory drug (NSAID) that inhibits the body's production of certain enzymes that trigger swelling and pain. Previously, within a few hours of taking the medication, the swelling always subsided, the pain vanished and I regained full mobility.

But indomethacin wasn't working during this episode last October, so I increased the dosage to the maximum allowable. And when the prescription med didn't work, I also took a couple of ibuprofen tablets in an effort to ease the discomfort.

Whoa. I was in for wild rides, literally and figuratively, starting on a Thursday evening. About an hour after swallowing the meds, I started to feel dizzy, so I sat down on a recliner in our living room. I

asked my wife to bring me a bottle of water. As she handed it to me, she sat down next to me and asked me if I felt OK.

“Sure,” I responded. “Just give me a few minutes and it'll pass.”

But it didn't. Thirty minutes later, she asked again how I felt.

“Worse,” I replied. I felt dizzy. I had tunnel vision. I thought I was about to lose consciousness. “I may be having the Big One,” I said in jest. That would have been quite unusual, as heart disease, let alone myocardial infarction, is virtually unknown in my family.

“I'm calling 911 right now!” she exclaimed.

“No!” I protested. “That could ground me.” Pilots dread any non-routine visit to a medical professional, as the FAA's Oklahoma City Aero Medical division has a laundry list of mental and physical ailments that will result in revocation of a pilot's medical certificate, and possibly the inability to renew it. To many U.S. civil aviators, it seems as though Aero Med believes the safest pilot is one who is prohibited from flying.

“You're not going to leave me a widow,” she snapped.

Guess who won that argument. Ten

minutes later, the Redmond [Oregon] Fire and Rescue ambulance truck rolled up and two EMTs were knocking at the front door. Within a few moments, the pair of pros had taken my vital signs, belted me onto a gurney cart, hooked me up to a portable EKG and poked me in the arm to insert an IV with saline solution drip. I was in for my first ambulance ride.

Shortly after the EMTs shut the back doors to the ambulance, I started to feel better. Apparently, the saline solution quickly rehydrated my body, much faster than just drinking plenty of water. Off we went to the local emergency room operated by Big Medicine in Central Oregon (BMCO), essentially the only full-spectrum medical services provider east of the Cascades. That's not the institution's real name. But folks all throughout the high desert east of the Cascades know it.

We soon discovered that an ambulance ride is more expensive per mile than chartering a Boeing Business Jet. Eight minutes, 4.6 mi. and nearly \$1,900 later, we arrived at BMCO's emergency room in Redmond. The EMTs rolled me into an exam room and transferred me to a bed. My wife rolled into the ER parking lot moments later and walked into



GETTY IMAGES/NOIROPAN

the exam room, ever maintaining her outward composure. Her eyes, however, betrayed the anguish she was concealing inside. After some preliminary tests, including a second EKG run, the ER physician diagnosed my condition as “presyncope” or a feeling of lightheadedness. While I thought I would lose consciousness, I never passed out. The ER nurse had me take two children’s aspirin, drink more water and relax.

By then, I was feeling well enough to say to my wife, “Let’s go home and sleep this off.” We all exhaled in relief.

Not so fast. The ER doc reviewed the EKG record and pronounced that my heart showed signs of ventricular tachycardia, V Tach for short, a fast, abnormal heartbeat that can become life threatening if it persisted for more than a few seconds. V Tach also may be accompanied by light headedness, dizziness and fainting, some of the symptoms associated with the presyncope I had experienced. Not uncommonly, V Tach can be prelude to a heart attack. BMCO’s chart notes also pointed to a “malignant cardiac dysrhythmia as captured on the cardiac monitor.” Irregular heartbeats are “an important cause of mortality,” according

to a 2007 report in *Post-Genomic Cardiology* by José Marín-García, MD.

As a result of the findings, the BMCO ER staff called for a second ambulance to rush me to its main hospital in Bend, where a private room in the Cardiac ICU was being prepared for my admission. This facility has a team of cardiologists, including ones trained in emergency medicine, plus extensive diagnostics equipment. It also has cardiopulmonary surgeons and surgical suites with modern equipment.

Perhaps I really was about to have the Big One, a massive fatal heart attack that would widow my wife and leave her with the stress associated with making end of life decisions on my behalf. Was it time to say our final goodbyes?

First Signs of Automation Dependency

There wasn’t much opportunity to sleep in Cardiac ICU after arriving near midnight on Friday morning. Doctor’s orders dictated that I could have nothing to eat or drink. I was tethered to an IV catheter, hooked up to a full-time EKG

and pulse oximeter, squeezed by an automatic blood pressure monitor every few minutes and poked for blood tests. Around 5:00 a.m., a medical technician entered the room to perform an echo cardiogram. Others listened to my heart and lungs, then quietly convened to discuss the indications.

At midmorning, the attending cardiologist came into the room with his chief assistant to deliver his findings. Thumbing through dozens of pages of dense print and complex charts, he concluded that I was apparently healthy, and had a normal heartbeat and blood pressure. There were negative findings from the echo cardiogram. I had robust blood oxygen saturation, normal blood chemistry. He saw no signs of V Tach or arrhythmia, let alone risk of a heart attack.

As for the findings of V Tach and arrhythmia at BMCO’s Redmond facility, he said they were most likely “artifact,” a tactful term for medical misdiagnosis caused by errors in technique and one that does not reflect the actual condition of the patient.

He was too professional to allow himself to smirk at the gaff at Redmond ER. But he allowed that the finding of V Tach most likely was caused by a loose EKG lead improperly attached to my chest. The resulting electrical anomaly was apparently interpreted incorrectly by the attending ER physician. It is not unreasonable to suspect that the finding of “malignant cardiac dysrhythmia” also was related to a loose electrical lead.

So, the EKG screen had produced the medical equivalent of computer-generated magenta data and lines in a cockpit, lulling the ER medical staff into believing the cardiac monitor findings as a single, infallible source of guidance without crosschecking other possibilities that could lead to a different conclusion. Old-school doctors, including my AME, say they first check for loose leads anytime they see an EKG hiccup, as it’s a common cause of a chart aberrance.

The debunking of the medical artifact was good news for my wife and I, obviously. But strict documentation provisions incorporated into the 2010 Patient Protection and Affordable Care Act (aka, Obamacare) meant that the finding of V Tach was written into my medical record in digital indelible ink. The cardiologist said that V Tach was a red flag for FAA Aero Med that would prevent me from renewing my First-Class Medical certificate in January 2019 without extensive clear and convincing evidence to disprove that I had serious heart problems.

.....Are Your Lucky or Safe?



GETTY IMAGES/GOIR

Navigating the complex maze at FAA Aero Med is daunting. There are myriad potential “Just Say, ‘No’” delays, deferrals and dead ends that can prevent a pilot’s being eligible to get a medical certificate for months. In many cases, pilots just give up because of the cost and complexity of pursuing medical certification and abandon active flying status.

“There is no customer focus,” says King School cofounder John King, who struggled to get his medical back for more than a year after having a momentary, unexplained loss of consciousness in 2014. It took four and one-half months just for the FAA’s Medical Certification Division to respond after King submitted a comprehensive package prepared by the Mayo Clinic, detailing why the loss of consciousness was related to a minor one-time seizure caused by excessive coffee consumption, prescription meds and a prostate infection.

He says that Aero Med informed him that it was going to deny his medical and that a whole slew of additional tests would be required for it to re-evaluate his potential eligibility. After more delays, King and his cofounder wife, Martha, recognized they would need legal help, so they retained Kathy Yodice in Frederick, Maryland, who specializes in such cases. Yodice filed a petition for review

by the NTSB, then requested an “informal meeting” with the FAA and King in Washington, D.C. King underwent another round of extensive medical tests to prove he was fit to fly, including two neurological examinations by specialists.

But two and one-half months later, King received a second letter of denial from the Federal Air Surgeon. He said it was particularly frustrating as, “FAA physicians who had never examined me were denying my medical.”

King says FAA Aero Med has a reputation for sequentially delaying decisions on medical waivers, making applicants jump over one hurdle, then wait weeks for a response from Oklahoma City, only to discover that Aero Med has placed another hurdle in the path to obtaining special issuance authorization.

Most successful medical waiver applicants use experienced third-party consultants to intervene with FAA Aero Med in order to streamline the waiver application process. They rigorously adhere to FAA Aero Med’s requirements for special issuance waivers and press the division to make timely decisions.

The fortunate few have access to high-level contacts at FAA headquarters in Washington who can pick up the phone and subtly, yet effectively suggest to the Aero Med division that protracted delays

in processing waiver paperwork are not acceptable. A digital lightning bolt from 800 Independence Avenue can ignite fires that incinerate miles of Aero Med division red tape 1,000 nm away.

King says that Aero Med needs to embrace the core values used by FAA’s Flight Standards office. One of those values is looking for ways to get to “yes” when encountering hurdles. “Just Say No” no longer is an option at Flight Standards. And it shouldn’t be an option at FAA Aero Med either.

