AeroSafety WORLD

STRICTLY BUSINESS
Duty/rest guidelines update

RULES REWRITE
New helicopter ops requirements

THEORIES ABOUND
Pinning down professionalism

QUESTIONABLE RELATIONSHIPS
CRASH REVEALS SYSTEMIC PROBLEMS

THE JOURNAL OF FLIGHT SAFETY FOUNDATION

APRIL 2014

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STABLE APPROACH CRITERIA AND Go-Arounds

As acting chief operating officer, I am pleased to help Ken Hylander lead Flight Safety Foundation during this interim period while we work to find Kevin Hiatt's successor as president and chief executive officer. As Ken said last month, during this period of transition, the Foundation must not be static, but continue to move forward as new challenges arise and old ones come into sharper focus.

Stabilized approaches and go-arounds fall into the latter category, and are what I want to focus on in this month's message. Ken told you in March that this was one of three areas of particular emphasis for us this year, along with safety data–sharing and protection, and advancing safety in challenging operations, primarily through our Basic Aviation Risk Standard (BARS) program.

An industry focus on stabilized approaches and go-around policy is not new — and that's actually part of the problem. We've been dealing with this issue for many years and have clearly benefited greatly from the industrywide effort to establish stabilized-approach criteria, monitor performance against those criteria through our flight data management/flight operational quality assurance programs and emphasize going around when appropriate without fear of second-guessing, criticism or punishment.

The problem is that our well–thought out, well-defined and closely tracked stable-approach criteria are not triggering the desired go-around decision, including when truly necessary. This is clearly demonstrated by the fact that 97 percent of unstable approaches, as determined by current criteria, are continued, and the vast majority result in incident-free landings.

The Foundation believes the time finally has come to address this inconsistency aggressively and head-on. We need to recognize that while stable-approach criteria are effective, necessary and worthy of continued emphasis, we have to step back and face the reality that a new construct must be considered to drive pilots toward a go-around when it is, indeed, absolutely required — that is, when the risk of continuing rises to an unacceptable level. The basic problem with today's stable-approach criteria is that while they serve as an excellent guide on how to fly an aircraft with precision on approach, a small deviation from the stringent criteria at 1,000 ft (or even 500 ft) does not necessarily create a risk worthy of triggering a go-around decision at that point and, therefore, pilots appear to be tuning out the criteria — about 97 percent of the time.

The Foundation's Go-Around Safety Initiative has been focusing on this issue since 2011. Extensive analysis has been done, and we think the time has come to expand and accelerate the effort to find a solution. By the time you read this, we will have had the opportunity — in Orlando, Florida, U.S., in mid-March — to bring the issue into focus at the Approach and Go-Around Safety Seminar, sponsored by the Foundation, JetBlue and the Regional Airline Association. We intend to make it a "call to action" to bring industry experts together to address this issue. We want to develop recommendations that help us make the distinction between that portion of the 97 percent of approaches that can continue with low risk and the smaller portion (including those we tragically saw at San Francisco and Birmingham last year) that *must* be aborted and turned into appropriate, effective and successful go-arounds. I hope I will have had the opportunity to talk with some of you in Orlando as we start to come to grips with this inconsistency in our stabilized approach and go-around policy and procedures.

Until next time, keep the blue side up!

William G. Bozin
Chief Operating Officer (Acting)
Flight Safety Foundation

AeroSafety WORLD

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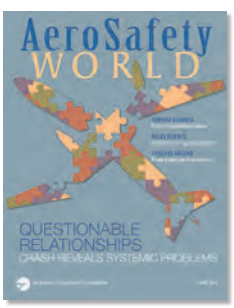

About the Cover
'Systemic deficiencies' and responsibilities divided among the operator and other organizations were cited in a 2011 crash in Ireland.

Illustration: Susan Reed

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SAFER AND Smarter

When Michael Huerta, administrator of the U.S. Federal Aviation Administration (FAA), said in March that "we need to make aviation even safer by being smarter about how we do safety," my ears perked up slightly. I was attending the Federal Aerospace Forecast Conference in Washington, organized by the American Association of Airport Executives, and I didn't expect to hear much talk about safety. I was there for the numbers, which Huerta addressed, but he also touched on the first of FAA's four strategic priorities: "Make aviation safer and smarter."

I began scribbling notes a little faster when Huerta started talking about the need to focus on risk-based decision making and relying on safety data input by the people who work in the system — such as the flight crews, controllers, dispatchers, cabin crews, mechanics and specialists within manufacturers and airports. "When you're faced with a system in which commercial fatalities are the rarest of the rare events, moving forward with safety management systems is the right thing to do," he said. "Instead of waiting for accidents, we're studying data, looking for emerging trends [and] identifying the hazards before they become an accident."

But what really caught my attention, and prompted me to request a copy of the speech to make sure I had captured it accurately in my notes, was when Huerta said that FAA is "not tip-toeing into this." The administrator said FAA is pushing to decrease the accident risk and the commercial fatal accident rate, and to prioritize its resources where it sees the risk. "Ultimately, I expect us to develop a new safety oversight model that prioritizes safety inspection efforts based on risk," he said. "This model will provide us with the tools to consider stopping certain oversight activities for known system operators that have strong safety management systems and safety management cultures."

New oversight models don't come along every day. As the administrator said, this is a bold step. Whether it is the right step, only time will tell, but in an era of budget and resource uncertainty, putting your resources where they can do the most good makes sense. A key to success here will be working with system operators that truly do have the strongest of safety cultures and safety management systems. Persuading the public that it is okay to stop certain oversight activities for some operators, no matter how well regarded, will be a tough sell.

Administrator Huerta went on to say that FAA historically has provided "all services to all people in many different locations with little differentiation. We are increasingly being asked to do more and do it with less. It's time for us to have a robust discussion about what services the FAA should be providing and what we might be able to stop doing or do differently through innovative business methods and new technologies."

Stay tuned. This could get interesting.

Frank Jackman
Editor-in-Chief
AeroSafety World

Serving Aviation Safety Interests for More Than 65 Years

Since 1947, Flight Safety Foundation has helped save lives around the world. The Foundation is an international non-profit organization whose sole purpose is to provide impartial, independent, expert safety guidance and resources for the aviation and aerospace industry. The Foundation is in a unique position to identify global safety issues, set priorities and serve as a catalyst to address the issues through data collection and information sharing, education, advocacy and communications. The Foundation's effectiveness in bridging cultural and political differences in the common cause of safety has earned worldwide respect. Today, membership includes more than 1,000 organizations and individuals in 150 countries.

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APRIL 7–8 ➤ Emergency Response Plan Course. International Society of Safety Professionals. Seattle. <isspros.org>.

APRIL 7–9 ➤ Flight Operational Forum Norway. FoF Norway. Oslo, Norway. <manager@fof.aero>, <fof.aero>, +47 911 84182.

APRIL 8–10 ➤ MRO Americas. Aviation Week. Phoenix. Helen Kang, <helen_kang@aviationweek.com>, <www.aviationweek.com>, +1 212.904.6305.

APRIL 15 ➤ NBAA Regional Safety Roundtable Forum. National Business Aviation Association. San Diego. Lisa Sasse, <lsasse@visionsafe.com>.

APRIL 15–17 ➤ Asian Business Aviation Conference and Exhibition (ABACE2014). Shanghai. Shanghai Airport Authority and U.S. National Business Aviation Association. Dan Hubbard, <dhubbard@nbaa.org>, <www.abace.aero/2013/news/abace2014/>, +1 202.783.9360.

APRIL 16–17 ➤ 59th annual Business Aviation Safety Summit (BASS 2014). Flight Safety Foundation and National Business Aviation Association. San Diego. Namratha Apparao, <apparao@flightsafety.org>, <flightsafety.org/bass>, +1 703.739.6700, ext. 101.

APRIL 22–23 ➤ Civil Avionics International Forum. Galleon (Shanghai) Consulting Co. Ltd. Shanghai, China. <marketing@galleonevents.com>.

APRIL 23–24 ➤ 2014 Annual ESASI Regional Air Safety Seminar. European Society of Air Safety Investigators. Milan, Italy. <esasi.eu>.

MAY 1 ➤ ISASI Mid-Atlantic Regional Chapter Spring 2014 Dinner/Meeting. International Society of Air Safety Investigators Mid-Atlantic Regional Chapter. Herndon, Virgina, U.S. Ron Schleede, <ronschleede@aol.com>.

MAY 5–9 ➤ Advanced Aircraft Accident Investigation Short Course. Embry-Riddle Aeronautical University. Prescott, Arizona, U.S. Sarah Ochs, <case@erau.edu>, <erau.edu/base>, +1 386.226.6928.

MAY 8–9 ➤ 3rd Air Medical and Rescue Congress China 2014. China Decision Makers Consultancy. Shanghai, China. <cdmc.org.cn/2014/amrcc/>.

MAY 9 ➤ Search and Rescue Forum China 2014. China Decision Makers Consultancy. Shanghai, China. Patrick Cool, <Patrick@pyxisconsult.com>, <cdmc.org.cn/2014/isrfc/>.

MAY 12–15 ➤ Unmanned Systems 2014 Conference. Association for Unmanned Vehicle Systems International. Orlando, Florida, U.S. <membership@auvsi.org>, <www.auvsishow.org/auvsi2014/public/enter.aspx>, +1 703.845.9671.

MAY 12–16 ➤ SMS Expanded Implementation Course. The Aviation Consulting Group. Honolulu. Bob Baron, <bbaron@tacgworldwide.com>.

MAY 13–15 ➤ RAA 39th annual Convention. Regional Airline Association. St. Louis. David Perez-Hernandez, <www.raa.org>, +1 312.673.4838.

MAY 20–22 ➤ Cabin Operations Safety Conference. International Air Transport Association. Madrid. Mike Huntington <COSCSales@worldtek.com>, <www.iata.org/events/Pages/cabin–safety.aspx>, +1 514.874.0202.

MAY 20–22 ➤ Safety Management Systems Short Course. Embry-Riddle Aeronautical University. Daytona Beach, Florida, U.S. Sarah Ochs, <case@erau.edu,> <daytonabeach.erau.edu/sms>.

MAY 21–22 ➤ Asia Pacific Aviation Safety Seminar (APASS 2014). Association of Asia Pacific Airlines. Bangkok, Thailand. C.V. Thian, <cvthian@aapa.org.my>, +603 2162 1888.

MAY 24–25 ➤ Rotortech 2014. Australian Helicopter Industry Association. Sunshine Coast, Queensland, Australia. <secretary@austhia.com>.

JUNE 4–5 ➤ RTCA 2014 Global Aviation Symposium. RTCA. Washington. <symposium@rtca.org>, +1 202.833.9339.

JUNE 10–11 ➤ 2014 Safety Forum: Airborne Conflict. Flight Safety Foundation, Eurocontrol, European Regions Airline Association. Brussels, Belgium. <tzvetomir.blajev@eurocontrol.int>, <skybrary.aero>.

JUNE 24–25 ➤ 6th annual Aviation Human Factors and SMS Seminar. International Society of Safety Professionals. Dallas. <isspros.org>, +1 405.694.1644.

JUNE 30–JULY 2 ➤ Safe-Runway Operations Training Course. JAA Training Organisation. Abu Dhabi, United Arab Emirates. <jaato.com>, +31 (0) 23 56 797 90.

JULY 3 ➤ Technology: Friend or Foe? The Introduction of Automation to Offshore Operations (Annual Rotorcraft Conference). Royal Aeronautical Society. London. <conference@aerosociety.com>, +44 (0) 20 7670 4345.

JULY 14–20 ➤ 49th Farnborough International Airshow. Farnborough International. Farnborough, Hampshire, England. <enquiries@farnborough.com>, <farnborough.com>, +44 (0) 1252 532 800.

AUG. 11–14 ➤ Bird Strike Committee USA Meeting. Bird Strike Committee USA. Atlanta. John Ostrom, <john.ostrom@mspmac.org>, <www.birdstrike.org>, +1 612.726.5780.

SEPT. 3–5 ➤ ALTA Aviation Law Americas 2014. Latin American and Caribbean Air Transport Association. Miami. <www.alta.aero>, +1 786.388.0222.

SEPT. 8–12 ➤ Aviation Safety Summit 2014. Latin American and Caribbean Air Transport Association. Curaçao. <www.alta.aero>, +1 786.388.0222.

SEPT. 23–24 ➤ Asia Pacific Airline Training Symposium (APATS 2014). Halldale. Bangkok, Thailand. <halldale.com/apats>.

SEPT. 23–25 ➤ International Flight Crew Training Conference 2014. Royal Aeronautical Society. London. <conference@aerosociety.com>, +44 (0) 20 7670 4345.

SEPT. 29–OCT. 3 ➤ Aircraft Accident and Incident Investigation: ICAO Annex 13 Report Writing. Singapore Aviation Academy, Singapore. <saa@caas.gov.sg>, <saa.com.sg>. +65 6543.0433.

OCT. 13–17 ➤ ISASI 2014 Seminar. International Society of Air Safety Investigators. Adelaide, Australia. <www.isasi.org>.

NOV. 11–13 ➤ 67th annual International Air Safety Summit. Flight Safety Foundation. Abu Dhabi, United Arab Emirates. Namratha Apparao, <apparao@flightsafety.org>, +1 703.739.6700, ext. 101.

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Be sure to include a phone number, website, and/or an email address for readers to contact you about the event.

59th annual Business Aviation Safety Summit

BASS 2014

April 16–17, 2014

Sheraton San Diego Hotel and Marina
San Diego, California

FLIGHT SAFETY FOUNDATION

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Agenda

(as of March 10, 2014)

Tuesday, April 15, 2014

0830–1130 **Business Advisory Committee Meeting**

1500–1800 **Registration and Exhibitor Set Up**

1700–1800 **Moderators' and Speakers' Meeting**

Wednesday, April 16, 2014

Opening Ceremonies

0730–0830 **Coffee with Exhibitors**
Sponsored by Universal Weather and Aviation, Inc.

0730–1700 **Registration**
Lanyards Sponsored by Austin Digital

0830–1000 President and CEO, Flight Safety Foundation

David McMillan — Chairman, Flight Safety Foundation Board of Governors

Peter Stein — Director of Flight Operations, Johnson Controls and Chairman, Flight Safety Foundation Business Advisory Committee

Wednesday, April 16, 2014 Continued

Keynote Address — Sergei Sikorsky, former President and CEO, Current Consultant, Sikorsky Aircraft

Business Aviation Meritorious Service Award Presentation

1000–1030 **Refreshments with Exhibitors**
Sponsored by Embraer Executive Jets

Session I

Moderators: Francois Lasalle, Managing Director, Votex FSM
David Belastock, Demonstration Pilot, Dassault Falcon Jet

1030–1110 **"Risk Management at Red Bull"** — Chuck Aaron, Chief Helicopter Pilot and Director of Maintenance, Red Bull, N.A.

1110–1150 **"Duty/Rest Guidelines 2014: One Cornerstone of Your Fatigue Management Effort"** — Leigh White, President, Alertness Solutions

1150–1230 **"Unmanned Aircraft Systems Integration into the National Airspace System"** — Jonathan Beesley, student, Liberty University School of Aeronautics

1230–1400 **Lunch**

1400–1415 **Feedback Opportunity**

1415–1500 **"FAA Medical Standards and Policies — Update 2014"** — Quay Snyder, M.D., M.S.P.H., President and CEO, Aviation Medicine Advisory Service

1500–1530 **Refreshments with Exhibitors**

1530–1700 **Panel Discussion**

Operators' Perspective of Current Safety Challenges

Panel Moderator: Francois Lasalle, Managing Director, Votex FSM

Panel Members: Peter Rothwell, General Counsel, Dassault Falcon Jet

David Bjellos, Aviation Manager, Florida Crystals Corp.

Chris Bing, Safety Manager, UT Flight

TBA

FLIGHT SAFETY FOUNDATION

NBAA

WFP World Food Programme

Thursday, April 17, 2014

0730–0830	**Coffee with Exhibitors**
0730–1700	**Registration** Agenda Printing Sponsored by Gulfstream Aerospace Corporation

Session II

0830–0910	**"Year in Review"** — James M. Burin, Foundation Fellow, Flight Safety Foundation
0910–0950	**"NTSB Briefing"** — Honorable Robert Sumwalt, Member, National Transportation Safety Board
0950–1030	**"What Should I Know About Lithium Batteries?"**— Thomas Anthony, Director, University of Southern California Aviation Safety and Security Program
1030–1100	**Refreshments with Exhibitors** Sponsored by Dassault Falcon Jet
1100–1140	**"Beyond the FARs: Assuring Flight Crew Physical and Mental Competence for Duty"** — Peter v. Agur, Chairman, the VanAllen Group
1140–1220	**"Business Aviation — International"** — Roger Lee, Director of Corporate Safety and Quality, Metrojet Ltd., Hong Kong
1220–1230	**Feedback Opportunity**
1230–1400	**Lunch**

Session III

1400–1440	**"21st Century Approach to Open Water Ditching"** — Dave Montgomery, International Captain
1440–1520	**"SMS — The Key to a Positive Safety Culture"** — John Sheehan, Audit Manager, International Business Aviation Council
1520–1550	**Refreshments with Exhibitors**
1550–1630	**"Dispatching Safer Flights Using the Flight Operations Risk Assessment System"** — Mike Hadjmichael, The MITRE Corporation
1600–1800	**Exhibitor Tear Down**
1630–1710	**"Cyber Espionage Threats to Aviation"** — Stu Solomon, Senior Director, Program Management, I Sight
1710–1720	**Final Feedback Opportunity**
1720	**Closing** — President and CEO, Flight Safety Foundation

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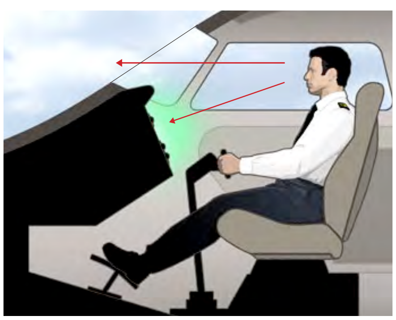

Normal cockpit view

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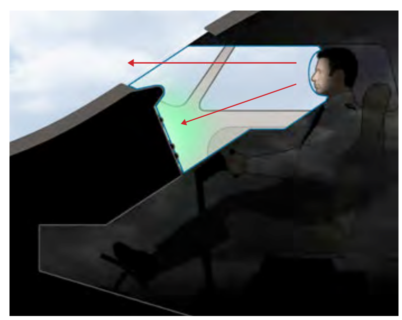

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Safety News

EU Data-Sharing Plan

The European Parliament has approved legislation establishing new rules to allow for quicker distribution of information about aviation safety incidents.

The legislation, passed in late February, calls for all segments of the aviation community within the European Union (EU) — airlines, manufacturers, pilots, air traffic controllers, maintenance personnel, national aviation authorities and the European Aviation Safety Agency (EASA) — to "gather and exchange incident information and ensure that action is taken where it is most effective."

EASA will coordinate a network of safety analysts responsible for identifying trends and safety issues across Europe and recommending action.

"Most aircraft accidents result from a combination of smaller errors or malfunctions, which, taken together, cause an accident," said Siim Kallas, European Commission vice president responsible for transport. "By gathering more information about isolated safety incidents and taking action to address them, we will help to prevent future accidents. With the expected increase in air traffic in the next two decades, we need to deliver such a system and make sure that the EU remains the leading region in the world for aviation safety."

Flight Safety Foundation praised the European Parliament's action as "an important step forward in aviation safety."

Ken Hylander, the Foundation's acting president and CEO, added, "Sharing data and applying powerful analytics to develop mitigation strategies represent leaps forward in further improving aviation's outstanding safety record. Through data sharing, we can collect evidence of small problems across the industry, identify the risk and work to develop solutions — before the accident occurs."

The new rules are expected to apply in full in November 2015, after the adoption of implementing regulations and the development of guidance material and technological applications for data recording, exchange and analysis.

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FAA Appeals Ruling on UAS Fine

The U.S. Federal Aviation Administration (FAA) says it is appealing an administrative law judge's action that could have allowed flights of unmanned aircraft system (UAS) vehicles before the FAA develops rules governing their operations.

Patrick Geraghty, a U.S. National Transportation Safety Board (NTSB) administrative law judge, dismissed the FAA's $10,000 reckless flying penalty against Raphael Pirker, who used a UAS vehicle weighing less than 5 lb (2.3 kg) in making a promotional video for the University of Virginia in Charlottesville in October 2011. Published reports said the video documented the UAS vehicle's flight under bridges and over pedestrians.

The appeal means that Geraghty's decision will not take effect until after the full NTSB has ruled in the case.

In his opinion, Geraghty said that the FAA has no authority over small UAS.

The FAA says, however, that it has authority over "anyone who wants to fly an aircraft, manned or unmanned, in U.S. airspace.

"Private sector (civil) users can obtain an experimental airworthiness certificate to conduct research and development, training and flight demonstrations. Commercial UAS operations are limited and require the operator to have certified aircraft and pilots, as well as operating approval. … Public entities (federal, state and local governments, and public universities) may apply for a certificate of waiver or authorization. The FAA reviews and approves UAS operations over densely populated areas on a case-by-case basis."

Model aircraft hobbyists do not need specific FAA approval, but they must comply with FAA guidance for model aircraft, including a prohibition on operating in populated areas. In addition, the FAA says, "You may not fly a UAS for commercial purposes by claiming that you're operating according to the model aircraft guidelines."

A 2012 law says that the FAA has until September 2015 to develop a plan for the "safe integration" of UAS into the National Airspace System. The FAA says that safe integration will be "incremental" and that it plans to publish a proposed rule later this year for small UAS vehicles — those weighing less than 55 lb (25 kg). Rules for larger UAS vehicles will be issued later.

Michael Toscano, president and CEO of the Association for Unmanned Vehicle Systems International (AUVSI), said his organization was reviewing the judge's decision and that AUVSI's "paramount concern is safety. We must ensure the commercial use of UAS takes place in a safe and responsible manner, whenever commercial use occurs. The decision also underscores the immediate need for a regulatory framework for small UAS."

Autothrottle Fix

The U.S. Federal Aviation Administration (FAA) has proposed an airworthiness directive (AD) that would require operators of some Boeing 737s to take steps to avoid an autothrottle problem associated with premature deceleration before landing.

The FAA said the proposed AD was prompted by "reports in which a single, undetected, erroneous radio altimeter output caused the autothrottle to enter landing flare retard mode prematurely on approach."

This situation could lead to a flight crew's loss of control of the airplane, the FAA said.

The FAA said it would accept comments until April 17 on the proposed AD, which would apply to certain 737-600s, -700s, -700Cs, -800s and -900s. The measure was proposed because of reports of loss of control associated with the problem, the FAA said.

The proposed AD calls for the removal of autothrottle computers and the subsequent installation of a new or reworked autothrottle computer as specified by Boeing in Alert Service Bulletin 737-22A1215, issued in November 2013. The action would affect about 500 airplanes registered in the United States; civil aviation authorities in other countries are expected to issue similar directives affecting airplanes in their jurisdictions.

Crackdown on Laser Strikes

U.S. authorities have begun a 60-day regional reward program to prevent the deliberate targeting of aircraft by people with handheld lasers.

The program — announced in February by the U.S. Federal Bureau of Investigation (FBI) and Federal Aviation Administration (FAA), along with the Air Line Pilots Association, International (ALPA) — offers rewards of up to $10,000 for information leading to the arrest of anyone who aims a laser at an aircraft. FBI field offices in 12 cities are participating: Albuquerque, New Mexico; Chicago; Cleveland; Houston; Los Angeles; New York; Philadelphia; Phoenix; Sacramento, California; San Antonio; San Juan, Puerto Rico; and Washington.

The FBI said that it also will work with state and local law enforcement authorities to educate young people about the dangers of targeting aircraft with lasers.

"It is important that people understand that this is a criminal act with potentially deadly repercussions," said Ron Hosko, assistant director of the FBI's Criminal Investigative Division.

FAA Administrator Michael Huerta added, "Shining a laser into the cockpit of an aircraft can temporarily blind a pilot, jeopardizing the safety of everyone on board."

ALPA President Lee Moak described the risks of laser illuminations as "unacceptable. Pointing lasers at aircraft in flight poses a serious safety risk to the traveling public."

FBI data show that there were 3,960 reported incidents in 2013 involving laser illuminations of aircraft, compared with 384 incidents in 2006. Thousands of additional incidents go unreported every year, the FBI said.

The FAA has had the authority since June 2011 to impose civil penalties of up to $11,000 per incident against individuals for aiming lasers at aircraft.

Common Airport Safety Rules

New rules are in effect providing for common safety standards for design, operation and maintenance in more than 700 airports across Europe.

The European Commission says the rules, which took effect in early March and will apply to the largest airports in the European Union and the European Economic Area, "put in place a European legal framework for national aviation authorities to certify airports' compliance with technical and operational requirements, as well as for the oversight of certified airports."

The rules allow for flexibility in cases of existing infrastructure and set forth steps for converting existing national airport certificates to certificates based on the new European rules.

"With the application of these new rules, airports will be safer and so will be the airline operators and the passengers using those airports," said Siim Kallas, European Commission vice president responsible for transport.

Night Flight Review

Spurred by the fatal 2011 crash of a Eurocopter AS355 F2 in dark night conditions in South Australia, the Australian Civil Aviation Safety Authority (CASA) has begun a review of regulations concerning night visual flight rules (VFR) flight.

CASA said its primary focus is "the need for a defined external horizon to be visible for aircraft attitude control."

CASA's review follows the issuance by the Australian Transport Safety Bureau (ATSB) of a report on an Aug. 18, 2011, crash 145 km (78 nm) north of Marree that killed the 16,000-hour pilot and his two passengers. The ATSB said the pilot probably was spatially disoriented and that factors contributing to his disorientation probably included the dark night conditions that prevailed at the time (*ASW*, 2/14, p. 23).

In describing its project, CASA noted that the ATSB report had characterized dark night visual meteorological conditions (VMC) as "effectively the same" as instrument meteorological conditions.

"The only real difference," the ATSB said, "is that, if there are lights on the ground, they can be seen in VMC. In remote areas, where there are no lights or ambient illumination, there is no difference. Pilots cannot see the ground and have no external cues available to assist with their orientation."

CASA said that its review is intended to clarify the term "visibility" in dark night conditions and to develop additional guidance material that emphasizes "the importance of maintaining a discernible external horizon at night."

In a separate discussion of accidents that occur during flight under night VFR, the ATSB said that pilots could effectively manage the risks, in part by ensuring that they remain current and proficient and by ensuring that the aircraft is appropriately equipped.

"Always know where the aircraft is in relation to terrain, and know how high you need to fly to avoid unseen terrain and obstacles," the ATSB said. "Remain aware of illusions that can lead to spatial disorientation — they can affect anyone. Know how to avoid and recover from illusions by relying on instrument flight."

Assad Kotaite, 1924–2014


© ICAO

Assad Kotaite, who served 30 years as president of the Council of the International Civil Aviation Organization (ICAO), died in February at age 89.

His tenure, from 1976 until his retirement in 2006, was one of the longest among top executives in United Nations organizations. A statement released by ICAO praised Kotaite for devoting his life to "the safe and orderly growth of international civil aviation" and noted that his career "mirrored the evolution of ICAO for over half a century."

A lawyer, Kotaite's career with ICAO began in 1953 with an appointment to the ICAO Legal Committee. He also served as Lebanon's representative on the Council of ICAO and secretary general of ICAO.

New Runway Safety Kit

A new Runway Safety Implementation Kit (iKit) — developed by the International Civil Aviation Organization (ICAO) in collaboration with one dozen other aviation organizations, including Flight Safety Foundation — has been released "in line with … efforts to resolve what remains the number one priority for global aviation safety experts," ICAO says.

The iKit contains many of the runway safety resources developed in recent years by ICAO's Runway Safety Programme, along with updated guidance.

ICAO said that it also would begin, along with its partners, a Runway Safety GO-Team program to help establish runway safety teams at airports around the world and to conduct regional runway safety seminars in Africa and the Middle East.

In Other News …

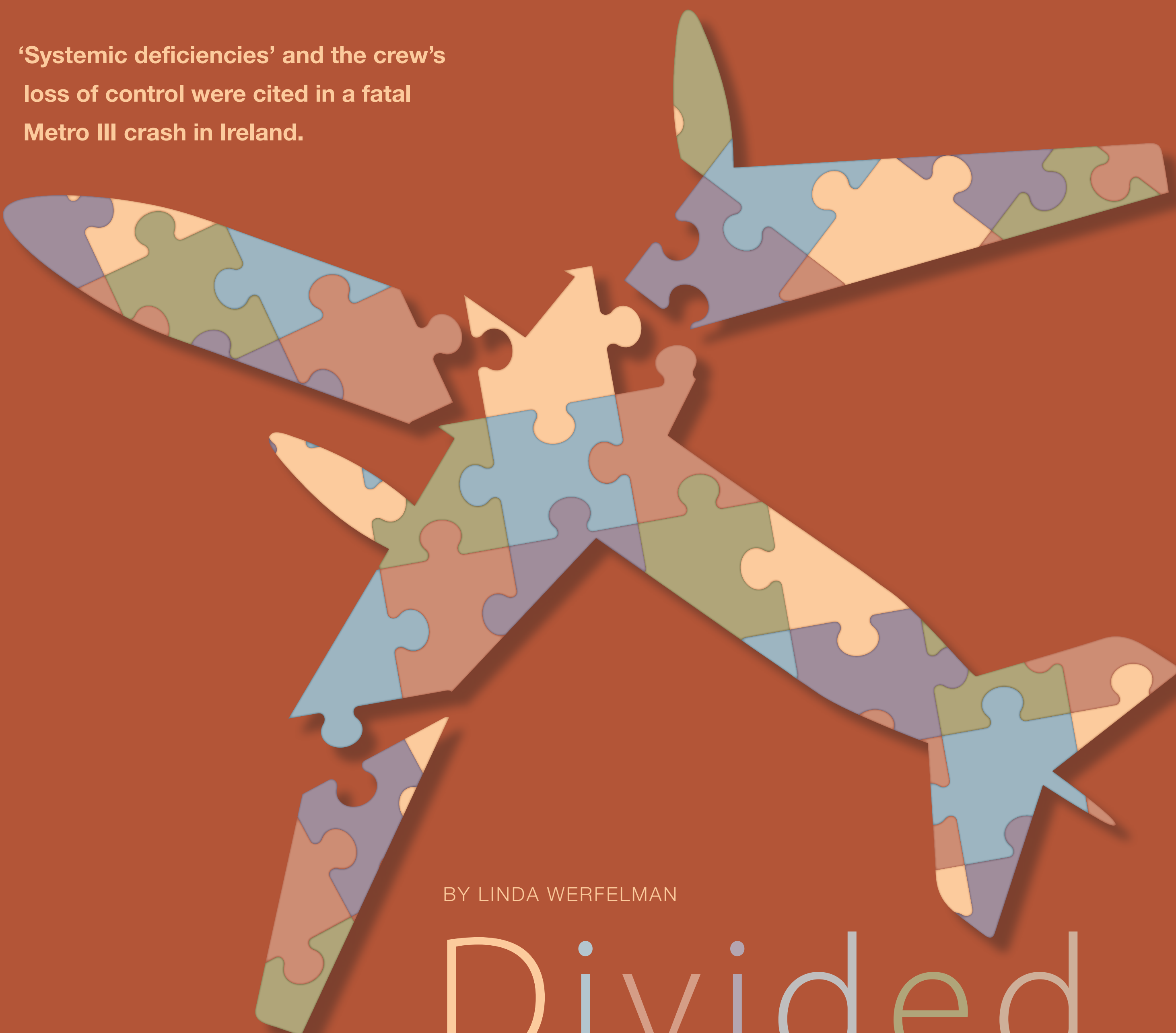
The U.S. Federal Aviation Administration (FAA) says it is simplifying the design requirements for adding an **angle-of-attack (AOA) indicator** to the cockpits of small aircraft. Until now, the effort and cost of adding an AOA indicator has limited use of the device in general aviation aircraft. The FAA says the indicators may help prevent loss of control in small aircraft because they are more reliable than other instruments in indicating the flow of air over the wings. … **Azerbaijan** has received a Category 1 rating from the U.S. Federal Aviation Administration (FAA), signifying that the country meets safety standards established by the International Civil Aviation Organization. Azerbaijan previously did not hold an FAA International Aviation Safety Assessment rating, and no Azerbaijani air carriers provide service to the United States. The Category 1 rating means Azerbaijani air carriers could add such service or participate in a code-sharing agreement with a U.S. carrier.