Eventually, FAA Aero Med cleared King to get his Third Class Medical flight physical. He soon he strapped back into the cockpit of the King Schools Falcon 10 with Martha and resumed their half century of flying as a team in high performance aircraft.

“This process just isn’t fair,” King says. Most pilots don’t have the financial resources to hire high-powered consultants. And they certainly can’t call in favors from friends at FAA headquarters. Ironically, King believes that Aero Med has a relatively high rate of approving medical waivers because so many people just give up when faced with the maze of obstacles created by Oklahoma City.

One high-profile aviation pilot/executive, who prefers not to be named, is an example of a pilot who threw in the towel.

"It's just a disaster in Oklahoma City. I had a minor heart hiccup and applied for special issuance," he recalled. "In the process, I told the FAA that I regularly have a glass of wine with dinner. They concluded that I was an alcoholic. With 60+ hr. work weeks, I just didn't have the time to pursue it."

Taking a lesson from King, I called attorney Kent Jackson of Jetlaw LLC, in Shawnee, Kansas. Jackson is a regular *BCA* contributor who authors our *Point of Law* column and is a long-time active pilot. He referred me to Dr. Quay Snyder's Aviation Medicine Advisory Service (AMAS) in Centennial, Colorado. AMAS and its predecessor, the Air Line Pilots Association Aeromedical Office, have been assisting pilots since 1969 in steering through the complex and often bewildering aero medical certification maze. ALPA member pilots in good standing with the union are afforded access to AMAS at no cost. The firm also has long-term contracts with several U.S. business flight departments and some individual professional pilots.

It was the best \$1,200 I could have invested in my future flying. AMAS assigned Dan Mirski, MD to my case. He sent me a detailed list of all required tests and documents, in strict accordance with FAA requirements for special issuance waivers for diagnosed heart conditions, even ones that are misdiagnosed.

Concurrently, BMCO Bend's cardiologist ordered me to wear a Zio patch heart monitor, which is essentially a miniature battery-powered EKG recorder worn on the chest, for two weeks to establish heart performance during normal day and night activities, including work, exercise and sleep.

A month or so later, I underwent a stress test EKG on an inclined treadmill to verify that I have a healthy heart. Not a problem. If you can hike up the Misery Ridge Trail at Smith Rock State Park, you can sail through a treadmill test in a doctor's office.

It would be more than three weeks before I could get an appointment to discuss the results with the cardiologist. The day of the appointment, a technician sat down with me and recorded more medical history into BMCO's computer. Let's call it the Infallible Records System or IRS. The medical tech asked me if I was taking any prescription meds. I assured him that I would never again take indomethacin. I had flushed the remaining capsules down the commode. On occasion, I was taking another prescription med to ward off potential arthritic

inflammation. When asked about nutritional supplements, I volunteered that my wife and I took multivitamins and also an off-the-shelf, antioxidant black cherry, açai, noni and pomegranate juice blend concentrate. Big mistake.

More Magenta Line Errors

Medical automation dependency struck again. When the technician entered "black cherry," IRS defaulted to black-cherry-flavored asenapine maleate. After the tech hit the "enter" button, another digital error entered my medical record.

This later would raise a prominent red flag with AMAS's Mirski. He asked why I was taking Saphris, the trade name for asenapine maleate. "Saffras?" I asked. "I don't even know how to spell it." Mirski explained that it was a powerful prescription grade anti-psychotic drug taken orally, with black cherry flavoring.

"What!?" I was dumbfounded. I've never seen a psychiatrist, let alone have been diagnosed with schizophrenia and acute mania associated with bipolar disorder. And I've never taken any anti-psychotic medication.

Seconds later, I was on the phone with BMCO, inquiring how such an entry error could have been made in my medical records. When no one could explain, I drove the 19 mi. to the cardiologist's office and requested face time with the doctor. As he was not available, I chatted with a lead nurse who told me that IRS won't allow any entry error into the machine to be expunged. Typing in "black cherry" defaulted to Saphris asenapine maleate, even though I was describing an off-the-shelf nutritional supplement we order online. The magenta line mentality again threatened to derail my FAA medical.

I was forced to engage a local attorney to initiate legal action against BMCO, just to get the institution to correct the error. And when BMCO did move on the problem, medical techs only entered into IRS that I had stopped using Saphris rather than correctly noting that I had never used it at all. I'm still fighting BMCO to get the entry error removed.

When all the tests, plus the results from an additional blood panel, were complete, we sent them to Mirski for final review before submitting them to the Federal Air Surgeon.

This uncovered a third BMCO magenta line error. Several key elements of the blood panel were missing from the records. IRS determined that simplified

blood panel results were all that were needed for cardiology, even though Mirski specifically laid out all the additional blood work details required by the FAA.

Finally, Mirski obtained all the documentation he needed from BMCO and he submitted the package to the FAA in mid-March requesting a Third-Class Medical to help move things along. Aero Med informed him that it would attempt to evaluate my request for a special issuance waiver in 60 to 90 days.

Huh? I would not be eligible to fly before midsummer 2019? I was planning on flying to conduct research for pilot reports in a half dozen different models in the coming weeks. I pleaded with Mirski to intervene with Oke City as I actually fly for a living even though I don't work for an FAR Part 121 air carrier or Part 135 air charter operator. I am not just a weekend recreational pilot.

Memo to self. Never tell FAA Aero Med that you're only seeking a Third Class. That's Oke City code for moving your application for special issuance to the bottom of the pile, as John King can attest. Mirski changed my request to First-Class Medical, the same as my previous medical certificate and escalated the issue through AMAS contacts in Oklahoma City.

Less than a week later in early May, the special issuance waiver arrived in the U.S. mail. I scheduled an appointment with the local AME the following day. "Say ah. Breathe. Cough." The retired Navy Flight Surgeon was extra careful to poke, prod and palpitate me all over my body, just as though I were undergoing an annual physical as an active naval aviator.

At noon on May 9, 2019, I finally received my First-Class Medical certificate. What a relief. But what an ordeal. Had it not been for the initial misdiagnosis of V Tach by BMCO's Redmond ER facility last October, I would have been able to renew my FAA medical certificate in January 2019.

The late Capt. Warren "Van" Vanderburgh of American Airlines warned us about becoming "Children of the Magenta Line" in the cockpit. Unfortunately, there seems to be no such medical oracle who can warn us about Children of the Magenta Line in hospitals.

In today's era of HMOs, factory productionized medical care and computerized records systems, serious pilots have to monitor the performance of doctors and computers in exam rooms as carefully as they do with other pilots and computers in the cockpit. **BCA**

Sunset for Circling?

RNP procedures potentially **eliminate need for high-risk approaches**

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



Teterboro's SIAP to Runway 06 often involves a tricky circle-to-land maneuver to align the aircraft with Runway 01 for landing into the wind. Runway 01 is a prime candidate for an RNP approach that would keep aircraft safely clear of Newark International's airspace north-northeast bound and then turn it to align for a straight-in with the runway centerline.

approach. For instance, the FAA's new circling minima assume a maximum turning radius of 2.7 nm for Category C aircraft while the minimum visibility could be as low as 2 mi.

VFR traffic pattern altitudes typically are much higher than circling minimum descent altitudes, so there are fatter margins above terrain and obstacles. In IMC, most air carriers require that all approaches be straight-in IFR procedures.

Besides the safety aspects, circling approaches also add to the cost of operating the U.S. national airspace system (NAS), according to the FAA. About one-third of all standard instrument approach procedures (SIAPs) using ground-based nav aids also have circling minimums. As the FAA makes the transition to the NextGen NAS, primarily using satellite navigation rather than ground-based nav aids, the number of SIAPs rapidly is increasing while it continues to support the old NAS during the NextGen phase-in. Now, there are more 12,000 SIAPs and the number is climbing rapidly as new satellite-based procedures are added.

Early in 2015, the FAA asked the RTCA to provide criteria and recommendations for decommissioning SIAPs, particularly circling procedures. The FAA, in response to the RTCA's feedback, now uses eight criteria to determine if cancellation of a circling procedure is warranted:

- (1) Is it the only SIAP for the airport?
- (2) Is the procedure a designated VOR minimum operational network (MON) procedure? (VOR MON provides a ground-based backup nav aid system in the event of a GPS outage.)

You're at least 25 times more likely to suffer a controlled flight into terrain (CFIT) crash during a circling approach than on a straight-in non-precision approach to a runway, according to Tzvetomir Blajev, chairman of the Flight Safety Foundation's (FSF) European Advisory Committee. Add vertical guidance to a straight-in procedure aligned with the runway and the safety factor is boosted another eight times.

The FSF polled air traffic controllers, airline operators, military organizations, regulators and airport operators for their opinions on circling approaches and go-around maneuvers. Virtually all of 110 respondents in Europe, the U.S., Canada and Australia said the CFIT risk is considerably higher for circling approaches than for other types.

Moreover, the FSF's approach and landing accident reduction (ALAR) task

force determined that the most probable causes of such CFIT mishaps were pilots' not knowing the design criteria for the circling procedures, causing them to inadvertently stray outside the bounds of protected airspace and fly into obstacles or terrain.