Compiled and edited by Linda Werfelman.

Divided RESPONSIBILITY

BY LINDA WERFELMAN

‘Systemic deficiencies’ and the crew’s loss of control were cited in a fatal Metro III crash in Ireland.



Susan Reed

The flight crew of the Fairchild SA227-BC Metro III had descended below decision height in fog at Cork Airport in Ireland before initiating their third missed approach. They lost control, and the airplane rolled right and struck the ground inverted, killing both pilots and four of the 10 passengers.

In its final report on the Feb. 10, 2011, crash, the Irish Air Accident Investigation Unit (AAIU) cited as the probable cause the “loss of control during an attempted go-around below decision height in instrument meteorological conditions [IMC].”

The report also cited contributory causes, including not only the pilots’ flight techniques but also their fatigue, the "inadequate command training and checking" during the commander's upgrade, the inappropriate pairing of two relatively inexperienced pilots and the "inadequate oversight of the remote operation by the operator and the state of the operator."

After reviewing the complex relationships among three organizations — the accident airplane's operator, which held a Spanish air operator certificate (AOC); the ticket seller, which was based in the Isle of Man; and the Spanish company that provided the airplanes and pilots under an agreement with the ticket seller — accident investigators identified "systemic deficiencies at the operational, organisational and regulatory levels … [that] provided the conditions for poor operational decisions to be made on the day of the accident."

The business model, in which the ticket seller provided air service even though neither it nor the owner held an operating license or an AOC, was "not in the best interests of passenger safety," the report said.

Below Minimums

The morning of the accident, the flight crew reported for work at 0615 local time at Belfast (Northern Ireland) International Airport and flew the accident airplane on a brief positioning flight to Belfast City Airport, where the airplane took on enough fuel for a roundtrip flight to Cork. After 10 passengers boarded, the copilot delivered the required safety briefing and the airplane took off at 0810 with the copilot at the controls.

As the airplane approached Cork at 0848, the automated terminal information service reported that low-visibility procedures were in effect. Air traffic control (ATC) provided information on runway visual range (RVR) for Runway 17, which was below required minimums for Category I operations, and said that a Category II instrument landing system approach, with lower visibility minimums, was available.

Neither pilot was approved to conduct Category II operations, and the airplane, which was not equipped with an autopilot or flight director system, was therefore not authorized for those approaches, the report said.

Nevertheless, the crew began the approach and continued the descent below the 200 ft decision height (DH) to 101 ft before beginning a missed approach. The second approach — to Runway 35, because the crew believed that the position of the sun behind the airplane might make it easier for them to see the runway — was continued to 91 ft. At 0915, after the second missed approach, they asked to spend 15 to 20 minutes in a holding pattern, waiting for visibility to improve. While in the holding pattern, the pilots discussed weather information for several nearby airports, including Kerry, where conditions were reported as good, with visibility of more than 10 km (6 mi).

However, at 0939, after ATC said that visibility was improving but still below required minimums, they began another approach to Runway 17, again continuing the descent below the DH, with the commander, the pilot not flying (PNF), operating the power levers.

"This was followed by a reduction in power and a significant roll to the left," the report said. "Just below 100 ft radio altitude, a go-around was called by the PNF, which was acknowledged by the PF [pilot flying]. Coincident with the application of go-around power by the PNF, control of the aircraft was lost. The aircraft rolled rapidly to the right beyond the vertical, which brought the right wingtip into contact with the runway surface."

The airplane was inverted when it struck the runway about 0950 and came to a stop in soft ground to the right of the runway; fires broke out in both engine nacelles and were extinguished by the airport fire service. In addition to the six fatalities, four passengers were seriously injured, and the other two received minor injuries. The airplane was destroyed.

Organizational Complexities

The airplane was owned by a Spanish bank, leased to a Spanish firm doing business as Air Lada and subleased to the Spanish operator, Flightline, which held an AOC. Flightline, along with three other operators, worked with the ticket seller, Manx2, which acted as the operators' agent and provided a single brand name and livery. The ticket seller told accident investigators that "it did not wish to have the regulatory complexity and crewing problems associated with holding an AOC," the report said. "Accordingly, aircraft were leased from EU [European Union] AOC holders."

The report said that this business model "allowed specialisation, with the ticket seller concentrating on the commercial side of the operation and subcontractors used for most other requirements; the operational requirements of crewing, maintenance, provision and operation of the aircraft being addressed by the AOC holders."

The U.K. Civil Aviation Authority said that it reviewed the ticket seller's website "periodically" and expressed concern that the seller "was allowing the impression to be created that it was a licensed airline." The website subsequently was changed to identify the ticket seller as the "agent for the four AOC holders within the marketing group," the report said.

The ticket seller told investigators that it depended on local regulatory authorities and their Safety Assessment of Foreign Aircraft (SAFA) ramp checks, as well as the U.K. Department for Transport, to ensure that their airplanes met safety requirements.

Under a 2010 contract, the operator subleased the accident airplane and a second Metro III from the owner and "was responsible for the whole operation," including training and checking the pilots and auditing the operation, the report said. A separate contract with the maintenance provider specified that the owner was to pay all maintenance costs.

The Agencia Estatal de Seguridad Aérea (AESA), Spain's aviation safety and security agency, was responsible for regulatory oversight, but it told accident investigators that it "had no knowledge of the owner, which was a commercial company and therefore not within its regulatory remit, nor were they aware of the connection between the ticket seller and the owner."

When the airplane was being used by a previous operator, AESA had sent inspectors to the Isle of Man for a ramp inspection, but, because the operator was not required to inform the agency of its remote activities, AESA was unaware that the airplane was being used in the area under a new AOC.

AESA told accident investigators that "to have better tools/procedures for proper oversight of a remote operation, EU regulation should require the operators to provide the certifying authority with a formal declaration stating which are the organizations that ultimately decide the flight's schedule, routes, crew roster, etc."

Four Days as Commander

The commander of the accident flight began flying in 2007 and held a European Joint Aviation Authorities (JAA) commercial pilot license issued in Spain. He had accumulated 1,801 flight hours, including 1,600 hours in type. He was hired as a Metro III copilot for three Spanish operators, and he flew concurrently for all three in early 2009, before being hired as a copilot by the operator of the accident airplane. His first flight as a commander was Feb. 6, 2011 — four days before the accident — and he had accumulated 25 hours in type as pilot-in-command. Records showed that, before the accident flight, he had flown into Cork 61 times as a copilot and seven times as a commander. There were no records of a diversion on any of those flights and no record that the commander had ever flown to Kerry.

The copilot held a JAA commercial pilot license issued in the United Kingdom and an SA227 type rating. He had 539 total flight hours, including 289 in type, and began flying for the operator on Jan. 8, 2011. When the accident occurred, he had flown 19 hours for the operator; a required line check had not been completed.

Reconfigurations

The accident airplane was manufactured in 1992 for an operator in Mexico. It was registered in Spain in 2004, and its most recent airworthiness review certificate was issued in 2010. At the time of the accident, it had been flown about 32,653 hours and 34,156 cycles.

The airplane had been configured to allow removal of the passenger seats for nighttime mail/cargo flights and reinstallation of the seats

© Cathal McNaughton|Reuters

Six of the 12 people in the Metro III were killed when the airplane crashed as the crew began their third missed approach on a foggy morning in Cork, Ireland.

for daytime passenger flights. The operator told accident investigators that two commanders had been "trained and authorized" to remove and reinstall the seats, but according to regulations, this task was "restricted to holders of a valid [Joint Aviation Requirements] … flight engineers licence."[1]

For the accident flight, the airplane had 18 passenger seats — the maximum capacity approved by the AESA.

Maintenance was performed by an approved maintenance organization based in Barcelona, Spain. Technical logs showed no defects between Nov. 9, 2010, when the airplane was returned to service after repairs for a hard landing, and the day of the accident.

An analysis of the airplane's flight data recorder showed that, throughout the 106 hours of available data, there had been a "mismatch between the recorded torques being delivered by the two engines," the report said, tracing the problem to a faulty sensor. The flight crews consistently adjusted the power levers manually to compensate, but in the final seconds of the accident flight, when the pilots reduced power below the normal in-flight range, the power difference was significant, the report said. The difference was among the contributory causes cited in the report.

Fog and Low Visibility

Flight documentation emailed to the crew the night before the flight by a service provider in Spain included initial weather information, which had been obtained at 1622 on Feb. 9. At 0625 the morning of the accident, the pilots downloaded current weather information, which said the RVR at Cork was above the required minimums, although there was fog nearby; the terminal area forecast called for visibility of 300 m (984 ft) and broken clouds at 100 ft, with visibility improving to more than 10 km (6 mi) between 0900 and 1100.

The airport had been operating under low visibility procedures since 1550 on Feb. 8, 2011, and the Irish Meteorological Service told investigators that weather conditions at the time of the accident had included fog, broken clouds at 100 ft and visibility around 350 m (1,148 ft); RVR on Runway 17 was 600 m (1,969 ft), and RVR on Runway 35 was 450 m (1,476 ft).

Immediate Cause

Although accident investigators concluded that the "immediate cause of the accident was a loss of control of the aircraft at a low height, from which recovery was not possible," the report also cited contributing operational, organizational and regulatory issues.

Both pilots reported for duty "without the prescribed rest," the report said, "and it is likely that [both] were suffering from tiredness and fatigue at the time of the accident."

The commander had received inadequate training for his role, the report said.

"Poor evaluation of the weather conditions, lack of CRM [crew resource management] and inappropriate decision making are largely attributable to the inadequate command training. … In addition, the copilot, who had only recently joined the operation, had not been line-checked,

Fairchild SA227 Metro III

The Metro III — a version of the SA226-TC Metro designed by Edward Swearingen and first flown in 1969 — is a twin turboprop airplane designed to seat two pilots and up to 20 passengers.

It has two Honeywell TPE331-12UHR-701G engines, each with a maximum continuous rating of 1,050 shp (783 kW).

The standard Metro III has a maximum takeoff weight of 14,500 lb (6,577 kg). Maximum cruising speed is 288 kt. Service ceiling is 25,150 ft, and range — with 19 passengers, baggage and instrument flight rules fuel reserves — is more than 782 nm (1,448 km).

Source: Jane's *All the World's Aircraft*, Irish Air Accident Investigation Unit yet was paired with the newly appointed commander. This inappropriate pairing resulted in a flat cockpit authority gradient with little formal command in evidence."

The copilot had not initially been scheduled for the flight but was added after the originally scheduled copilot asked the aircraft owner's operations manager — described by that copilot as "the person responsible" — for a duty change. The operator was not told of the change, "although the preparation of rosters and availability of adequately rested flight crew was wholly the responsibility of the operator," the report said.

"Such a crew pairing is not conducive to flight safety and came about due to the operator not exercising appropriate control over its crew rosters and its lack of operational control and effective oversight," the report said.

Missing Link

The investigation found "no evidence of a direct link between [the ticket seller] and the operator, the holder of the operating licence providing the air services," the report said.

The accident flight was considered an "intra-Community air service" — one that operated within the EU under regulatory requirements calling for "a high and uniform level of protection of the European citizen through the adoption of common safety rules." This intra-Community air service represented a departure from the operator's previous core activity of cargo flights.

"Sufficient scrutiny of this proposed remote operation by the operator should have identified and managed the additional resources and challenges while mitigating any risks identified," the report said. "The lack of a contract, or contact, between the operator and the ticket seller illustrated that this did not take place."

Because the operator's AOC was issued by Spain, that meant that Spain was the only EU member state with responsibility for oversight of the operation. Regulatory authorities in Ireland and the United Kingdom had no role in oversight, and EU regulations did not permit their involvement except through a ramp check under the SAFA program, but "SAFA inspections cannot substitute for the continuing safety oversight responsibility of a national aviation authority," the report said.

The report added that "the investigation is concerned that the lack of adequate oversight and control … by the regulatory authority of the state of the operator did not identify the operator's shortcomings, thereby contributing to the cause of the accident."

The report also criticized "the commercial model of an intra-Community air service provided by a ticket seller [as] not in the best interests of passenger safety, as it can facilitate utilisation of resource-constrained undertakings [firms] to provide air services, thus allowing a ticket seller to exercise an inappropriate and disproportionate role with no accountability regarding air safety."

The report contained 11 recommendations, including one calling on the European Commission's director-general for mobility and transport to "review the role of the ticket seller when engaged in providing air passenger services and restrict ticket sellers from exercising operational control of air carriers providing such services, thus ensuring that a high and uniform level of safety is achieved for the travelling public."

Other recommendations said the director-general should:

- Improve "the efficacy and scope of SAFA inspections, and … provide for the extension of oversight responsibilities, particularly in cases where effective oversight may be limited due to resource issues, remote operation or otherwise"; and,
- Review the obligations of EU member states to order penalties for violations of flight time limitations.

Several recommendations called on the European Aviation Safety Agency to provide guidance to operators on the handling of successive instrument approaches in IMC or at night when landings cannot be made, to ensure that existing regulations prescribe an appropriate level of command training and checking, and to review the process for issuing AOCs.

A recommendation to the AESA said the agency should review its policies on oversight of air carriers, especially those engaged in remote operations, and recommendations to the operator called for a review of its policy on diversions following a missed approach resulting from weather and the implementation of "appropriate training for personnel responsible for flight safety and accident prevention."

This article is based on AAIU Report 2014-001, "Formal Report: Accident, Fairchild Aircraft Corporation, SA 227-BC Metro III, EC-ITP; Cork Airport, Ireland; 10 February 2011." The 240-page report was published Jan. 28, 2014, and is available at <www.aaiu.ie>.

Note

1. The report said that seat removal and reinstallation procedures also were required to be "specified in the maintenance organisation exposition and be accepted by the competent authority." Accident investigators received no evidence that this had been done, the report said.

PARSING ‘Professionalism’

BY HEATHER BALDWIN

Illustration: Jennifer Moore
Photo: © STYLEPICS/depositphotos.com

The aviation community still debates what the term means — and how to achieve it.

For the past several years, *professionalism* has been one of the most widely used words and fervently discussed topics in aviation. Pilot and air traffic controller professionalism made the U.S. National Transportation Safety Board's (NTSB's) Top 10 "Most Wanted" list in 2011. It was the focus of a 2010 NTSB forum and a 2009 Air Line Pilots Association, International white paper.

It has been the subject of countless articles and blogs in the years since then. Whether it's an accident post-mortem determining that pilots behaved in an "unprofessional" manner, a CEO declaring his employees are the "most professional" in the business or leaders calling for an industrywide elevation in the level of professionalism, aviation is reaching for improvements in this area to make continued gains in safety and to attract future talent.

One of the challenges is the lack of a common definition. Ask any 10 people in the aviation industry to define professionalism, and while some basic themes tend to remain consistent, you will hear 10 different definitions, each placing greatest emphasis on the traits most important to an organization or segment of the industry. If it is true that an organization cannot manage what it cannot measure, it is also true that the industry cannot manage what it cannot define — clearly, succinctly and across organizational boundaries.

Professional behavior is something we all know when we see it. It was cited often with respect to the flight crew's ditching of US Airways Flight 1549 in the Hudson River after both engines were damaged by bird strikes shortly after takeoff (*ASW,* 8/10, p. 57). Unprofessional behavior just as readily has been cited in other accidents, such as some attributed to the flight crew of Colgan Air Flight 3407, which crashed during an approach (*ASW,* 3/10, p. 20). Distracting, nonoperational conversation by the Colgan crew below 10,000 ft contrary to regulations, inadequate monitoring of airspeed and the captain's failure to effectively manage the flight, for example, were among contributing factors in the loss of control–in flight (LOC-I) accident that resulted in 50 fatalities.

But that's an oversimplified juxtaposition to make while the full concept of professionalism is much more complex. For one thing, while many emphasized technical mastery of flying as the hallmark of the professional, in the Hudson landing, it was not only the skills of Chesley Sullenberger and Jeffrey Skiles, the captain and first officer, respectively, that prompted the industry acclaim they received. It was their overall performance to high expectations, including unflappable calm after a startling event, quick decision making and total focus on duty and critical priorities. It was, for example, Sullenberger's twice walking the length of the cabin after evacuation to confirm no one was still aboard, although the airplane had begun to fill with water and to sink.

As the many regulatory, LOC-I risk-reduction and pilot licensing and training changes have demonstrated since the Flight 3407 crash, how much of pilots' performance and response to threats can be attributed to their professionalism alone can be a tricky question. Systemic questions — experience, training, acceptability of ratings on routine flight checks — are among numerous factors to consider. Airlines often struggle with realism in their expectations. What aspects of professionalism can be trained and influenced by an employer, and which are more intrinsic aspects of individual character?

"Companies always advertise that they are the gold standard, but no one has defined what that is," says Richard Walsh, who serves on the board of directors of the National Business Aviation Association (NBAA) and in recent

Capt. Chesley Sullenberger, above, and First Officer Jeffrey Skiles were lauded for their performance and professionalism after they landed an Airbus A320 on the Hudson River following a bird strike on takeoff from New York's LaGuardia Airport.

© Seth Wenig/Reuters

years was chairman of NBAA's safety committee. Professionalism is the same, he said; until a clear, industry-accepted definition emerges, no one can really know what level they actually have attained.

Technical Proficiency

Among people who work in aviation, casual definitions of professionalism typically touch on two components: technical proficiency and emotional/relational proficiency. Guenther Matschnigg, a former senior vice president of safety and flight operations at the International Air Transport Association (IATA), says professionalism means "adherence to procedures and regulations; knowledge, experience and the willingness to do a job with the best information. It's also a value," he adds. "Don't violate anything. Stick to the rules and don't deviate."

Similarly, in a March 2011 presentation, NTSB Member Robert Sumwalt said that professionalism "is a mindset that includes precise checklist usage, precise callouts, precise compliance with SOPs [standard operating procedures] and regulations, and staying abreast and current with knowledge and skills."

On the pilot side, recent efforts to advance technical professionalism have included the United States last year increasing the minimum number of flight hours for first officers to fly for a commercial airline from 250 to 1,500 and requiring an airline transport pilot license; the institution in many countries of the multi-crew pilot license, which takes zero-time students to the right seat of an advanced airliner, embedding the multi-crew environment, threat and error management, human factors awareness and airline-specific SOPs throughout the training program; and introduction of revised training methods, to name a few.

"We felt very strongly that the training, how it is being done in modern aircraft, needed to be improved and adapted," said Matschnigg, citing IATA's introduction of competency-based and evidence-based training. The former entails teaching candidates until they are deemed competent in a skill, rather than concentrating on completing a specified number of training hours. Evidence-based training requires pilots to demonstrate competence in managing the most relevant threats based on operational evidence, including industry data. For example, Matschnigg says, most airlines' checks in a simulator still require the flight crew to respond to a V_1 cut, an engine failure during takeoff, even though today's engine reliability means this situation rarely happens relative to other threats. "I'm not saying you should never do it, but technology has advanced beyond training today," he says. Emphasis should instead be on handling situations that present higher-priority risks based on flight data analysis. For instance, in the February 2010 issue of IATA's *Airlines International*, Matschnigg noted that "there was nothing that trained pilots for a high-altitude stall, even though we have clear evidence that this can be a real risk."

Ron Nielsen, a retired airline captain and industry expert who is often called on to provide input on topics related to professionalism, says training of technical competencies based on evidence of threat prevalence should extend to addressing the issue of maintaining a sterile cockpit below 10,000 ft, a causal factor, as noted, in the Flight 3407 crash as well as at least three other fatal U.S. accidents since 2004 (*ASW,* 10/08, p. 38; 11/07, p. 38; 4/11, p. 16).

"There are human limits to imposed stoicism," says Nielsen. "If I were training pilots, I would try to invite them into non-operational conversation [during simulator training] so if they make a mistake, they can experience firsthand how getting sucked into conversation can cause an error. We should be practicing in the simulator what we truly experience in the cockpit."

Relational Proficiency

Technical competence is unarguably a foundational element of professionalism, but Sumwalt's list of traits that make an aviation professional includes one additional line: "The ability and willingness to say 'I don't know' or 'I am wrong.'" That is where the discussion begins to cross over into the softer, but equally important, side of professionalism — the ability to effectively manage relationships and interactions with others. This aspect tends to be not only harder to measure, but for pilots and mechanics, who tend to be highly precise, analytical, data-driven and individualistic people, it is also very challenging.

Nielsen, who participated on a discussion panel in the NTSB's May 2010 forum on professionalism in aviation, defines professionalism as "encompassing two aspects: technical competence and social competence. A professional is someone who is fully self-aware of his own personality and how he impacts others." A captain acting with expected professionalism, for instance, intentionally creates an atmosphere of open communication, he says. Such an environment is critical for a safe and highly functioning team, and, therefore, this is considered an essential aspect of professionalism. If the captain's interpersonal behavior style is more domineering and dictatorial — and he or she allows that style to set the tone in the cockpit without awareness of its impact — it can make the first officer reluctant to speak up about a problem.

"In the first 15 minutes in the cockpit, the other guy [first officer] is making an assessment about whether he can risk telling me what's on his mind," Nielsen explains. "Current aviation training doesn't address personal style, and it needs to, because the things that naturally make a good pilot — being task-driven, direct and precise — can create problems in the cockpit."

Those on the corporate side of aviation say this relational dimension of professionalism is critical. Asked to define professionalism, Sheryl Barden, president and chief executive officer of Aviation Personnel International (API), starts by pointing to the ability to communicate and manage relationships. "What is your demeanor and your bearing? How do you handle tough situations with a client?" she says. Corporate pilots, for instance, must be able to skillfully communicate problems — such as the inability to land at the flight-planned destination — and present solutions to top executives and high-net-worth passengers accustomed to successful outcomes on demand. Professionals can navigate these kinds of interactions in addition to being masters of their craft and seeking continued development of their technical skills.

These softer skills are tough to measure, as noted, and it may be nearly impossible to document a return on investment from training on these skills, some observers say. The industry spends little time training on softer skills, but that may need to change. API has been in business for more than 40 years, and Barden says she is among those noticing a shift in the behavior of some of the people now coming into the workforce. There have been many anecdotes about some millennials — those born between the early 1980s and the early 2000s — presenting challenges related to individual professionalism that the industry must address, she says.

"Aviation is a very precise career demanding excellence and the ability to follow a lot of rules. You can't make it up as you go along or just decide you'll do it later, as we are seeing in many of our millennials," Barden said. "The concept of 'I want it all now' is also a factor because this is an industry that doesn't put 'me' first. This is going to be one of the hardest challenges we face as we move forward: How do we adjust to meet the values of the next generation?"

Barden is not the only one who has noticed these changes, and she is watching their implications for professionalism in aviation. Brad

Social media has blurred what once was a clear line between personal and professional lives.

Stemmler is director of operations at Aviation Search Group, an executive and technical direct placement search firm to the aviation industry. He has dealt with people — both those already in the industry and those hoping to enter — for 16 years, and says the newest generation tends to be less comfortable than previous generations with what older workers consider relational basics, like a handshake and eye contact. Long accustomed to communicating via electronic devices and to becoming "friends" at the click of a button, the ability to manage difficult conversations with confidence and mastery does not seem to come readily to some individuals in this generation, he argues.

Another challenge millennials face in presenting themselves as aviation professionals involves the myriad online outlets in which their lives and demeanor are portrayed. Social media has blurred what once was a clear line between personal and professional lives. "If someone has put their life out for the public to see, they are making a conscious decision to display themselves in a certain light," Stemmler said. "Potential employers are certainly interested in how they have done that," as it can be revealing of a person's values and character traits.

He is quick to add that while social media makes the non-technical side of professionalism more complex, the basics of professionalism have not changed. In addition to being technically proficient, he says, a professional in aviation "demonstrates appropriate behavior — courtesies, appearance and respect — toward others in the workplace. We all know when we interact with a professional. There's a certain acumen, a polish," he says. "You walk away pleased with the engagement. You appreciate the courtesy and respect they've shown you. You walk away confident in their competence."

Giving Back

As with every generation before them, millennials in general need coaching and development in order to be and to grow into employees recognized for professionalism. A willingness to mentor and bring along the next generation of workers must be included in any definition of the word *professional* in aviation, says Dale Forton, president of the Professional Aviation Maintenance Association (PAMA). "The mark of a professional today is someone who learns, earns and returns to their industry," he says.

Learning encompasses not only the initial aviation education, licensing and ratings that enable a person to get their first job but also ongoing training and education that keep people technically proficient and continually up to date on best practices. Earning simply refers to a person's ability to make a living in an aviation career, the dictionary definition of professional.

Returning is "the final and true mark of a professional," says Forton. "Your conduct, your character, your ethical responsibilities and standards all get 'topped off' when you return to your industry. Volunteer. Participate in a career day. Get involved in chapters like PAMA. Bring new people into the industry. Create a positive image of the profession. We all need to give back."

NBAA's Walsh agrees. He defines professionals as those who pursue "continuous improvement to excel in their role" and people "committed to sharing and developing the talent around them." This works in two directions. A professional must have the expertise to mentor and the humility to be willing to be developed. Walsh said he has noted "a real paradigm shift" over the last two or three years in this area, with growing numbers of intern programs, value-sharing across different corporations, job shadowing and other human development initiatives.

Still, we as an industry have a long way to go, these observers agreed. While Walsh believes the business aviation community recently has made "incremental progress" in instilling professionalism, the economic challenges of the past five years combined with globalization of corporate aviation adversely have affected those efforts. Perhaps most revealing of how far we have yet to go in cultivating widespread professionalism is individual awareness. "When I do talks, I always ask pilots, 'What is the difference between an amateur pilot and a professional pilot?'" Walsh concludes. "A lot of them can't define it."

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High Confidence

BY WAYNE ROSENKRANS

FSF–NBAA task force updates guidelines for duty/flight time and rest in business aviation.

Duty/Rest Guidelines 2014 for Business Aviation — a free, three-part digital document set for release in mid-April — answers the clamor from U.S. business aircraft operators and pilots for fresh expert advice on this critical subject, the authors say. It's the product of six months of research and development, and three additional months of editorial refinement, by a fatigue task force formed in July 2013 by Flight Safety Foundation and the National Business Aviation Association (NBAA).

The task force essentially reconsidered this industry sector's long-used, voluntary practices for managing duty time, flight time and rest in light of the latest operational needs and advances in the science of fatigue, says Leigh White, president of Alertness Solutions, who chaired the task force.

The centerpiece of this document in Adobe Portable Document Format (PDF) is two one-page tables of currently recommended hours for maximum duty period, maximum flight time and minimum off-duty period for augmented and nonaugmented flight crews. The task force expects numbers in these tables to be implemented by business aircraft operators only in their context of extensively updated/rewritten definitions of terms and explanatory guidelines, available online at <flightsafety.org/dutyrest>. A new foreword introduces the overall content.[1]

White considers *Duty/Rest Guidelines* a complete and direct replacement for *Principles and Guidelines for Duty and Rest Scheduling in Corporate and Business Aviation,* published in February 1997 by the FSF Fatigue Countermeasures Task Force.[2] "Among our other goals for this document was providing a useful tool that is practical, and easy to understand and to implement," she said. "These guidelines hopefully will set the cornerstone — but only one cornerstone — of every fatigue management effort in this sector of aviation, with both its design and recommendations easily incorporated into any operator's flight operations manual. Our industry is not being force-fed these guidelines — operators and pilots are asking for them, and we've been highly motivated to give them something they can use."

Clear and Simple

The task force's scientific panel and an industry panel (leading operators and experts in business aviation) collaborated during the research, development and revalidation phase to reach consensus on what to update, White said. The result incorporates science on par with the expertise behind the latest changes in fatigue management within U.S. commercial air transport. In short, the panels "focused on how nearly two decades of scientific advances should influence today's recommended practices for duty and rest scheduling while meeting the safety and operational goals of the general aviation community," she said.

"Another intent of our project was to consider whether the existing guidelines still provide a sufficient safety margin for current flight operations. To answer that question, our subject matter experts studied the relevant global accident and incident experience during the period since the 1997 publication. Our scientific explanations are refined from 1997 and in plain language. Elements of fatigue management are described, and we show operators where the *Duty/Rest Guidelines* fit within their overall fatigue-management efforts and what to do if an operator is required to operate outside of the guidelines."