Even when pilots stay within the bounds of protected airspace on circling approaches, they risk losing control during tight turns to final, overshooting the landing runway or landing long and fast.

For those reasons, among others, virtually all U.S. airlines prohibit their pilots from flying circling approaches in less than 1,000-ft./3-mi. VFR weather conditions. Even though they are visual maneuvers, circling approaches typically are flown close to the ground, at relatively low speeds and in poor weather. Notably, turning radii for specific categories of aircraft may considerably exceed the visibility minimums required for the circling

QUIST/WIKIPEDIA

(3) If the runway is served by multiple SIAPs, is this the lowest circling minima for that runway?

(4) Does the runway have an ILS with circling minima? If so, ILS is the preferred ground-based navaid if the runway is served by multiple SIAPs using ground-based navaids.

(5) Is this the only landing facility with one or more circling approaches within 20 mi.?

(6) Will cancellation of the circling procedure eliminate the lowest landing minima for a specific runway?

(7) Is the circling-only procedure required because an obstacle or terrain would make a straight-in approach unfeasible or result in minima higher than circling minima?

(8) Is the circling-only procedure required because not all runways have straight-in SIAPs and is the final approach course more than 45-deg. offset from the runway centerline?

PBN Provides Potential Solutions

In 2003, the FAA rolled out its “Roadmap for Performance-Based Navigation,” providing safer, quicker and more fuel-efficient routing for aircraft with modern avionics, including advanced GPS and FMS navigation systems. This made aircraft increasingly capable of autonomous operations, freeing them of much of their dependence on ground-based navaids, as well as a considerable amount of labor-intensive ATC monitoring and vectoring. PBN Roadmap procedures typically are constructed using multiple waypoints that overlay well-proven ATC vector patterns plus ground-based navaid routes, including those using radial/DME fixes, radial-to-radial intersections and heading-to-radial legs. Area Navigation (RNAV) departure and arrival procedures were among the first terminal area procedures to be upgraded to PBN.

The 2003 Roadmap also introduced Required Navigation Performance (RNP) procedures, essentially virtual monorails in the sky constructed of

curved and straight segments. Alaska Airlines’ Captains Steve Fulton and Hal Anderson actually pioneered RNP procedures in Alaska in the mid-1990s to provide safe access to terrain-challenged airports, such as Juneau International (PAJN). They went on to develop 29 more RNP approaches for the air carrier’s Alaska operations. The FAA embraced the concept and put 100 airports into its master plan for RNP procedure upgrades. There now are more than 400 RNP approach procedures in the U.S.

Increasingly more precise and robust navigation equipment, such as GPS using satellite-based augmentation systems and hybrid GPS/IRS boxes, plus highly accurate digital flight guidance systems, allowed tighter tolerance RNP procedures to be created, such as the eight waypoint RNP approach that follows the Potomac River to Reagan Washington National Airport’s (KDCA) Runway 19. If the aircraft and flight crew are capable of RNP precision of 0.11 mi., the ceiling minimum is 491 ft. The close proximity of prohibited areas for the White House and the Capitol make such precision navigation a critical requirement, especially in the

aftermath of 9/11. Again, Alaska was the first air carrier to earn authorization to fly this procedure.

RNP approach procedures can provide precision guidance to each runway end, safely and consistently avoiding obstacles, terrain hazards, national security zones and noise sensitive neighborhoods. The Roadmap’s clear priority is to use PBN to ease congestion at major airline hub airports, reducing arrival delays, exhaust emissions, environmental noise impact and fuel consumption. To further that goal, the FAA is establishing six Navigation Service Groups (NSGs) to determine the order in which airports will be upgraded with RNP procedures.

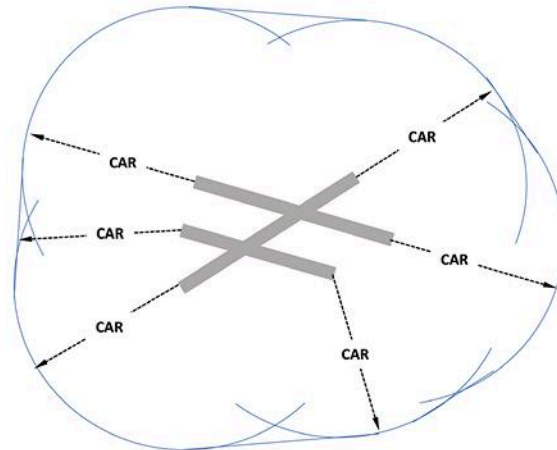
► NSG 1 — The 15 largest hub airports that account for 30% of all IFR flight operations and 45% of airline passenger traffic.

► NSG 2 — The 60 remaining airline hub airports accounting for 45% of all IFR flight ops and 39% of passenger enplanements.

► NSG 3 — Three-hundred smaller and non-hub airports primarily serving air carriers.

► NSG 4 — More than 500 national and

Circling Approach – Protected Airspace



Circling Approach: Minimum Straight-In Leg

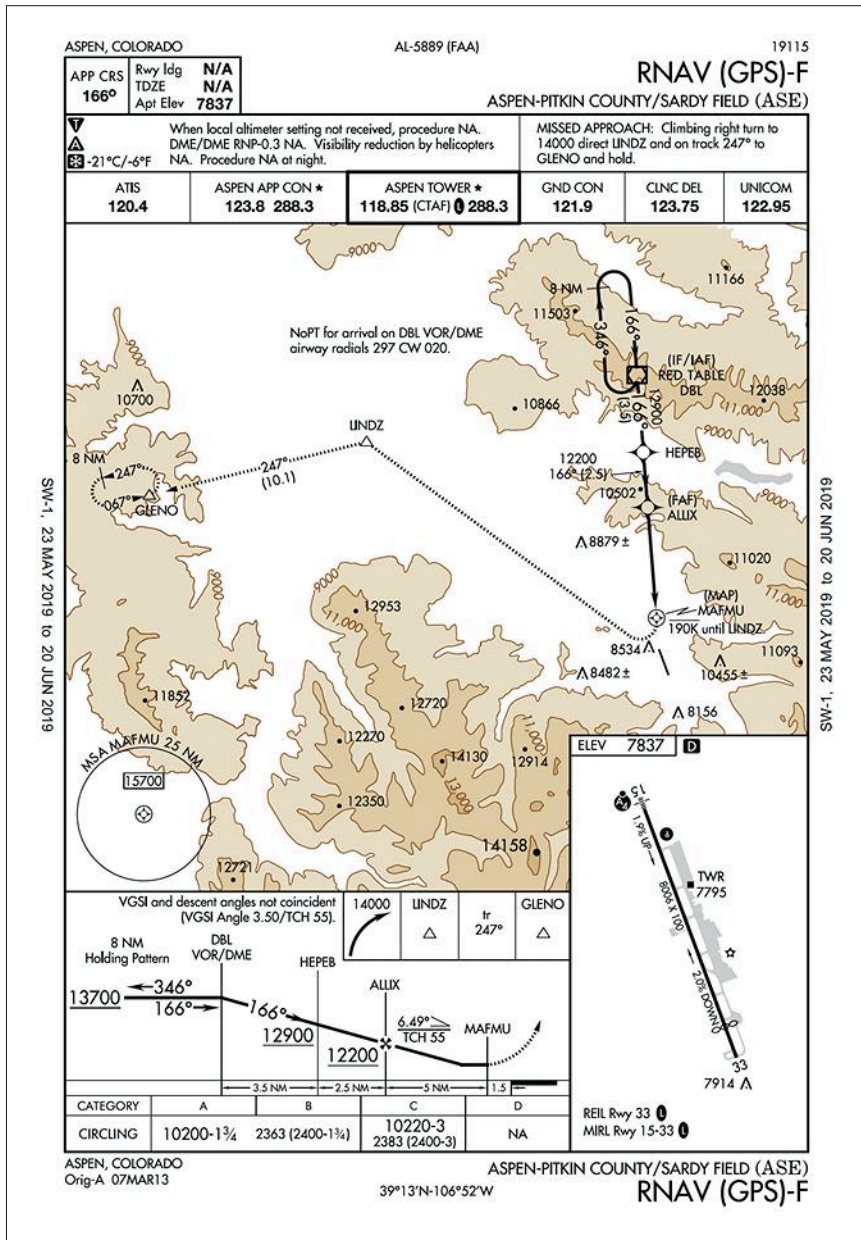
CAT	V/IAS	Bank Angle	Straight Leg
A	90	25°	0.4
B	120	25°	0.4
C	140	20°	0.5
D	165	20°	0.6
E	200	22°	0.7



CAR = Circling Approach Radius [Revised TERPS]

CAT	0 - 1,000 MSL	1,001 - 3,000 MSL	3,001 - 5,000 MSL	5,001 - 7,000 MSL	7,001 - 9,000 MSL	≥9,001 MSL
A	1.3 NM	1.3 NM	1.3 NM	1.3 NM	1.4 NM	1.4 NM
B	1.7 NM	1.8 NM	1.8 NM	1.9 NM	2.0 NM	2.1 NM
C	2.7 NM	2.8 NM	2.9 NM	3.0 NM	3.2 NM	3.3 NM
D	3.6 NM	3.7 NM	3.8 NM	4.0 NM	4.2 NM	4.4 NM
E	4.5 NM	4.6 NM	4.8 NM	5.0 NM	5.3 NM	5.5 NM

Circling minima now account for true airspeed changes with altitude, as indicated on approach charts by the white “C” inside the black diamond. While the maximum indicated airspeeds have remained unchanged for Category A, B, C, D and E aircraft, the circling area radii increase with circling altitude. Note well: Published circling visibility minima may be considerably lower than circling area radii.