The easy-to-interpret tables show, assuming a 24-hour period, the maximum number of duty hours and flight hours, and the minimum rest hours and intervals for ready comparison to operators' existing policies and flight operations manual. "The values remain fully consistent with current scientific knowledge and operational experience," White said. "We verified that the numbers make sense scientifically and operationally, and then the narrative body of the document provides the context. What's really fresh and new about this document compared to the 1997 publication is that context. This has got to be a living document reviewed or revisited every five years or so, at least to have the numbers verified and new research applied. With IBAC [the International Business Aviation Council] and ICAO [the International Civil Aviation Organization] involved, there will be a drive to keep these fresh."

A good example of the influence of fatigue-science advances upon *Duty/Rest Guidelines* is the document's intensified emphasis and updated explanation of effects of the *window of circadian low* (WOCL) — roughly 0200 to 0600 (for individuals adapted to a usual day-wake/night-sleep schedule) when the body is "programmed" physiologically to sleep and during which alertness and performance are degraded. This subject had been introduced in the original publication. "Over the last 16 years, more has been learned about what happens operationally with both of the main fatigue factors: window of circadian low and hours of wakefulness," White said. "Those are the two main physiological factors that come into play in these guidelines or in any duty/rest scheme today. Certainly, more has been learned about encroachment on the WOCL, and this has heightened awareness. We really do know more about how to manage this risk operationally now than we did in 1997, and confidence in the new guidelines' effectiveness came through in our scientists' voices."

Readers familiar with the 1997 publication will find differences in definitions of a number of terms and elimination/replacement of some content. "The thing that gives *Duty/Rest Guidelines* 'legs' [i.e., global applicability] is IS-BAO [the International Standard for Business Aircraft Operations]," she said, which operators have been motivated to adopt for diverse reasons such as potential issues of legal liability, safety enhancements, commercial advantages of registration and the acquisition of long-range business jets.

Globalization factors similarly influenced the alignment of definitions for consistency with those in the upcoming fatigue management implementation guide for general aviation to be issued jointly by the Foundation, ICAO and IBAC. In fact, *Duty/Rest Guidelines* as a standalone PDF will be temporary, she added. Plans call for the document's entire content to be incorporated permanently into the new implementation guide.

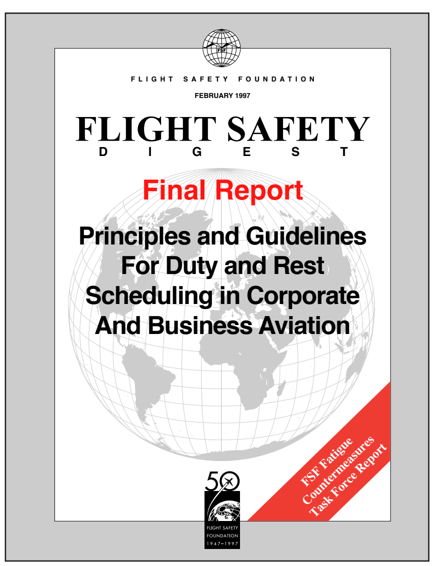
Kevin Gregory, vice president and senior scientist, Alertness Solutions, said that regular review of the validity of recommendations, including the strengthening of some elements and the discarding of others, in *Duty/Rest Guidelines* also is consistent with many operators' safety management principles.

As someone who also had a hand in developing the original publication, he recalls that in the mid-1990s, the whole idea of applying duty/rest principles and recommendations from U.S. National Aeronautics and Space Administration research to business/corporate aviation felt like venturing into uncharted territory. The effort called for heavy emphasis on convincing operators about the value of scientists' work and the data-driven problem solving.

"In a lot of ways, this was new ground even though there had been discussions already ongoing for many years about a need to update the air carrier duty and rest guidelines at the FAA [U.S. Federal Aviation Administration] level," he said. "We were saying, 'Here's this report — but it's really a starting point' to get people thinking … to motivate them to incorporate the 1997 guidelines into operations. Now we feel that the industry, to a large extent, is much more aware, more sophisticated in recognition of fatigue issues and risks that they need to address."

Operation of long-range business jets, some capable of 16-hour flights, ideally should not be the primary motivation for an operator to adopt the document. "Let's not lose sight of the fact that these principles are just as relevant in other types of operation — such as many short-haul flights during a 14-hour duty period — that can be as challenging from a fatigue perspective," White said.

The 1997 publication unquestionably became accepted as a voluntary standard within business aviation, and one especially used by auditors, she said. It has been widely considered the starting point of best practices in flight departments, and auditors typically would inquire during the exit briefing about the operator's rationale and risk mitigations in case of deviations. "Absolutely, there was an impact from the original publication, and I think that the newly refreshed document similarly is going to have a significant impact," she said.



Transition to 2014 Version

Various pathways for operators' transition from the now-outdated publication to *Duty/Rest Guidelines* can be effective, the creators advise. However, White suggests that operators first categorize themselves — as the new guidelines suggest — as either the type of operator conducting nominally simple flight operations or as the type of operator conducting complex/irregular flight operations that exceed the guidelines. Step one, for both types, should be to compare the tables with the operator's existing policy and flight operations manual.

"Then it's really important, as an operator, to think about what you actually do," she said. "If you're getting any kind of fatigue reports or you're gathering any kind of fatigue information, take a look and see if you're doing something that exceeds what these recommendations lay out."

In the case of simple operations, the operator next should revise training to conform to the first step, White said. "Implementation plus training, combined, equals fatigue management in simple operations," she said.

"As your operations get more complex, as you start pushing/exceeding these guidelines, you need to do active fatigue management, which means looking to see where it is in your operations that you exceed the recommendations. Then you actively manage with fatigue reporting, enhanced training, procedures in place, talking about mitigations for flight risks and awareness. So we introduce in the last section of *Duty/Rest Guidelines* what fatigue management means if operators are going to choose to fly outside these recommendations." The FSF-ICAO-IBAC implementation guide now being completed will add more detailed recommendations for such operators.

The point is to recognize any operational demands to perform unusual/irregular flight operations, then to document the risks, and finally to design and implement appropriate mitigations using *Duty/Rest Guidelines*. "For example, include in your manual what happens when you approve — but then exceed — a selected duty extension, or if you have to plan a flight outside of the guidelines," White said. "Have some documented procedures, and then include all of this information about mitigations and exceedances in your annual training. Then pay attention with ongoing monitoring as you are doing operations that exceed these recommendations. Collect fatigue reports, have some post-trip briefings — something so that you can pay attention to the outcomes."

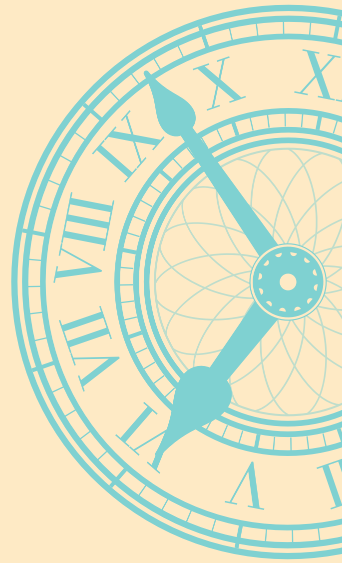
A key advantage of the new document's endorsement by ICAO and IBAC will be its status going forward as part of the IS-BAO standard. "When auditors are trained, they'll have this template, and they'll be able to look at an operator's flight operations manual and fairly quickly assess the fatigue-management effort," she said. "If they're not exceeding those guidelines, then the only other basic thing they need to be doing is training. The auditors verify that the operator is doing the training, and they're done. If the operator is exceeding these guidelines, the auditor can look at the mitigations and other fatigue-management steps that they can easily audit."

Among elements eliminated/replaced during the update, most involved making terminology easier to grasp for non-scientist users, more concise and more operationally focused. "Since the 1997 guidelines, scientists have been working in the industry more operationally," White said. "We were acutely aware that our audience is the operators. The scientific terminology related to operations is more consistent now."

A second reason for elimination/replacement was relevance to today's operational settings, and a third reason was the need for conformity to terms now used in fatigue-related materials intended for international use. "The concepts are still there — they're just described in a way that's, hopefully, more accessible," White said.

Duty/Rest Guidlelines, by design, also contains some subtle references to quality of life benefits for pilots. White said, "We want as many people to read this document as possible. The way that fatigue risk management is framed by everybody now is that it is a joint responsibility. The operator has to do 'these five things,' and individuals need to hold up their end of the deal, too."

In the final analysis, successful fatigue risk mitigation through large-scale voluntary practices hinges on buy-in from operators and pilots in the business aviation community, Gregory added. "We're saying, 'There are benefits for you here as well,'" he said. "You've just been out flying to Asia and you're back for a week. Here's how quickly you're going to adapt so that you can enjoy your time with your family at home.' Operators have got to find a way to show that there's a benefit to the individuals as well as the organization."



'Collect fatigue reports, have some post-trip briefings — something so that you can pay attention to the outcomes.'

Notes

1. In addition to the two tables and foreword, *Duty/Rest Guidelines* covers, in part, an introduction to fatigue management; active fatigue management; objectives and limitations of the guidelines; recovery period; time-of-day and circadian physiology; individual differences; latest recommendations to operators; WOCL operations; off-duty period, sleep opportunity and recovery opportunity; time-zone changes; duty period; standard flight time and extended flight time; non-augmented and augmented operations; cumulative duty/flight limits; standby; fatigue countermeasures; predeparture protected rest; controlled rest on the flight deck; restorative breaks; operator best practices; fatigue-reporting systems; and how to obtain further detailed guidance.

2. The original *Principles and Guidelines* publication is still available at no cost from the FSF website at <flightsafety.org/flightsafety.org/fsd/fsd_feb97.pdf>.

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Rewriting THE RULES

BY LINDA WERFELMAN

New requirements in the U.S. and the U.K. are intended to boost helicopter safety.

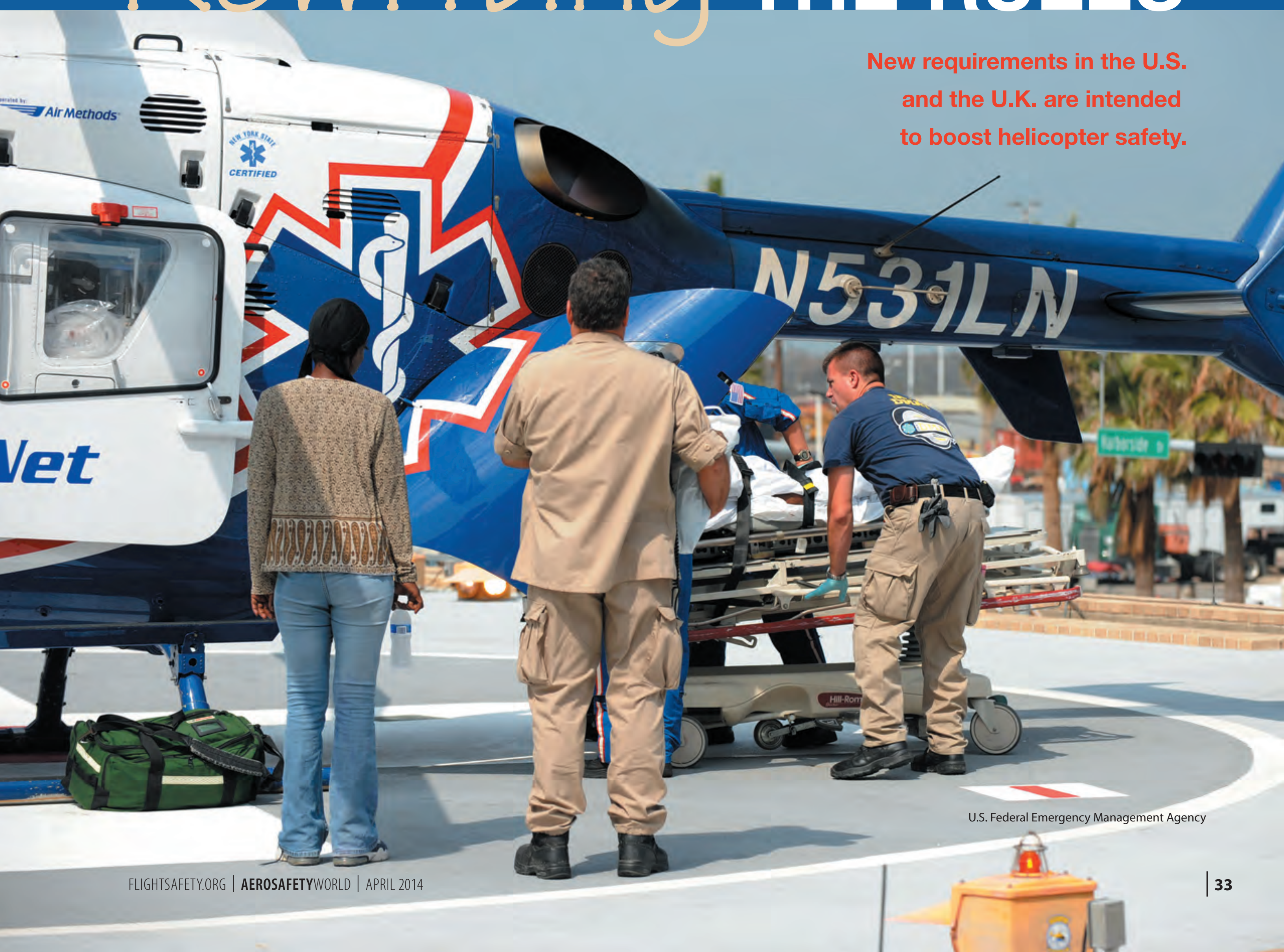
Authorities in the United States and the United Kingdom, in unrelated actions, are taking a series of steps they say will strengthen safety requirements for helicopter operations.

In the United States, the Federal Aviation Administration (FAA) issued a final rule in late February ordering operators of helicopter emergency medical services (HEMS) flights and other operations to adopt stricter procedures, to install additional safety equipment and to improve communications and training. The FAA said the action represented "the most significant improvements to helicopter safety in decades" (*ASW*, 3/13, p. 22).

In the United Kingdom, the Civil Aviation Authority (CAA) moved to prohibit helicopter flights over the North Sea when sea conditions are severe, to improve pilot training and checking, and to require the installation of new safety equipment to aid passengers in emergencies.

In announcing the FAA's new rule, Administrator Michael Huerta said the changes will "help reduce risk and help pilots make good safety decisions through the use of better training, procedures and equipment."

Helicopter operators have until April 22 to begin using the rule's "enhanced procedures for flying in challenging weather, at night and when landing in remote locations," the FAA said. Within three years, EMS helicopters must use "the latest on-board technology and



U.S. Federal Emergency Management Agency

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equipment to avoid terrain and obstacles," the FAA said, and within four years, the helicopters must be equipped with flight data monitoring systems.

The FAA said most of the changes prescribed by the rule would apply only to HEMS operations and other commercial operations conducted under U.S. Federal Aviation Regulations Part 135, which regulates commuter and on-demand operations.

The U.K. CAA said that it would … begin examining each offshore helideck "ensuring they meet strict safety standards."

Part 91 Weather Minimums

One change, however, establishes new weather minimums for helicopters being flown under Part 91, which sets forth general operating and flight rules.

Under that change, Part 91 helicopter pilots operating under visual flight rules and below 1,200 ft above the surface in Class G uncontrolled airspace — currently required to remain clear of clouds and "at a speed that allows the pilot adequate opportunity to see any air traffic or obstruction in time to avoid a collision" — will be permitted to operate "clear of clouds in an airport or heliport traffic pattern within ½ nm [0.9 km] of the runway or helipad of intended landing if the flight visibility is ½ statute mi (0.8 km) or more."

The FAA said that its review of U.S. National Transportation Safety Board (NTSB) accident data from 1991 to 2010 showed that, if the rule had been in place, it might have prevented 49 helicopter accidents that resulted in 63 deaths.

Radio Altimeters

Among the changes for all Part 135 operators is the requirement that each helicopter be equipped with a radio altimeter, which the FAA said can "greatly improve a pilot's awareness of height above the ground during hover, landing in unimproved landing zones and landings in confined areas where a more vertical approach may be required." Radio altimeters also increase situational awareness in low-visibility conditions, including inadvertent flight into instrument meteorological conditions (IMC).

Other provisions call for:

- Helicopter occupants to wear life jackets when a helicopter is being flown over water and beyond power-off glide distance from the shore and for the aircraft to be equipped with a 406-MHz emergency locator transmitter;
- Higher weather minimums to be observed when designating an alternate airport in a flight plan; and,
- Helicopter pilots to be tested on their handling of flat-light, whiteout and brownout conditions, and on their ability to recover from inadvertent flight into IMC.

HEMS Considerations

Among the changes that apply specifically to HEMS operations is a requirement to equip HEMS helicopters with helicopter terrain awareness and warning systems (HTAWS), which the FAA said would "create a safer environment for emergency medical services flight operations by preventing controlled flight into terrain at night or in bad weather."

The rule noted that the NTSB has praised HTAWS as a key piece of safety equipment that might have prevented numerous accidents in recent years if HEMS operators had been required to install the device.

The FAA similarly said that its review of HEMS accidents from 1991 through 2010 showed that 62 crashes "could have been mitigated" if the HTAWS requirement and other provisions of the new rule had been in place. Those crashes resulted in 125 fatalities.

Other provisions directed at HEMS operations say that:

- All flights with medical personnel aboard must be conducted under Part 135, which has more stringent requirements than Part 91 in several areas, including weather requirements and flight crew duty time limits and rest requirements.
- Operations control centers must be established for air certificate holders with 10 or more EMS helicopters. Center staff members will communicate with pilots, provide weather information and flight monitoring, and help in preparing preflight risk assessments, thereby providing "an additional measure of safety for complex operations," the FAA said.
- EMS helicopters must be equipped with a flight data monitoring system to "promote operational safety and … provide critical information to investigators in the event of an accident."
- Pilots-in-command must hold instrument ratings.
- Preflight risk-analysis programs must be established; pilots must, before departure, identify the highest obstacle along their planned flight route; and flight crews must comply with applicable weather-related flight rules.
- Safety briefings or training must be provided for medical personnel.

Offshore Operations

At the same time the FAA was publishing its new rule, the U.K. CAA announced a series of actions to increase safety in offshore helicopter operations (*ASW*, 9/13, p. 26).

Deirdre Hutton, chair of the CAA, said the actions "will result in significant improvements in safety for those flying to and from offshore sites."

Hutton added that helicopter operators, the oil and gas industry and the European Aviation Safety Agency (EASA) were expected to "move forward with recommendations to them as soon as possible. For our part, the CAA is already taking forward actions directly under our control."

The changes followed a review conducted in conjunction with the Norwegian Civil Aviation Authority (N-CAA) and EASA in the aftermath of five crashes of North Sea helicopters between February 2009 and August 2013.[1] Two of the crashes were fatal, with a total of 20 deaths.

The U.K. CAA report on the review noted that three of the last five crashes of U.K. helicopters in the North Sea had involved the failure of a critical part of the main gearbox transmission, adding, "The process of preventing accidents starts by establishing high technical design standards that enable safe products through a robust certification process with high production and maintenance standards."

The CAA said that it will implement measures "prohibiting helicopter flights in the most severe sea conditions, so that the chance of a ditched helicopter capsizing is reduced and a rescue can be safely undertaken."

Another measure says that passengers "will only be able to fly if they are seated next to an emergency window exit to make it easier to get out of a helicopter in an emergency (unless helicopters are fitted with extra flotation devices or passengers are provided with better emergency breathing systems)."

A related provision requires improved emergency breathing equipment for all passengers "to increase underwater survival time, unless the helicopter is equipped with side floats."

In addition, the U.K. CAA said that it would make "important changes" in pilot training and checking requirements and begin examining each offshore helideck "ensuring they meet strict safety standards."

The CAA said that it expected operators to take steps to upgrade their helicopters and survival equipment, with the installation of side floats, automatic flotation equipment and hand holds next to push-out windows, and the use of improved life rafts and life jackets.

The agency also issued recommendations to EASA on improving helicopter safety; "establishing a review of offshore helicopter accidents and incidents with national aviation organisations, such as the CAA, to highlight safety issues and develop remedies; and developing standardized helicopter operating information for pilots."

In response, EASA said the review would "play a significant part in improving the safety of offshore operations in Europe" and pledged to study the recommendations contained in the package and deliver a progress report in early April.

The N-CAA said the "thorough review … identifies and assigns many important actions and recommendations which we believe will strengthen the safety of offshore operations in the U.K., Norway and, potentially, worldwide."

Note

1. U.K. CAA. CAP 1145, *Civil Aviation Authority — Safety Review of Offshore Public Transport Helicopter Operations in Support of the Exploitation of Oil and Gas*. February 2014. Available at <www.caa.co.uk>.

Factual context, fresh insights and logical implications from last year's crash of Asiana Airlines Flight 214 stand to influence settled beliefs about today's state of crash-related performance of people, equipment and systems throughout commercial air transport. However, substantive changes to aircraft systems, equipment or practices affecting airplane cabin crashworthiness, occupant protection and emergency response likely would be premature pending the U.S. National Transportation Safety Board's (NTSB's) completion of the investigation, several subject matter experts told the agency's Dec. 11, 2013, investigative hearing in Washington.

The NTSB's preliminary report, last updated in August 2013, summarizes the accident this way: "On July 6, 2013, about 1128 Pacific Daylight Time, Asiana Airlines Flight 214, a Boeing 777-200ER, registration HL7742, impacted the

NTSB hearing on Asiana Airlines Flight 214 expands insights into occupant protection, escape and rescue.

BY WAYNE ROSENKRANS

Survival FACTORS

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About 15 minutes after the Boeing 777-200ER came to a stop, fire ignited in the right engine oil tank outside the fuselage.

U.S. National Transportation Safety Board

sea wall and subsequently the runway during landing on Runway 28L at San Francisco International Airport (SFO), San Francisco, California. Of the four flight crewmembers, 12 flight attendants and 291 passengers, about 182 were transported to the hospital with injuries and three passengers were fatally injured. The airplane was destroyed by impact forces and postcrash fire. The regularly scheduled passenger flight was operating under the provisions of [U.S. Federal Aviation Regulations] Part 129 between Incheon International Airport, Seoul, South Korea, and SFO. Visual meteorological conditions prevailed at the time of the accident."

The U.S. Federal Aviation Administration (FAA) recently has published two reports on trends in accident survivability, said Jeff Gardlin, aerospace engineer, Transport Airplane Directorate, FAA. "What they basically show is that the accident rate and the fatality rate in accidents are both dropping, and that the percentage of accidents that are survivable is increasing," he said. "It's [also] pretty clear that there is an increase in traffic, and that it is likely that we will see accidents even at a very low rate."

Major components of FAA's occupant-survivability approach since the 1980s have included measures clearly relevant to this accident, such as reducing flammability/heat-release of large interior surfaces of the cabin and seat cushions; manufacturing new airplanes and retrofitting older fleets with advanced insulation that resists penetration of the fuselage by external fire; improving exit path markings and lighting; requiring seats dynamically tested to withstand loads up to 16 times the normal acceleration of gravity (16 g) forward along the longitudinal axis; and improving escape slides with changes such as radiant heat–reflective fabrics and low smoke toxicity, he said.

Aircraft Crashworthiness

Bruce Wallace, associate technical fellow for evacuation systems engineering, The Boeing Co., and member of the NTSB survival factors team for the accident, described what he called "key events in the impact sequence," the 777 design features that contributed to the protection of occupants during the crash and how these features performed in the accident. During the initial impact, the widebody jet's main landing gear and aft fuselage struck the seawall at an airspeed of more than 100 kt (185 kph), he said.

"The severe impact loads caused the main landing gear to separate from the wings," Wallace said. "The impact also resulted in extensive damage to the aft fuselage structure and separation of the tail. The aft galley, one large cargo container and a great deal of baggage were released onto the runway. The airplane continued to travel down the runway resting on the nose gear and the engines. As the airplane continued down the runway, the left engine separated and the airplane became partially airborne. With the nose gear in contact with the ground, the airplane rotated counterclockwise approximately 330 degrees and impacted the ground in a downward and sideways direction.

"As the airplane slid to a stop, the lower fuselage was peeled open toward the right side of the airplane. The right engine separated and came to rest next to the fuselage. A fire ignited in the right engine oil tank outside the fuselage. From video review of the accident, black smoke can first be seen coming out of door 1L [first main door from front, left side] approximately 15 minutes after the airplane came to a stop. Two escape slides inflated inside the cabin, but all passengers and crew were evacuated from the airplane using alternate exits (see "ARFF Timing Insights," p. 40). This [brief summary] does not diminish the fact that there were fatalities and injuries."

The occupant-safety considerations employed in the 777 design specifically for crash survival reflect the entire airline industry's decades of evolutionary improvements, he said. "Airplane safety and survivability of airplane interiors emphasize three areas: surviving an impact, surviving a fire and airplane evacuation," Wallace said. "Keeping the severity of the multiple impacts in this accident in mind, the airplane performed extremely well with respect to each of these goals during … the impact sequence, despite being subject to several severe impacts that likely exceeded the design goals. The passenger seating area remained intact, and the overhead stow bins did not fall on passengers or block their evacuation."

The separation of the engines and main landing gear, by design, from high-impact forces falls into the category of enabling occupants to survive a post-crash fire. That feature is intended to prevent fuel-tank rupture, and in this accident, the fuel tanks did not rupture. Wallace said, "If a fire occurs, insulation blankets [*ASW,* 4/08, p. 37] and cabin materials are designed to resist the spread of fire. … Although fire did occur in the right engine oil tank, its propagation was slowed significantly to allow for evacuation of all passengers and crew."

A fundamental factor in enabling occupants to evacuate the airplane in this situation was the escape slide systems. For the 777-200 series, the associated timed test for airworthiness certification by the FAA demonstrated that up to 440 occupants, motivated to act urgently in a high-density seat configuration, can evacuate within 90 seconds in night emergency-lighting conditions with a standards-presumed scattering of luggage in aisles and half the slides inoperative (*ASW,* 1/07, p. 46).

Regarding the slides that inflated inside the accident aircraft, he said the NTSB's final determination of the failure mode — tentatively believed to be catastrophic failure of the release mechanism during the impacts — is awaiting the conclusion of the investigation, as are any possible safety improvements. Wallace said that in his Boeing career, he had never known of aircraft damage that resulted in interior slide deployments, and John O'Donnell, president, Air Cruisers (the slide manufacturer), agreed that this failure was unprecedented.

"Some of the features that expedite evacuation are simple-operation doors; seats and other interior components designed to stay secure and not block the aisles; and automatic, self-inflating escape slides," Wallace said. "Despite

This post-crash photo of the accident airplane's cabin shows clear aisles and no collapses of overhead stow bins.

the extensive structural damage to the airplane in this accident, the doors opened, the seats and interior components stayed clear of the aisles, and the occupants were evacuated from the airplane.

"It is difficult to foresee, and design to, all possible events that may occur during an airplane accident. This accident included multiple, extremely severe impacts that exceeded the design and certification requirements. Despite this, the 777 occupant-safety features performed extremely well and contributed to the high survival rate. This performance of the 777 airplane highlights the benefits of the work that the regulators, operators and suppliers have done — along with Boeing — to increase airplane safety and accident survivability."

Survival also was strongly influenced by the design, testing and standards-compliant manufacturing of all types of passenger and crewmember seats in the accident airplane, he said. Airplane cabin components and all items of mass must meet standards requiring that they remain restrained and have enough strength not to fail under static (gradually applied and sustained) loads or dynamic loads (those applied as a sudden impulse). "One [requirement example] is that static loads on all components in the airplane [withstand] 3-g side load; the seats themselves are 3-g side load," Wallace said. "In addition, we do dynamic testing of 16-g and 14-g [loads] to demonstrate that we can protect the occupants in those kinds of dynamic loads."

He also cited the overhead stow bins remaining intact as an example of standards improvement based on company analysis and NTSB recommendations. "Over time, as we evaluate airplane accidents, we do discover areas for improvement — and stow bins are one of those," Wallace said. "The stow-bin systems themselves are designed to the 9 g forward, 6 g down, 3 g side, 3 g up and 1.5 g aft [load criteria]. In addition to that, we do have some flight and ground loads that increase the up-and-down loads, so we design [and test] our stow bins to meet them."

The survival factors group studied the post-crash condition of the accident airplane's 16 flight attendant jump seats, located at the eight pairs of exit doors. "Jump seats at [door pairs] 1 through 3 were all intact," he said. "Door 1R had a twisted seat pan, and

ARFF Timing Insights

The December 2013 testimony before the U.S. National Transportation Safety Board by subject matter experts in aircraft rescue and fire fighting (ARFF) in part provided insights into the time factor involved in responding to Asiana Airlines Flight 214 — a critical context for the performance of the accident aircraft and its occupant survival–related equipage.

"The initial impact … occurred at 1127," said Dale Carnes, assistant deputy chief, San Francisco Fire Department. "Approximately 12 seconds later, the U.S. Federal Aviation Administration tower dispatched an 'Alert 3 in progress' to all three fire stations. At 1131, two minutes after being dispatched and three minutes after the initial impact, the first ARFF unit, Rescue 88, arrived on scene, followed 37 seconds later by Rescue 9. Upon seeing that the initial passenger-egress paths on the left side of the aircraft were not threatened, both units immediately attacked the fire in engine no. 2, which was resting against the right side of the aircraft.

"By 1133, a little less than six minutes post-impact, all seven airport firefighting companies [teams of firefighters led by fire officers] and two paramedic units were on scene. Paramedics were beginning to collect casualties and to initiate triage. Approximately one minute later, the first of 56 ground ambulances arrived on scene. At 1138, the ARFF personnel entered the aircraft for interior search and rescue. By 1146, all trapped passengers and those who had remained behind to assist had been removed from the aircraft. By 1218, approximately 19 minutes after the impact, all fire in the fuselage had been extinguished with the support of companies from San Francisco and mutual aid [vehicles and personnel] from San Mateo County.

"At 1301, the last patient from the airfield was transported by ambulance. All ambulatory passengers had been relocated to the terminals, and a significant number of those passengers later self-reported injuries and underwent secondary triage. By 1758, the last of those passengers were transported from the terminals to area hospitals. All told, 56 ground ambulances, two medical helicopters and two buses transported 179 patients to 12 area hospitals."