Conventional standard instrument approach procedures are limited to circling minimums if the final approach segment descent angle exceeds 3.77 deg. For the RNAV (GPS)-F approach to Aspen, the descent gradient from ALLIX, the final approach fix, is 6.49 deg. That's well in excess of the steepest approach gradients, such as for London City Airport and Lugano. As a result, some pilots won't attempt the RNAV (GPS)-F approach to Aspen if the weather is less than 13,000 ft. ceiling and 10 mi. visibility.

nearby Newark Liberty International Airport (KEWR) 11 mi. south-southwest. (See "TEB's Non-Circling, Circling Approach" [BCA, September 2017, page 28] and "Teterboro Crash Facts: Safety Board Operations Chairman's Report" [BCA, April 2018, page 36]).

Several factors were involved in the accident, including overshooting the centerline because of a gusting, 15- to 32-kt. crosswind out of the northwest.

Teterboro has a history of landing mishaps in which circling approaches may have been factors.

If there were an RNP approach procedure to Runway 1 at TEB, one that would parallel Runways 4L and 4R at Newark on a northeasterly course until turning toward the threshold of Runway 1 near the Meadowlands Sport Complex, it could eliminate the need for the circling maneuver and provide pilots with precise guidance to the runway end. Teterboro already has an RNP approach for Runway 6, but not Runway 1.

California's Truckee Tahoe Airport (KTRK) is another general aviation facility that has a history of accidents linked to circling approaches. The latest high-profile mishap occurred in December 2005, when a Learjet 35A during a charter flight positioning leg, attempted to circle to land on Runway 28 (now Runway 29) in gusting crosswind conditions. The aircraft stalled during a sharp turn to align the aircraft with the runway centerline.

While the FAA since has published RNAV GPS approaches for Runways 11 and 20 at Truckee Tahoe, it has yet to create an RNAV GPS approach for Runway 29, let alone RNP procedures for any of the runways at the airport.

Aspen-Pitkin County Airport/Sardy Field (KASE) in Colorado has had its share of landing accidents, many of which have been linked to its "drive-and-dive" approach to Runway 15 with close-in terrain that only allows circling minima to be published. NetJets, in response, commissioned a private-label RNP approach procedure that essentially follows the

regional general aviation airports. **► NSG 5** — About 2,400 local and basic general aviation airports where existing ILS and localizer ground stations may be removed.

► NSG 6 — Up to 12,000 general aviation airports not named in FAA's national plan of integrated airport systems (NPIAS). The Roadmap says FAA has no intention of adding PBN procedures at those landing facilities.

The Roadmap gives top priority for creating new RNP procedures and for maintaining or upgrading ILS equipment at NSG 1 and NSG 2 airports. NSG 3 airports won't get new ILSes and general aviation airports may lose ILS as the FAA makes

the transition to localizer WAAS precision with vertical guidance (LPV) GPS approaches as part of its masterplan.

General Aviation Airports in Need of RNP

In May 2017, a Learjet 35A, operated by a charter company, crashed and burned while attempting an approach to Runway 1 at Teterboro Airport (TEB), New Jersey, killing both pilots. As is often the case, the aircraft was cleared to fly the ILS Runway 6 approach, then circle to land Runway 1. The circle maneuver is required to avoid traffic conflicts with

AircraftBluebook⁷ **JET APPRAISALS**

Performed by Accredited Senior Appraisers



Desktop Aircraft Appraisals / On-Site Asset Verification and
Logbook Review / Residual Values / Customized Analysis

877.531.1450 / jetappraisals.com

AVIATION WEEK⁷
NETWORK

Roaring Fork River up the canyon to the runway threshold. The approach has considerably lower weather minima than the publicly available SIAPs and it is more comfortable to fly.

Other general aviation airports that could benefit from RNP procedures are in Telluride, Colorado (KTEX); Sun Valley-Hailey, Idaho (A20) and Laughlin-Bullhead, Arizona (KIFP); plus Bert Mooney (KBTM) at Butte, Montana; Yellowstone Regional (LCOD) at Cody, Wyoming; and Mammoth Lakes, California (KMMH).

Yet all these facilities fall into NSG categories with much lower priorities for RNP upgrades than major airline hub airports.

Other Obstacles to RNP Access

Currently, the FAA views all RNP procedures as having “unique capabilities that require special aircraft and

aircrew authorization similar to Category II and III ILS procedures.” The rationale is that RNP procedures typically have tighter lateral and vertical obstacle clearance tolerances than conventional procedures, so individual vetting of aircraft and pilot capabilities is needed. Thus written, FAA authorization is required for RNP approach operations.

For RNP procedures that have radius-to-fix segments, Advisory Circular AC 90-101A specifies that aircraft must have lateral roll steering, flight directors or autopilots, along with GPS, an inertial reference unit and Class A TAWS. A GPS or FMS navigator with automatic leg sequencing is a must. RNP pilot training is required, including training in simulators that are approved for RNP.

Operational approval is granted in the form of air carrier operational specifications or management specifications. FAR Part 91 operators need

letters of authorization (LOAs). GE Aviation, Honeywell and Jeppesen, among other firms, provide assistance to operators in obtaining RNP LOAs.

Garmin, however, believes that such rigorous requirements are unnecessary barriers that prevent access to the benefits of RNP approaches. So, between June and August 2012, the firm conducted a series of evaluation flights with 12 pilots in a “minimally equipped” PA-32 Piper Cherokee 6 and a Cessna Corvallis equipped with a G2000 avionics package.

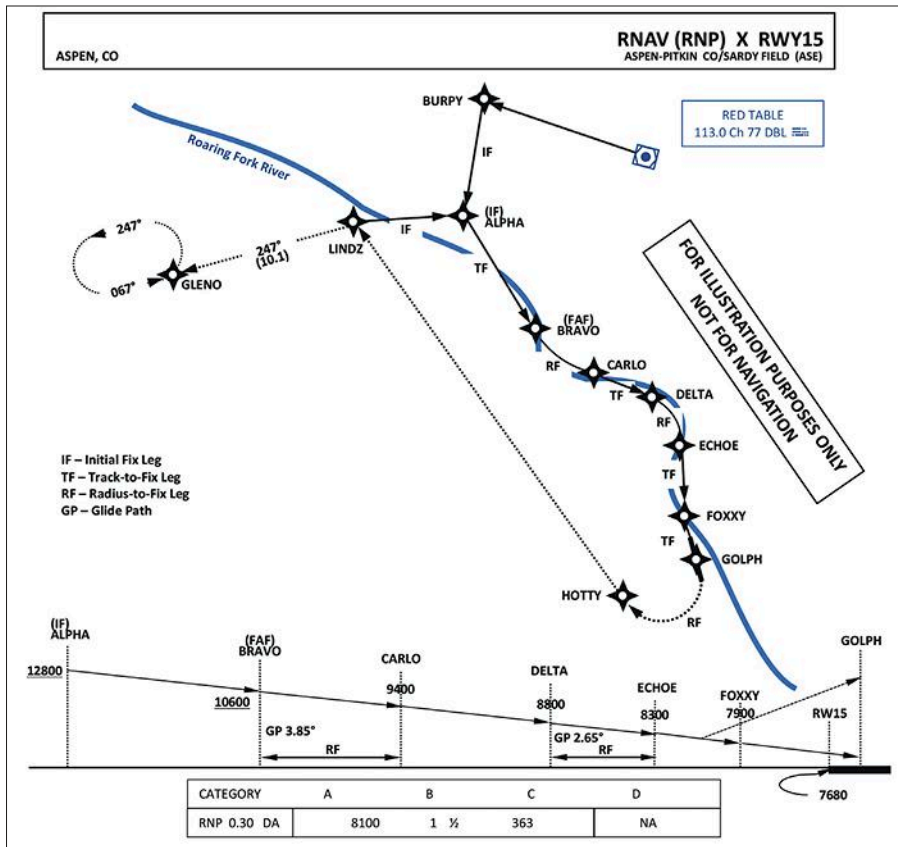
The tests proved that IFR-rated general aviation pilots, with low, medium and high time experience, could hand-fly straight and radius-to-fix RNP procedures with 0.5-nm total flight technical error 95% of the time without the aid of a flight director or autopilot.

Based on the results of Garmin tests, the RTCA is revising its recommendations, for aircraft that fly approaches at 200 kt. or slower, to allow RNP procedures to be flown using only a course deviation indicator for RNP 0.3 and higher straight-path segments and CDI plus moving map display for RNP 1 and higher radius-to-fix legs.

Removing the hardware requirement for an autopilot or flight director with roll steering is in keeping with the NextGen design philosophy in which the emphasis is on demonstrated performance capabilities rather than specific avionics. Eliminating this barrier will make it easier for general aviation aircraft operators to realize the benefits of RNP with radius-to-fix legs.

In summary, there are few technical barriers to replacing circling approaches with RNP procedures at many general aviation airports where such tight tolerance procedures improvements are sorely needed to boost safety margins. The main obstacles are FAA NextGen airspace development priorities and budget limits. The pace at which RNP procedures replace circling approaches at smaller airports can be accelerated by general aviation pilots, trade associations, airframe and avionics manufacturers, and local airport authorities working together to encourage the FAA to broaden the scope of its PBN Roadmap.

RNP procedures offer breakthroughs in system efficiency benefits at large airports. At smaller airports, Flight Safety Foundation statistics show that RNP procedures may help save lives. **BCA**



RNP approaches typically use Track-to-Fix straight legs and Radius-to-Fix curved legs to create virtual monorails in the sky that can guide aircraft precisely around obstacles, terrain and sensitive areas. We created this illustration to show that an RNP approach into Aspen, that roughly follows the Roaring Fork River, could gently descend the aircraft to intercept a normal 3.00 deg. final to Runway 15. Just as importantly, the missed approach uses a precisely defined Radius-to-Fix leg from GOLPH to HOTTY to keep the aircraft safely clear of terrain and obstacles as it turns away from the airport toward LINDZ.

AVIATION WEEK Fleet&MRO FORECASTS

COMMERCIAL | BUSINESS | HELICOPTERS | MILITARY

Discover New Business for the Next 10 Years

With moderate growth of 1.4% expected on deliveries of civil-operated turbofan and turboprop aircraft over the next decade, rely on the **2019 Business Aviation Fleet & MRO Forecast** to help you create plans and strategies to maximize revenue generation.

- Determine **MRO requirements**, broken down by **size class, aircraft model** and **region**, as well as **expense category** and see how these match your capabilities
- Acquire granular details of **deliveries and retirements** going out 10 years
- Ascertain the **MRO demand through 2028**, including how it is segmented by airframe, component, engine and modification maintenance

Trust Aviation Week Network's **2019 Business Aviation Fleet & MRO Forecast** to provide the data, intelligence and insight you need to capitalize on the business and fleet opportunities that lie ahead.

For more information on Aviation Week Network's
Fleet & MRO Forecasts

go to pages.aviationweek.com/forecasts
or call 866.857.0148 or +1.847.763.9147



AVIATION
WEEK
NETWORK

Bringing Cancer Patients Closer to Their Cure



Cancer Patients Fly Free in Empty Seats on Business Jets

- Corporate Angel Network arranges free flights to treatment for cancer patients by using empty seats on business jets.
- Since 1981, Corporate Angel Network, a not-for-profit organization, has worked with more than 500 corporations including half the *Fortune* 100, to fly close to 60,000 cancer patients to specialized treatment and currently transports 250 patients each month.
- The process is simple. Call or visit our website for more information.

Close to 60,000 flights and counting!


Corporate Angel Network

(866) 328-1313 WWW.CORPANGELNETWORK.ORG
TWITTER: @CORPANGELNET INSTAGRAM: @CORPORATEANGELNETWORK



Keeping Your Medical

How to handle FAA when the Doc says, “This could be trouble . . .”

MANY PILOTS FEAR THAT A MEDICAL MISUNDERSTANDING WILL cost them their career. Because of the draconian laws surrounding the FAA’s medical process, these fears are justified. Keep in mind that piloting is a “privilege” and not a constitutional right, and thus those who fly don’t have the legal protections that most Americans take for granted.

One of the oldest legal protections is physician-patient privilege. In order for a doctor to properly treat you, you need to feel comfortable that you can discuss all issues confidentially. However, pilots don’t have this privilege. The FAA can request any of your medical records. And if you fail to provide that information or fail to authorize your doctors to release it to the agency, the FAA may suspend, modify, or revoke your medical certificate or, in the case of an applicant, deny the application for a medical certificate.

What if you make a mistake on your application? A merely incorrect answer can cost you your medical certificate, but a fraudulent answer can mean suspension or revocation of ALL of your airman, ground instructor, and medical certificates and ratings. And a fraudulent answer can mean worse than just revocation of all of your certificates. Here is the warning that you might have missed as you submitted your last medical on medxpress.faa.gov:

Whoever in any matter within the jurisdiction of any department or agency of the United States knowingly and willingly falsifies, conceals or covers up by any trick, scheme, or device a material fact, or who makes any false, fictitious or fraudulent statements or representations, or entry, may be fined up to \$250,000 or imprisoned not more than 5 years, or both. (18 U.S. Code Secs. 1001; 3571).

To sustain a conviction against a defendant for a violation of 18 U.S.C. § 1001, the government must prove: (1) that the defendant made a false statement; (2) that the statement was material; (3) that the defendant acted with specific intent to mislead; and (4) that the matter was within the purview of a federal government agency.

Does the U.S. Department of Justice go after pilots for fraudulent medical applications? Wouldn’t revocation of all certificates be punishment enough? In fact, the department has a long history of pursuing and winning these cases. Defendants typically make three arguments:

- 1) The FAA form is fundamentally ambiguous.
- 2) Since the federal government doesn’t pursue every

medical fraud case with criminal charges, any prosecution is “selective prosecution” and therefore amounts to a denial of due process.

3) Because the FAA has authority to revoke, the justice department’s criminal charges amount to double jeopardy.

Unfortunately for the defendants, the courts have rejected all three arguments. Decades ago, there were a few acquittals because the courts found the “medical” questions regarding criminal activity to be ambiguous. The FAA subsequently redesigned the form, and in recent years, courts have been unpersuaded by arguments that the form is confusing.

So, you can’t lie to the FAA. How do you challenge a determination that you are no longer fit to fly? You have the right to appeal a FAA medical determination to the National Transportation Safety Board (NTSB). If the FAA pulls your medical before it expires, then, if you appeal, the burden of proof is on the FAA. But, if the FAA waits and simply denies you the next medical, then if you appeal, the burden of proof is on you. The burden of proof directly translates to the expense of hiring an attorney and a medical expert willing to testify on your behalf.

Fortunately, an alternative path has developed. A variety of “aero-medical advocacy services” now provide a far more efficient and cost-effective solution

to medical disputes. Instead of hiring an attorney, (who probably doesn’t know medicine), to argue against a FAA attorney (who probably doesn’t know medicine), in front of a NTSB judge (who probably doesn’t know medicine), why not hire a medical advocate to speak directly with the FAA’s medical experts? The system is still far from perfect, and still feels heavily weighted against the pilot, but cutting the lawyers out of the process takes the parties out of a war mentality and improves communications by having the pilot’s doctors talk directly to the FAA’s doctors.

The Air Line Pilots Association, the Allied Pilots Association and the National Air Traffic Controllers Association all provide aero-medical advocacy services to their members. If you run a flight department, consider subscribing to a service for your pilots. The pilot population is aging, and there is a shortage of replacements, so it’s in the interest of your continued operation to not lose a good pilot to some medical misunderstanding. **BCA**

You have a right to appeal a FAA medical determination to the National Transportation Safety Board (NTSB).



Citation CJ4

Simple Citation reliability, 1,900 nm with 4 passengers

FOR LESS THAN \$6 MILLION, YOU CAN BUY A SINGLE-PILOT CITATION that can fly 4 passengers from San Diego, California to Savannah, Georgia, and land only 7 minutes behind a Learjet 45XR performing the same mission. The top line CJ differs from previous iterations of the CitationJet as it has a new wing, adapted and scaled down from Citation Sovereign, more robust Williams International FJ44-4 turbopfans, more fuel and higher operating weights. With full fuel, it can carry a 987-lb. payload. Each additional passenger costs about 60 nm of range. The 9.0 psi pressurization provides a 7,800-ft. cabin at FL 450, the aircraft's top cruise altitude.

Interiors typically feature a forward, side-facing, one- or two-seat divan, four club chairs in the main cabin and two forward facing chairs in the aft cabin. The main seating area is 7-in. longer than that in the CJ3, affording passengers more legroom. A 5-in. dropped aisle affords 57 in. of headroom in the center of the interior. There is a 15 cu. ft. crew baggage compartment in the nose, 6.5 cu. ft. of internal storage in a forward cabinet and an aft 55.6 cu. ft. baggage compartment.

The standard Collins Venue cabin management system includes a BluRay/DVD player, 10.6-in. bulkhead monitor, two 10.6-in. side-ledge monitors, XM satellite radio receiver, moving map display and remote control cabin fan speed and temperature control. Also included are a two channel Iridium SATCOM phone, left and right side 110-volt AC outlets and a data port to accommodate personal media devices. A dual zone climate control includes a virtually trouble-free vapor cycle air-conditioner.