Interior hose lines failed to suppress the large fuselage fire that was spreading rapidly during ARFF operations, Carnes said. Upon the completion of evacuation and rescue of at least four trapped people, the operator of a vehicle equipped with a high-reach extendable turret and a piercing nozzle penetrated the crown of the fuselage three times to inject firefighting agents that were successful in extinguishing the fire. "We had a total of nine of our 22 personnel [and some non-ARFF airport staff] that were inside the aircraft at any one time during the rescue," Carnes added. The NTSB's investigation continues into the cause and manner of death of one of the passengers found fatally injured outside the aircraft.

— WR

door 3L had some deformity on that seat pan, as well, but they were all intact. At door 4R, we lost the aft end of the airplane, and a significant amount of the floor structure underneath it. Two jump seats did end up out on the runway [during] the initial damage to the tail end of the airplane. There was a third jump seat that ended up right-aft of the airplane on the final impact in the final resting zone. So those were all in the area of the airplane [in which impact loads] exceeded the normal 9-g forces that we design our components to." He also noted that the sequence of initial vertical impact loads, followed by loads during the fuselage rotation and then a significant side load were "not typical of what we have seen with accidents."

Asked whether, overall, seats in the accident airplane — all manufactured and installed to the 16-g standard to protect occupants in a survivable crash — performed as expected, Wallace cited the fire damage as one factor that precluded a complete assessment. All fatalities involved passengers who had been subjected to the most severe forces while seated in the far-aft rows 41 and 42, he added.

"All the seat legs themselves that we could inspect [in the fire area] were still mounted to the floor tracks," he said. "Where we had the significant structural damage, the seats were, in general, leaning back. Some of the legs had come loose or had been fractured. There were a lot of legs bent to the left. … Since we had lost the lower portion of the fuselage back there, the floor that supports [seats] was pushed up on the right side; it was very badly damaged. … Without that structure, it's difficult for us to really consider [the seat performance]. … It's hard to tell what the forces were on the seats. … They were still able to protect many of the occupants [and] performed pretty well, considering the damage to the airplane."

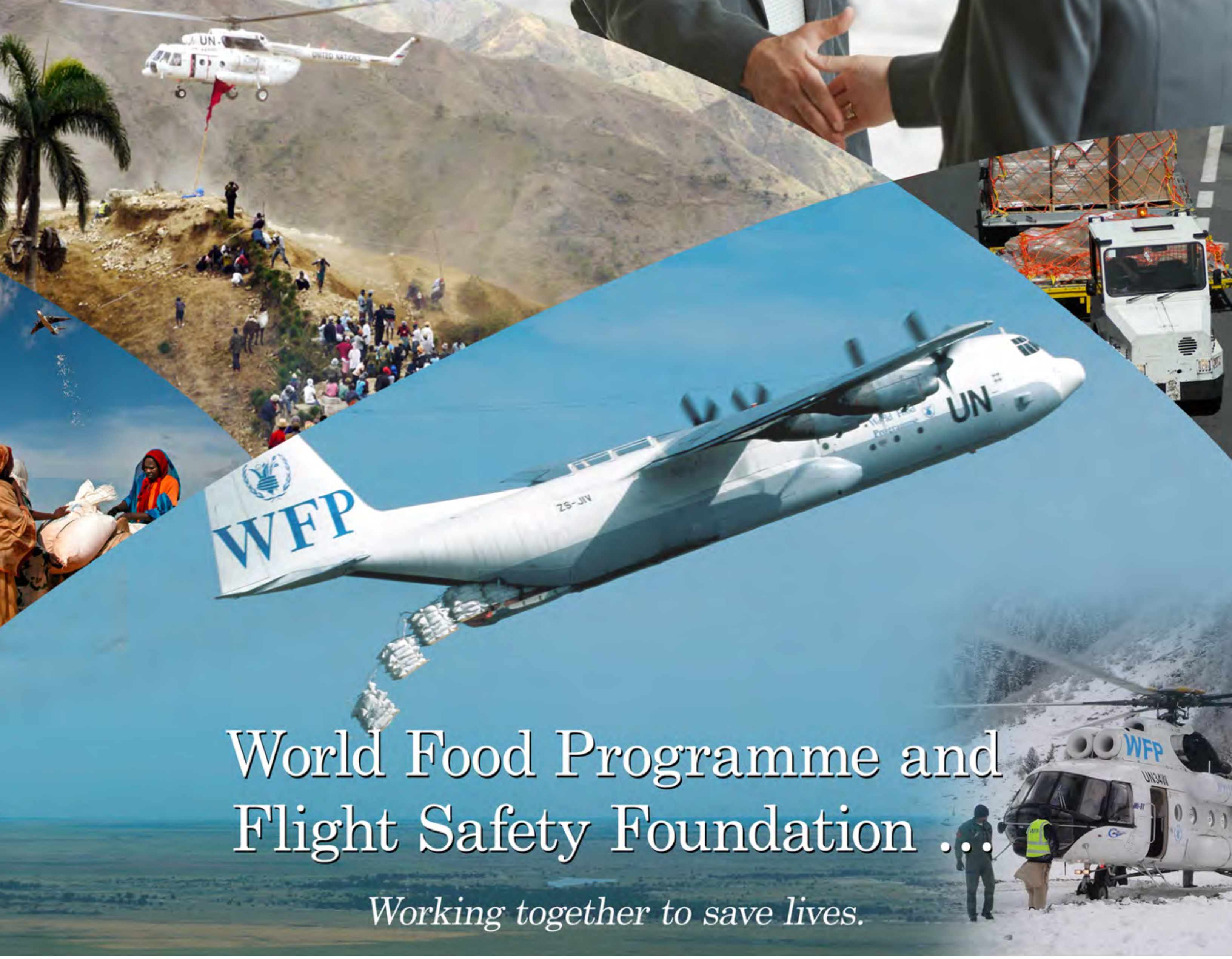
One reasonable way of assessing fire-resistance performance of cabin materials in the accident airplane was simply to look at the outcome, Wallace agreed with the NTSB questioners. "The first sign of dark smoke coming out of door 1L was about 15 minutes in [i.e., after initial impact], and that would indicate … with the attitude of the airplane, it was the highest point, the smoke would move that way," he said. "But … in this accident, the fire was slowed greatly enough that we could get everybody evacuated — including the rescue team that was able to get [out] the people that could not get out themselves."

Wallace was among witnesses at the investigative hearing who agreed with the view that, given that the investigation is still under way with many details not finalized, the likely best course for the industry is to reserve judgment about the exact lessons learned. Nevertheless, some suggested that one avenue for improvement may involve several characteristics of the impact sequence of Asiana Airlines Flight 214 that have not been seen in any other accidents.

Ensuring Ability to Evacuate

"[The FAA now has] initiatives under way to address airframe-level crashworthiness," said the FAA's Gardlin. "We're looking at means of providing occupant protection or occupant-injury criteria that more closely correlate with what we're interested in, which is the ability of someone to evacuate an airplane after an accident. The standard we have now has been, to some extent, [carried] across from automotive standards. They are valid standards, but they are not specifically geared to [aviation] problems. We're looking at novel ways of giving passengers safety information that they might actually assimilate and use, and we have an extensive research and development–prioritization process under way that we are hoping to implement that covers all the areas that I mentioned."

FAA dynamic-testing regulations require that head-impact protection be provided for transport category airplane occupants, said Richard DeWeese, coordinator, Biodynamic Research Team, FAA Civil Aerospace Medical Institute. "Depending on the seat design — particularly how far apart the passenger rows are — this can be done in different ways. If they are close enough together, then the seat back can be used as an effective energy-absorber. The person flails over onto the seat back, and it absorbs that head-impact energy, reducing the risk of injury. If the rows are far enough apart, then the person flailing forward with just a lap belt restraining them would miss the seat in front entirely, again protecting the head from impact. It's the seats that fall in between [that are problematic], where the seat back is too far away to really be much of an energy-absorber but it's close enough to present an injury risk. That's where something like a shoulder belt or an inflatable restraint system can be used to provide head-impact protection." In the accident airplane cabin, only the flight attendants and the passengers in first/business-class seats had lap belts and shoulder harnesses so that these occupants would have protection at least equivalent to occupants of economy-class seats, he said. He added that such restraints also are superior in the level of protection afforded.



The World Food Programme (WFP) is the food aid branch of the United Nations, and the world's largest humanitarian organization. WFP provides food to about 90 million people each year, including 58 million children. From its headquarters in Rome and offices in more than 80 countries, WFP helps people who are unable to produce or obtain enough food for themselves and their families.

The Aviation Safety Unit (ASU) of WFP is responsible for the aviation safety of the humanitarian air services provided by WFP — flights to many of the highest-risk parts of the world every day for clients' needs and, often, survival.

The WFP aviation safety activities are designed to reduce the risk of accidents and to enhance safety awareness among all users and service providers. They strive to offer professional and safe air transport service through quality control.

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Flight Safety Foundation will assist the World Food Programme's efforts to further enhance the training and education needs of its Aviation Safety Unit by providing FSF products and services, instructional seminars, expertise, knowledge and lessons learned to this vital aspect of the World Food Programme.

WFP United Nations World Food Programme

For more information on how you can help, contact Susan Lausch in the FSF Development Department at development@flightsafety.org or phone +1.703.739.6700, ext. 112.

FLIGHT SAFETY FOUNDATION

Birds AT WORK

Falcons, bald eagles and other raptors are enlisted to clear airport skies of their feathered comrades.

BY LINDA WERFELMAN

One of the scariest sights a bird can see while hanging out at an airport just might be … another bird. Not just any bird but one of several particular species of raptors that chase down other, smaller birds.

This relationship between the hunters and the hunted plays into the hands of some airport managers who want a multitude of tools at their disposal to ward off bird strikes. Falconry — hunting by a falcon or hawk in cooperation with a human partner — is one of those tools.

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"Just the sight of a falcon flying is enough to scare the birds away from an airfield," said Mark Adam, president of Falcon Environmental Services, which provides bird-strike prevention services at Toronto Pearson International Airport, Montreal–Trudeau International Airport and a number of military airfields in Canada and the United States.

"It's like the shark in the water," Adam said. "If you were at the beach and saw a shark fin [in the water], you'd get out right away. The same thing applies to raptors and smaller birds — they see that 'fin' and they get out."

Exploiting that type of bird thinking, Adam's company — and other similar operations at other airports — rely on teams of raptors and their handlers as part of a wildlife control program designed to keep birds away from aircraft.

Birds … look at an airport and think they have found a sanctuary.

In the Beginning …

Raptors were first used to drive nuisance birds away from landing and departing airplanes in the late 1940s at an airfield in Scotland. Initial success there prompted the creation of similar programs elsewhere in the United Kingdom and, later, in Europe and North America.[1]

Nevertheless, according to a team of California researchers, airport falconry programs for years were somewhat limited because of the relative scarcity of properly trained raptors and handlers, and the high costs of operating the programs.

whyskymac|Wikimedia CC-BY-2.0

"There's a different awareness about bird strikes now," said David Bradbeer, wildlife program specialist at Canada's Vancouver International Airport (YVR), which instituted a falconry program in 2012, years after an earlier trial run that lasted less than a year in the 1970s. "These programs have come a long way."

YVR, which already ran a diverse wildlife strike–prevention program, including habitat management, pyrotechnics, sirens and border collies (*Airport Operations*, 7-8/02), added falconry as a means of discouraging dunlins — migratory shorebirds that are resistant to other tactics. "We knew that shorebirds responded to predatory falcons," Bradbeer said.

Airport as Sanctuary

Birds have always been attracted to airports, and most look at an airport and think they have found a sanctuary, Adam said.

Aside from the noise generated by arriving and departing aircraft, he added, "it's a fairly quiet environment, with warm surfaces like paved taxiways. We're there to create a hostile atmosphere [so these birds understand that] it's not a good place to come in and relax and eat."

At Pearson, for example, 30 raptors — peregrine falcons, gyrfalcons, Harris's hawks and bald eagles — are stationed at the airport, along with about a dozen handlers. They work 365 days a year, in teams, covering the airport from one hour before sunrise to one hour after sunset.

"These birds [the raptors] do a great job of moving a large number of birds [potential bird-strike victims] over a large area," Adam said.

Each type of raptor has its own specialty when it comes to encouraging other birds to leave the area, he said.

Because of the falcon's speed and ability to cover lots of ground relatively quickly — peregrine falcons travel at 40 to 60 mph (64 to 97 kph) in level flight and up to 200 mph (322 kph) in a steep dive called a "stoop" — they work best in open areas.[2] Harris's hawks, which are slower but more calculating, are used primarily in tight quarters, where more maneuvering might be necessary to deliver the move-along message. Bald eagles — more than twice the weight of other raptors and menacing enough to alarm almost any other bird — can dispatch geese that might not respond to the smaller, less frightening falcons.

"A falcon *might* scare away a goose, but a bald eagle is guaranteed," Adam said.

At YVR, the raptors' schedule is different, but the results of their work are the same. Seven to 10 raptors — mostly peregrine falcons but also gyr-peregrine hybrids, Harris's and Ferruginous hawks, a bald eagle and a young

Emily Fleming, a raptor biologist, and Hercules, a juvenile bald eagle, get ready to go to work at Vancouver International Airport.

© Howard Slutsken

golden eagle — live at the airport from October until April, when the largest number of wintering shorebirds are in the area, said Gillian Radcliffe, director of Pacific Northwest Raptors, which runs the YVR falconry program.

During that time, the raptors work about eight hours a day at varying times, often depending on the tide. Dunlins' daily routines are dictated in part by the tide, and when high tide comes, they tend to head for the airport.

As at Pearson, each species of raptor has its specialty, and "we change them around, depending on the birds' skill sets," Radcliffe said. The eagles are especially good at intimidating waterfowl, she said, noting that the sight of one of the eagles patrolling the airport's perimeter is enough to make an approaching flock of snow geese turn away.

Bird-Strike Data

Transport Canada (TC) data show that 1,545 bird strikes were reported in Canada in 2012, the most recent year for which data are available. That number represented an increase of slightly more than 1 percent from 2011 but was about 9 percent below 2010's total.[3] Strikes involving other wildlife account for considerably smaller numbers — 39 mammal strikes were reported in 2012, with the most frequently struck species being rabbits (13 strikes) and coyotes (seven strikes).

Pearson reported more bird strikes (131, or 8 percent of the total) in 2012 than all other Canadian airports except YVR, where 12 percent of the reported strikes occurred. Not only is Vancouver's airport located on a major Pacific flyway, it also has parks and wildlife conservation areas nearby, making it appear to be an attractive rest area for birds.

TC data show that, about 60 percent of the bird strikes reported in 2012 did not identify the type of bird involved. Of those that were identified, however, about 6 percent were hawks and eagles. Those particular raptors were types that would not have been inclined to control airport "nuisance birds" but instead would have been focused on catching mice and other small rodents and have been "almost oblivious" to aircraft, Adam said.

Getting Started

Adam said that his company's program at Pearson includes wildlife strike risk/hazard assessment, habitat management, trapping and relocation of some problem birds, training for airport staff, standards compliance, and data collection and sharing.

Risk assessment, which always is performed at the start of a program, can involve the use of avian radar to track bird movements, which then are compared with aircraft movements to determine the time of day, or the time of year, when a strike would be most likely, he said. Risk assessments are


© Mark Adam, Falcon Environmental Services

updated at five-year intervals, he added.

The raptors used in the company's programs are bred at company facilities especially for their roles in wildlife management, Adam said.

"Over the years, we have been able to refine the falcon gene pool to reflect traits or characteristics we are interested in," he said. "Consequently, we have very little turnover in our falcons."