In keeping with three decades of CJ design philosophy, short field performance is a strong suit. Standard-day takeoff field length is 3,410 ft. and up at BCA's 5,000-ft. elevation, ISA+20C airport, it's 5,180 ft. While 3,000 ft. of pavement is sufficient for shorter, work-a-day missions, operators say they plan on 4,000 ft. for safe margins.

The CJ4 has been upgraded with more robust systems. It's the first CE525 to have scratch-resistant glass windshields. It has a quad-redundant electrical system, single-point pressure refueling and a 3,000-psi hydraulic system that powers the landing gear, flaps and speed brakes. A separate hydraulic power pack supplies the wheel brakes. Aircraft s.n. 100 and subsequent have externally serviced lavatories. SB525C-38-01, priced at \$115,000, makes this available on earlier aircraft, according to Gavin Woodman, co-founder of the brokerage firm AEROCOR.

The CJ4's Collins Pro Line 21 cockpit in 2010 was the most advanced of any Model 525, having four 10 in. by 8-in. displays,

MultiScan weather radar, TCAS II, automatic emergency descent mode and left and right CDUs for FMS-3200 and radio control, plus airport performance computer, XM satellite radio weather receiver and Class A TAWS. One FMS was standard. A second was optional. Operators say the \$6,000 annual subscription for navigation database updates seems steep, twice or more as expensive as Garmin database subscriptions for other CJs.

The aircraft is easy to fly, similar to earlier members of the CJ family. The displays are crisp and they include full EICAS. But synthetic vision is not available. A Pro Line Fusion upgrade, similar to that offered for CJ3, has not been announced. FADECs slash the workload associated with managing

the 3,621-lbf turbopfans. Plan on block speeds of 410 to 420 kt. for most trips. Most pilots are comfortable flying the aircraft 4 hr. or about 1,700 nm in no-wind conditions.

As delivered from the factory, the CJ4 was provisioned for ADS-B. But avionics were designed for Do-260A compliance, rather than Do-260B, the current standard.

Serial number 177, plus s.n. 187 and subsequent are compliant with the new standard, says Woodman. SB525C-34-12 is a \$23,000 option that upgrades older aircraft to Do-260B. Be careful with downtime. Collins Aerospace says it takes four weeks of advance notice and 23 days of shop time to upgrade the TDR-95D transponders for ADS-B, Woodman advises.

Direct operating costs are moderate. Plan on 160 gal./hr. for fuel, \$317 per hour for Williams TapAdvantage engine maintenance plan, \$269 per hour for Textron Aviation's Pro Tech labor program and \$370 per hour for Pro Parts. Engine TBO is 5,000 hr. Pro Tech and Pro Labor enrollment fees for aircraft not in those Textron maintenance programs is based on aircraft age, flight hours and maintenance history.

While the oldest models command about \$5.5 million to \$5.8 million in the resale market, newer models, incorporating all the service bulletin updates and having fresher paint and interiors sell for \$7 million and higher. The CJ4's arch competitor is Embraer Phenom 300, having similar cruise speeds and range, but better fuel efficiency and more tanks-full payload. Textron Aviation's own CJ3+ is another competitor, offering almost as much range, but it carries fewer passengers with full tanks and it cruises slower.

Of the 288 CJ4s built, only 7 to 10 are for sale. While the resale market has plateaued from 2018 levels, prices haven't declined significantly. Textron Aviation's product support for its top line CJ remains strong, so this light jet gets high marks from operators and it will remain in service for decades to come. **BCA**



TEXTRON

AIRCRAFT LIGHTING INT'L

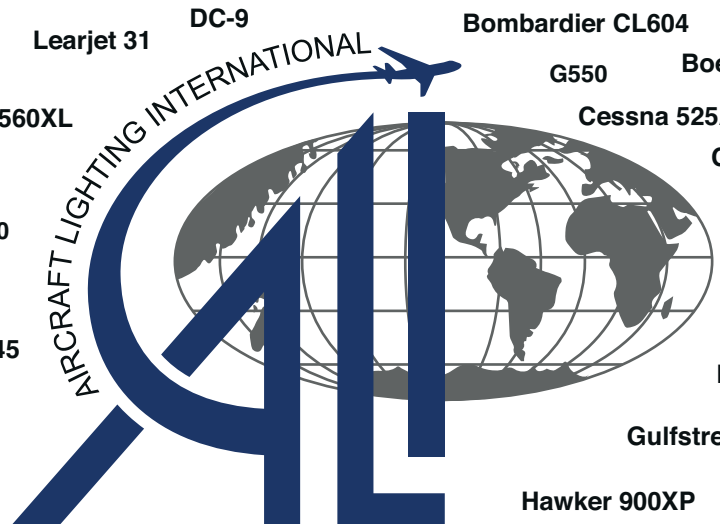
PRESENTS

L5800 LED SYSTEM WITH DIMMER FOR G200's, G450's, & G550's



PMA'd LED SYSTEMS AVAILABLE FOR THESE AIRCRAFT

Bombardier CL600	Learjet 31	DC-9	Bombardier CL604	Hawker 850XP
Sabreliners			G550	Learjet 25
Learjet 36	Cessna 560XL		Cessna 525A	Cessna
S-76A	Astra SPX		Cessna 551	Pilatus PC-12
Hawker 800	G450		Global Express	
EMB 120	Falcon 2000		Falcon 900	
Hawker 1000	Learjet 45		Hawker 700	Learjet 55
1125 Westwind			Gulfstream 100	SAAB 340
Cessna 550	GV		Hawker 900XP	Cessna 560
Learjet 35				Falcon 50
Gulfstream 200	ALI-USA	FAA-PMA	ISO 9001:2015	AS9100D
Bombardier CL601	G III	Cessna 750	G IV	Westwind 1124
			Hawker 600	Beechcraft 400A



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

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

► **Bii.aero**, London, U.K., announced the appointment of **James Burley** as the new commercial manager.

► **IBA Group**, London, U.K., announced that **Julian Aldana** has joined the company as a technical manager based in North America. **Guljar Lehri** has joined IBA's Technical and Asset Management team with responsibility for developing a number of areas including airline relationships and aircraft remarketing.

► **Cirrus Aircraft**, Duluth, Minnesota, announced that **Zein Nielsen** has been selected to succeed co-founder **Dale Klappmeier** as its next chief executive officer. Nielsen has held senior leadership roles at a range of global world-class organization, including Tesla Motors, James Hardie and Bang & Olufsen.

► **CTS Engines**, Ft. Lauderdale, Florida, promoted **Vesa Paukkeri** to chief executive officer, completing its planned leadership transition. **Brian Neff**, former CEO, has transitioned to chairman of CTS Engines.

► **Duncan Aviation**, Lincoln, Nebraska, announced that **Luke Swager** is manager of customer service for the Battle Creek, Michigan location. He began his career at the Battle Creek facility as an airframe mechanic on the Falcon/IAI team. He became project manager in 2005, moving to assistant manager of Customer Service in 2013 in January 2019 he assumed his new role with the company. **John Petersen** is the new regional manager for the Northwest region of the U.S. As an 11-year resident of Puyallup, Washington, he brings with him a vast knowledge of the area and Duncan's customers. **Scott Stoki** was named the new engine overhaul manager overseeing the day-to-day operations of the company's Turbine Engine Maintenance facility located in Lincoln, Nebraska.

► **Engine Assurance Program (EAP)**, Dallas, Texas, has hired **Jim Wilson** as regional sales manager. He previously worked for Williams International as program director, aftermarket programs. Wilson will be based in Michigan and report to **Marco Cardenas**, EAP sales director.

► **FlightSafety International**, LaGuardia Airport, New York, promoted **Patricia Arundell-Lampe** to senior vice president



JAMES BURLEY



ZEIN NIELSEN



LUKE SWAGER



JOHN PETERSEN



SCOTT STOKI



JIM WILSON



P. ARUNDELL-LAMPE



JESSICA NAOR



D. LEVINE-WILSON



DAVID BEST



MICHAEL LORENZINI



PETE BEILBY

and chief financial officer responsible for all financial matters for the company. Prior to joining FSI, she was an audit manager for Price Waterhouse and then joined Chyron Corporation as CFO.

► **Flexjet**, Cleveland, Ohio, announced that **Clay Wilcox** will join the company as vice president of sales and lead its new Gulfstream G650 shared ownership program. Wilcox joined **NetJets** 11 years ago and has served as regional vice president of sales and senior sales executive with its whole aircraft division.

► **Flying Colours**, Peterborough, Ontario, expanded its international team, naming **Paul Dunford** to the newly created role of managing director of international operations and **Andrew Pearce** as European sales manager. Dunford, who joined Flying Colours in 2014, launched the company's Singapore operation and served as general manager of Flying Colours Corp. Asia PTE Ltd. Pearce has 35 years of international experience in the MRO, completions and aircraft sales, previously serving with Canadian, Middle Eastern and European business aviation entities and having experience with the **Bombardier** aircraft family.

► **GrandView Aviation**, Baltimore, Maryland, named long-term head of marketing and sales, **Jessica Naor**, as chief operating officer. She has been with the company since 2010 when she began as a helicopter charter sales coordinator.

► **International Aircraft Dealers Association (IADA)**, Southlake, Texas, has contracted with **Diane Levine-Wilson** to ensure that aircraft search data provided exclusively by the accredited dealers on the organization's AircraftExchange.com aircraft search website is accurate and up-to-date for buyers of sellers of business aircraft.

► **Jet Aviation**, Basel, announced that **David Best** has been appointed as the new senior vice president and general manager, Regional Operations U.S. Best succeeds **David Paddock**, who was recently announced as the new president of the Jet Aviation Group.

► **Launch Technical Workforce Solutions**, Oak Brook, Illinois, announced that **Michael Lorenzini** was appointed to the newly

created position of chief commercial officer. Most recently, Lorenzini served as senior vice president at Gogo.

▶ **Levaero Aviation**, Thunder Bay, Ontario, announced that **Ray Kuliavas** has joined Levaero team as vice president with an emphasis on business development. Kuliavas has more than 40 years of experience in aviation in new client acquisition, client retention and brand growth, along with aircraft sales, product marketing management and service development.

▶ **Red Cat, Inc.**, Santurce, Puerto Rico, a provider of distributed data storage, analytics and services for the drone industry, announced the appointment of **Nicholas Liuzza Jr.** and **Patrick R. Mitchell** to its Board of Directors.

▶ **Regional Airline Association**, Washington, D.C., announced the appointment of **Bill Whyte** as vice president of Aviation Operations and Technical Services. Whyte was most recently the general manager of Flight Operations Training at **Compass Airlines** with responsibility for the development and implementation of all pilot training programs for the Embraer 175 fleet.

▶ **Safran Helicopter Engines**, France, appointed **Bernard Barussaud** executive vice president of operations. Barussaud is a 27-year company veteran, joining the **Snecma** engineering department in 1992 and later becoming head of services for the cost estimates department, director of Snecma manufacturing excellence center for compressor blades, and most recently, executive vice president of manufacturing at Safran Transmissions Systems.

▶ **Shell Aviation**, announced that **Anna Mascolo** has been named vice president. She assumes the position from **Anne Anderson**, who is moving into a senior leadership role in Shell's chemical business. Mascolo has broad experience in chemicals, fuels and gas products.

▶ **TAG Aviation**, Farnborough, U.K., announced the appointment of **Pete Beilby** as director of Flight Operations for the U.K. and Malta. Beilby joins TAG from **Cobham Aviation Services** where he was the director of Flight Operations, U.K. Special Mission, for the last three years.

▶ **TrueNoord**, Schiphol, Netherlands, announced that **Carst Lindeboom** will act as the chief representative of the company's new office in Centennial Tower in Singapore. Lindeboom is sales director of Asia-Pacific for the company. He previously covered the Asia region from TrueNoord's office in Amsterdam.

▶ **West Star Aviation**, East Alton, Illinois, announced that **Kenneth Rivers** has been named the new satellite manager at the company's Scottsdale, Arizona (SDL) location. He will be responsible for the managerial oversight of the facility and staff. He has over 25 years of aviation experience having been the lead tech at the company Chicago location. Previously, Rivers held leadership roles at JA Aviation. **BCA**

Advertisers' Index

Aircraft Lighting Page 65

aircraftlighting.com

Corporate Angel Network Page 3

corpangelnetwork.org

Centex Page 69

centex.aero

Embraer Page 13

executive.embraer.com

FlightSafety International Page 19

flightsafety.com

Garmin 4th Cover

garmin.com

Honda Aero Page 27

gehonda.com

Lektro Page 68

lektro.com

Manassas Regional Airport Page 70

flyhef.com

Piper 3rd Cover

piper.com

Schweiss Page 68

schweissdoors.com

SmartSky Networks Page 10

smartskynetworks.com

Products & Services **Previews**

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

1. New Weather Course from Sporty's

Sporty's all-new weather course, Aviation Weather — A Pilot's Guide will give pilots the confidence to analyze and manage their weather flying. With more than four and a half hours of practical tips for all pilots, this course gives both the basics of weather safety and professional tips on avoiding inflight hazards. The course includes topics on how to read clouds to decoding METARS and TAFs, from weather tools such as the Graphical Forecast for Aviation to thunderstorm forecast products, and much more. The course also demonstrates how to use the forecast tools available in ForeFlight. Available online.

Prices: \$99.95

Sporty's

www.sportys.com/weather



approved by the U.S. Federal Aviation Administration, the European Union Aviation Safety Agency and the National Civil Aviation Agency of Brazil. The training will be offered at the FlightSafety Le Bourget Learning Center in Paris this summer using a FlightSafety-built Embraer E190-300 E2 full-flight simulator and other advance training technology.

FlightSafety International

www.flightsafety.com


2. FSI E-Jets E2 Training Program Approvals

FlightSafety International's new Embraer E-Jets E2 training program has been



3. CARE's First International Distributor

CARE, Constant Aviation Rotable Exchange, has advanced its effort to establish an international network of distributors to support its business. EMTC Aviation Services agreement is CARE's first distributor to launch the international network. The initial expansion includes PMA Brake Friction solution for the 737NG. CARE offers Rotor and Stator assemblies for brake assembly applications 2612302 and 2612312. The product is on the shelf




DOORS

MANUFACTURING
HYDRAULIC "ONE-PIECE" DOORS
&
"LIFT-STRAP" BIFOLD DOORS

- Aviation
- Agricultural
- Commercial
- Industrial
- Designer

THE DOOR LEADER



507-426-8273

SCHWEISSDOORS.COM



Since 1945

The Ultimate Aircraft Tug



Models ranging
15,000 to 280,000 lbs.

- Electric
- Towbarless
- Certified
- Universal
- Easy to Use
- Simple to Maintain
- Rugged

www.LEKTRO.com

1-800-535-8767 1-503-861-2288
sales@lektro.com

INCREASE RANGE

FLIGHT PLAN (B350):

KLAS - KTPA

1,724 NM

5h-10m

FUEL: 3,788 LBS

RESERVES: 627 LBS

SADDLE TANKS



KING AIR 90, 200, 250, 300 & 350



IN GOD WE TRUST

CENTEX

AEROSPACE INCORPORATED

Flight image courtesy of
FlightAware (flightaware.com)

254-752-4290 | www.centex.aero



CAPITAL
CONVENIENCE

LOW COSTS.
LOW TRAFFIC.
HIGH EXPECTATIONS

— FULFILLED. 



FLYHEF.COM

Products & Services Previews

for immediate delivery and is offered at significant cost saving versus an OEM option, according to Dana Seese, vice president CARE. The company anticipates additional distributors in Latin America and Asia Pacific by Q3 2019.

Care
(800) 440-9004
www.care.aero



4. Signature Flight Support Teams with Uber Elevate Skyports

Signature Flight Support took the stage at the Uber Elevate summit and announced a nationwide partnership with Uber Elevate, facilitating ground based operations and skyport infrastructure for Uber Air. Signature Flight Support is Uber Elevate's first nationwide operations and on-airport infrastructure partner. Signature will also be the ground-based operator of choice for Uber Copter services, which offers the first real demonstration of the Elevate experience.

Uber plans to operate a network of electric air taxis in cities worldwide to enable four-person shared flights in densely populated urban markets. These electric vertical take-off and



landing vehicles (eVTOLs) differ from helicopters in that aim to be orders of magnitude quieter, safer, more affordable, and more environmentally-friendly.

"Signature Flight Support's operational prowess and industry leading understanding of the private aviation space makes them an ideal fit for Uber Elevate's business," said Eric Allison, Head of Uber Elevate. "Efficient and safe skyports are a critical component of our business model, and our future collaboration with Signature will allow for a seamless rider experience from the moment they arrive at a Skyport, to the moment they depart."

As an FBO operator for Uber Elevate, Signature intends to apply its industry leading expertise to support skyport infrastructure and operations serving eVTOL passenger pickups and dropoffs at their on-airport locations, as well as designated purpose-built eVTOL urban skyports. In the near term, Uber and Signature will co-develop industry leading practices around safety and customer experience for Urban Air Mobility.

Signature Flight Support
www.signatureflightsupport.com

July 1969 News

Probably the most **important aspect of the new system** (forecast for at least 10 years hence) is that it would place **less need for the human controller** being in the loop. — *BCA*

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

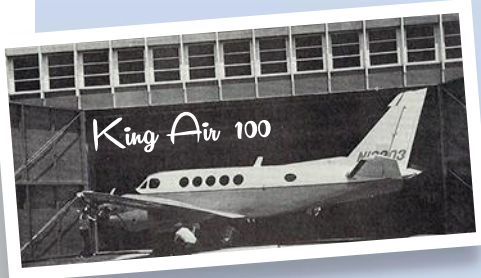
Long hot summer in air travel began June 19, when some 240 controllers, many in New York Center, called in sick, thus delaying more than 1,000 flights and creating takeoff queues up to 60 airliners long at JFK.

Reading Air Show Notes: *BCA's* Corporate Pilot of the Year Award went to Harold Curtis, manager of Air Transportation, National Distiller and Chemical Corp. "for his ability to integrate the newest of airplane and techniques into a high usage corporate flight operation." The citation noted that Curtis was: first to order a Gulfstream II, first to use inertial nav equipment, and the first to fly the Atlantic with business aircraft and business jets.



Lockheed JetStar on the tarmac at Reading makes do as an umbrella for spectators seeking refuge from the rain.

Named Corporate Aviation Executive of the Year by *BCA* was Arizona Governor Winthrop Rockefeller for his "pioneering use and unquestioned acceptance of the airplane as a business tool from the days of the Ford Tri-Motor through the entire Beechcraft family of airplanes through to the Sabreliner and the Fan Jet Falcon."



Model 100 King Air is shoehorned through Twin Beech-size door at the Beech auditorium. The more expensive (around \$600,000 delivered) King Air was unveiled at Wichita on May 26.

Reading Air Show Renderings:

F. Lee Bailey, noted criminal lawyer and, of late, aviation figure, sold his Learjet

to Air America in Washington, D.C., which has four Learjets and with them intends to out-jet Executive Jet Aviation in the charter field. . . . Max Conrad was on hand with his flying gas tank Piper Aztec "Let's Fly". . . . Airplane movements during the four show days were about the same as last year, the Reading tower chief reported. His records showed total operations for each of the four days as 2113, 2943, 3059 and 2272 for a grand total of 10,837 (the 1968 total was 10,156).

THE ARCHIVE

FREE DEMONSTRATION FLIGHT



For Professional Pilots Flying
FALCON • GULFSTREAM I • JET COMMANDER • JETSTAR • COMVAIR
KING AIR • LEARJET • SABRELINER • OH 105 • ELECTRA • DC-9

The flight safety concept, the demonstration flight is a professional pilot's simulator, monitored by our own professional instructors. It's free . . . if you are a professional pilot flying one of the 11 aircraft listed at the top of this ad.

You'll experience a realism that does not even approach what you can get back the same old "fly" trainer.

Experiencing with the aid of the pilots reactions and our own flight instructor's help, you'll have a more gripping and realistic flight experience than you can get in any other simulator.

Bring your flight log, of course. Bring your own check list. But don't put it off. This offer is time limited.

Flight safety means the nation's top professionals including some for 75 out of the 100 top corporations and a high percentage of those flying for corporate and private governments. We're the FAA for the Continental, FAA and NACA. Plus, for Air Force One. Plus for Governors, Lockheed, McDonnell Douglas and major airlines. These pilots, used by Flight Safety to maintain the highest standards of flight proficiency.

They welcome being able to come back to our simulators again and again. Why? Because there is no flight safety in the real world to keep it.

Pre-schedule your free demonstration flight so that the simulator will be waiting. All it takes is a call to Training Information at 214-747-9700. Or return the coupon and we will contact you.

FLIGHT SAFETY, INC. Section A-11
Marine Air Terminal/La Guardia Airport, Flushing, New York 11371

I am the _____ (pilot) _____ (captain) _____ (company) _____ (type) _____ (airline)

Please call me at _____ (phone) _____ (office) _____ (home) _____ (cell)

I wish to schedule my flight _____ (date) _____ (time) _____ (location)

Flight Safety, Inc. is offering a free demonstration flight for professional pilots flying one (or more) of 11 different aircraft types in the hope that you will sign up and come back to their simulators again and again.

Is your company rich enough to afford anything other than EJA overhaul and maintenance?



EXECUTIVE JET AVIATION, Inc.

U.S.A. HEADQUARTERS
 10000 W. 10th Street, Suite 100
 Overland Park, Kansas 66150
 Tel: 913-666-1100
 Telex: 251111 EJA
 Cable: EJA

Executive Jet Aviation, Inc. at Columbus, Ohio, reminds readers that "no one in the world is more qualified for business jet overhaul and maintenance than EJA . . . no one!"

July 1969 News

Increasing **user fees at three** New York City airports (LGA, JFK and EWR) during peak hours **from \$5 to \$25** has resulted in a **31% decrease in general aviation** traffic at these fields during those times. — *BCA*

President Nixon Proposes a 10-Year, \$5 Billion Airports/Airways Plan: An increase of from 5% to 8% in tax on domestic airline tickets, a \$3 tax on most international tickets, a 5% tax on air freight waybills, and a tax of nine cents a gallon on all general aviation fuels would be aviation's contribution to this multi-year multi-billion-dollar airport/airways program submitted to Congress on June 16.

One Used Aircraft Coming Up:

After plane splashed into San Francisco Bay on an ILS approach to SFO, work crews labored furiously to raise the 75-ton machine from the 8-ft. deep brine before corrosion set in. After a \$4 million overhaul, the Shiga, JAL's stretched DC-8 is in the skies again. Rumor has it, though, of passenger complaints of salty Sukiyaki.

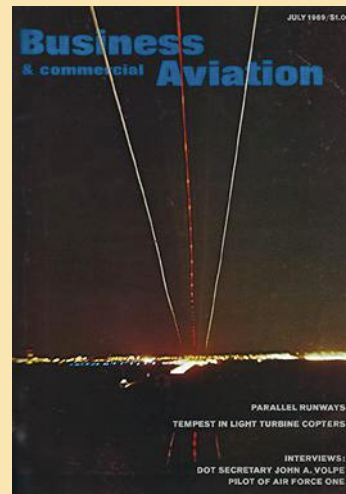
Turboprop DC-3: The installation of two Rolls-Royce Dart Mark 510 engines may bring the DC-3 once again into modern competition. Called the Turboprop DC-3, this mod made its maiden appearance at the Paris Air Show.

Flexible Future: When certified in early 1970, the Bell Model 212 will be the first twin-engine medium size chopper dedicated for commercial use.

Functional in the extreme the Cessna 207 can accommodate such outside cargo as oil drums, trunks, crates and large cartons with passenger seats removed. **BCA**



THE ARCHIVE



Diverging pattern of lights, extending upward like errant tracer rounds, is actually the final approach path of a Boeing Jetliner as captured in a time exposure. Night landing was on Newark Airport's Runway 04. (Photo by Ralph Kellner, BCA's art director)

AEROSTAR

In the design and development of the Aerostar series, Ted Smith and his engineering group adopted a design philosophy unshackled by traditional design and manufacturing methods or an existing line of airplanes to dictate design criteria or compromise.

The Aerostar airplane incorporates the finest minimum of detail parts as compared with those required in the construction of the more common light-twin, single-engine airplanes. Fabricate quantities are achieved by the utilization of thicker structural skin which, impact structural integrity and clear, sleek aerodynamic lines.

The minimal number of detail parts in all major assemblies, the mid-wing configuration, reduction in drag characteristics resulting from minimum frontal area, are but a few advantages of the Aerostar.

The Aerostar is the first completely new light twin to be introduced in many years. The Model 600 Aerostar, new in production, has a gross weight of 5,500 pounds, a useful load in excess of 2,000 pounds, a nearly honest six-place deluxe interior and touring power.

Two 260 hp, normally aspirated, 60°SAB series engines give the Model 600 a cruising speed of over 250 MPH at 10,000 feet. We would welcome the opportunity to show and tell you about this exciting new airplane.

For further details contact:
Marketing Manager, Ted Smith-Aerostar Co., Inc., 7991 Broadway Avenue, Van Nuys, California 91410. Telephone Area Code 213-968-2105.

The Ted Smith Aerostar is the first completely new light twin to be introduced in many years, according to the advertisement.

M600. MISSION: **POSSIBLE.**



1,658 NM RANGE · 2,400 LBS USEFUL LOAD · G3000 AVIONICS

Meet the powerful, pressurized cabin-class turboprop designed for your mission. Everything you need, including the lowest operating and acquisition costs in its category. An evolution of the popular Meridian, the Piper M600 is designed with a robust clean sheet wing and vastly increased fuel capacity for a smoother, more stable flight, 658 nm more range, 700 lbs more useful load and 250 kcas Vmo. Contact your dealer for a demo, or experience the Freedom of Flight™ at piper.com.

M-CLASS: M350 | M500 | M600

piper.com
1.772.299.2403

Piper[®]
FREEDOM OF FLIGHT



**FAA
APPROVED**

G5000® FLIGHT DECK UPGRADE FOR CITATION EXCEL/XLS

- » ZERO-TIME AVIONICS
- » LOWER OPERATING COSTS
- » SIGNIFICANT WEIGHT SAVINGS
- » ADS-B/DATA COMM AND MORE
- » AUTOMATICALLY ACTIVATED EMERGENCY DESCENT MODE
- » SURFACEWATCH™ SURFACE MONITORING AND ALERTING TECHNOLOGY
- «

For more information, visit Garmin.com/XLS