When it's time to go to work, a handler typically takes a position that allows for the release of the raptor so that it flies into the wind when it takes off at an angle that puts it in view of the airport nuisance birds, he said. As the raptor is released, the handler pulls out a lure — made primarily of leather and outfitted with wings to resemble the same type of bird that the raptor is chasing. When the lure is pulled out, so is a reward — often a small piece of quail — that draws the raptor back to the handler.

The goal is not for the raptor to catch the prey — that happens only about 1 percent of the time, Adam said — but rather for the sight of the raptor in flight to scare the prey away from the airport.

Only rarely does a working raptor fail to return to its handler, he added, noting that the birds are equipped with transmitters that allow handlers to track them down and scoop them up. This happens most often with younger, less experienced raptors, he said.

Natural Tendencies

The working raptors "naturally have a tendency to do this [kind of work]," Radcliffe said. "They're hunters by nature."

Their training is intended to encourage them to be responsive to their handlers and to discourage too much independence, limiting the chances that one day, one will fly off the job.

When the raptors are young, they do a lot of "fitness work," Radcliffe said. Their basic training accustoms them to working with their human handlers, lets them experience traveling short distances while crated and introduces them to lures, she said. One exercise involves filling a large balloon with helium, attaching a lure underneath and letting the bird follow the balloon to 500 or 600 ft and then return, with the lure, to a handler on the ground, she said.

"We want them to range out and pursue problem birds … but we don't want them taking off in hot pursuit of everything," she added. "We don't encourage them to be aggressive hunters."

Training continues even as the raptors grow accustomed to their work, and their handlers are "constantly evaluating and assessing" their behavior, she added. "Sometimes, there's something in their behavior that we're not so keen on."

In those cases, more training can correct the unwanted behavior, or the bird can be taken out of the program.

"Things change over time," she said. "Some are very good at bird control for a number of years."

Notes

1. Erickson, William A.; Marsh, Rex E.; Salmon, Terrell P. "A Review of Falconry as a Bird-Hazing Technique." In *Proceedings of the 14th Vertebrate Pest Conference*. Published at University of California, Davis, California, U.S., 1990. Available online at <digitalcommons.unl.edu/>.

2. Royal Society for the Protection of Birds. *Birds by Name: Peregrine*. <www.rspb.org.uk/wildlife/birdguide>.

3. Transport Canada. *Wildlife Strikes at Canadian Airports: A 2012 Annual Report*. Additional data were derived from similar reports for 2011 and 2010.

BY FRANK JACKMAN

Internal Evaluation Programs Often Cited In SMS Audits

Internal evaluation programs (IEPs) and safety training were the areas most likely to be found deficient in safety management system (SMS) audits conducted in 2013, according to a report analyzing the results of those audits. Argus PROS (Partners and Resources for Operational Safety) conducted audits of private and commercial flight operations from Jan. 1 to Dec. 31, 2013, and the results from 75 audits were analyzed by PRISM. Both companies are wholly owned subsidiaries of Argus International.

"The objective of this report is to highlight those recurring deficiencies found in SMS implementation and execution," the companies said. "A view into this industrywide aperture helps aviation operators focus their efforts on common deficiency areas cited by auditors, and use this information to improve their own SMS implementation and execution efforts." The report, which presents an analysis of operations that had deficiencies in a particular SMS focus area, is available at <argus.aero>.

Of the 75 audits included in the analysis, 53, or just under 71 percent, had findings involving IEPs (Figure 1). "An IEP is especially important because of its design, seeking to uncover latent process or program weakness within operations and maintenance focus areas because they become causal factors in an accident or incident," the report said.

The next most frequently cited area was safety training, which was assessed as deficient in 46, or 61 percent, of the audits. According to the analysis, a lack of continuing education and SMS training for safety mangers accounted for

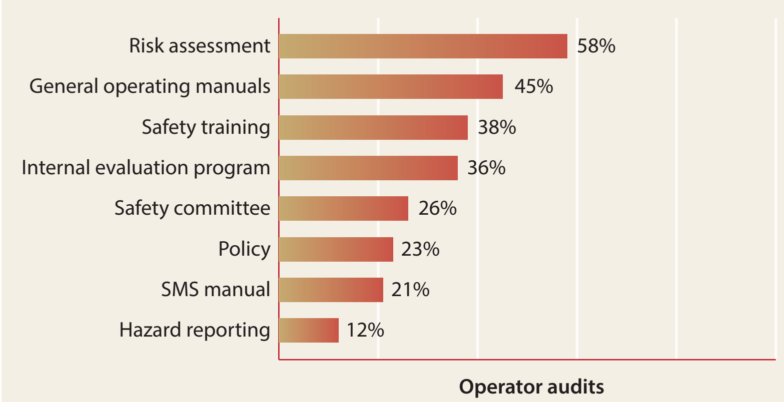
Safety Management System Recommendations, 2013

SMS = safety management system

Source: Argus PROS

Figure 1

Safety Management System Recommendations, 2012



SMS = safety management system

Source: Argus PROS

Figure 2

many of the recommendations. "Participation in self-development, and safety conferences and courses is very important for safety mangers to initiate and continue increased understanding of safety management concepts and practices," the report said.

The only other focus area that showed up in the majority of audits (39 of 75, or 52 percent) was categorized as "SMS manual." A sample audit recommendation in this area says that the SMS manual needs to be reviewed to ensure that is appropriate for the size and scope of the company.

Interestingly, the analysis of the 2013 audits produced significantly different results than did an analysis of audits conducted in 2012 (Figure 2, p. 47). According to the 2012 report, 58 percent of the audit findings pointed to deficiencies in risk assessment (*ASW*, 5/13, p. 50). The next most common problem area involved the general operating manual (45 percent), followed by safety training (38 percent). 2013's most often cited deficiency, IEP, showed up in 36 percent of the audits the previous year, and SMS manual was only cited in 21 percent of the audits.

But when looked at from a multiple-year perspective, the 2013 results basically are in line with previous results. The PRISM report aggregated and averaged previous years' results and compared them with 2013. In the period 2008–2012, IEP and SMS training were the most frequently cited problem areas, with an average of 29 recommendations each per year out of 322 audits conducted during the five-year period (Figure 3). When 2013's numbers are rolled in with the previous five years, the results are much the same. For the 2008–2013 period, IEP and SMS training were cited in 49 percent and 48 percent of all audits, respectively (Figure 4).

Still, the 2013 audits are notable for the number of recommendations each audit produced, compared with previous years. In 2013, there was an average of 3.99 SMS recommendations per audit, which is more than in any of the other years tracked in the report (Figure 5). The previous high came in 2008, when there was an average of 3.02 recommendations per audit. The low point came in 2010, with an average of 2.08 recommendations per audit.

Safety Management System Recommendations, 2013 vs. 2008–2012

SMS = safety management system

Source: Argus PROS

Figure 3

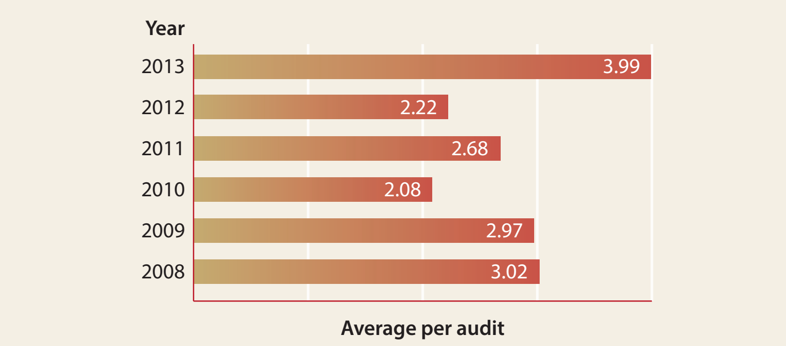
Safety Management System Recommendations, 2008–2013

SMS = safety management system

Source: Argus PROS

Figure 4

Average SMS Recommendations per Audit, 2008–2013

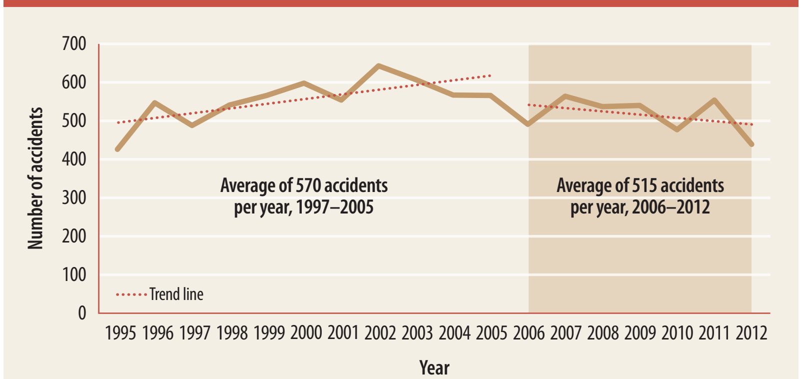


SMS = safety management system

Source: Argus PROS

Figure 5

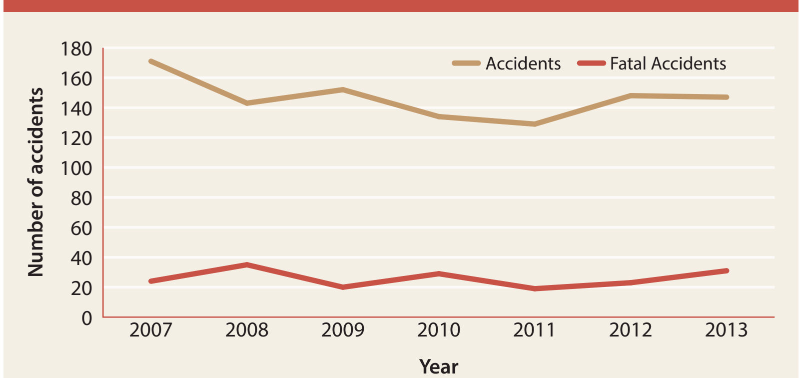
Worldwide Civil Helicopter Accidents, 1995–2012



Source: International Helicopter Safety Team

Figure 6

U.S. Civil Helicopter Accidents, 1995–2012



Source: International Helicopter Safety Team

Figure 7

Helicopter Accident Rate Trending Down

The average number of worldwide civil helicopter accidents per year currently is trending downward, according to information released in February by the International Helicopter Safety Team (IHST).

IHST data for the period 1997–2005 show that this average was 570, and that the average then had trended upward at an annual rate of 2.5 percent (Figure 6). But in the 2006–2012 period, the average was 515 per year, and that average trended downward at 2 percent per year, said IHST, which was formed in 2005 to lead a government–industry effort "to address factors that were affecting an unacceptable helicopter accident rate."

IHST qualified its analysis by saying that it does not have "solid" data on worldwide flying-hour increases or decreases since the organization was formed, but "the number of helicopters is growing and the flying hours in many helicopter industries have been increasing. As a result, the IHST is fairly confident that the accident rate is declining by at least as much as the accident count is declining."

IHST's goal is reduce the worldwide helicopter accident rate by 80 percent by 2016 from a "baseline rate" of 9.4 civil accidents per 100,000 hours in 2001–2005 to 1.9 accidents per 100,000 hours.

The number of civil helicopter accidents in the United States declined by one in 2013 to 147 from the previous year, but the number of fatal accidents jumped by nearly 35 percent to 31 in 2013 from 23 in 2012, according to IHST data (Figure 7).

Separately, the Helicopter Association International's (HAI's) five-year comparative U.S. civil helicopter safety-trends data show an accident rate of 4.83 per 100,000 flying hours in 2012, the most recent full year for which data are available. The rate in 2011 was 4.02 and in 2010 was 4.47. HAI's accident rates were calculated using 3.17 million helicopter hours flown in 2012, 3.08 million in 2011 and 3 million in 2010. The flying hour estimates are based on annual forecasts generated by the U.S. Federal Aviation Administration.

Into the Maw of a Thunderstorm

Upset by wind shear, an A319 stalled during approach.

BY MARK LACAGNINA

The following information provides an awareness of problems that might be avoided in the future. The information is based on final reports by official investigative authorities on aircraft accidents and incidents.

JETS

Microburst Suspected

Airbus A319. Damage, injuries not reported.

The A319 flight crew "did not pay enough attention to the complex weather condition" and exercised "weak" decision making when they pressed ahead with an approach into known severe thunderstorm activity after several other crews had diverted to alternate airports, said the Civil Aviation Administration of China (CAAC).

The aircraft was upset by wind shear-related turbulence associated with a suspected microburst and stalled during an instrument landing system (ILS) approach to Wuxi, China, the morning of Sept. 14, 2010. A recently published English translation of the CAAC's final report on the serious flight incident said that the A319's electronic flight control system (EFCS) "saved the plane from the stall condition." After regaining control of the aircraft, the crew diverted to another airport.

The aircraft had departed from Chongqing at 0745 local time. About an hour later, the crew received a special report from the airline's dispatch office about severe thunderstorm activity at the Wuxi airport. The Airbus was about 30 minutes from Wuxi at 0900 when an airport traffic controller advised the crew to expect the ILS approach to Runway 03 and that surface winds were from 040 degrees at 11 kph (6 kt) and visibility was 2,400 m (1.5 mi) in a "light thunderstorm" and light fog. However, "strong lightning" was observed west of the field.

Subsequent updates indicated that the weather conditions deteriorated rapidly as the thunderstorm producing the strong lightning moved over the airport. The controller advised the crew that the terminal area was "covered by thunderstorm" and that "some planes ahead of you diverted to Nanjing." Nevertheless, the crew requested and received radar vectors to intercept the ILS localizer at 2,140 ft.

The A319 encountered severe turbulence as it descended through 1,680 ft. "Under the influence of microburst and the following wind shear, the aircraft attitude changed significantly," the report said. The aircraft encountered a strong downdraft, and the autopilot continuously increased angle-of-attack (AOA) to keep the A319 on the glideslope.

Indicated airspeed decreased below the selected 126 kt. A "LOW ENERGY" warning activated, and the crew reacted by changing the selected airspeed to 131 kt, rather than manually applying full power as required by standard operating procedure.

The change in the selected airspeed resulted in a slow increase in thrust. Meanwhile, the aircraft's AOA continued to increase, causing airspeed to decrease at a rate of 7 kt per second. When AOA neared the stall value, the EFCS "alpha protection" mode activated; it disengaged the autopilot, applied maximum thrust and trimmed the tail control surfaces to reduce the AOA, which was nearing 23 degrees.

The report indicates that the EFCS was nearly overwhelmed by the forces imposed on the aircraft by the thunderstorm. Despite the application of maximum thrust and nose-down pitch, the A319 stalled, rolled right and began to sink at 3,924 fpm. The EFCS kept the bank angle from exceeding 44 degrees and eventually recovered the aircraft from the stall at about 884 ft. The crew conducted a go-around and landed the aircraft at Ningbo about 30 minutes later.

The English translation of the CAAC report did not specify how many people were aboard the A319 or whether there were any injuries or damage during the thunderstorm encounter. The report indicated that the aircraft was inspected at Ningbo and subsequently released for service.

Based on the findings of the investigation, the CAAC recommended that airlines "strengthen training on safety awareness and skills, preventing flight crews from reckless flight in severe weather conditions."

Ice Blocks Windshield

Learjet 35A. Minor damage. No injuries.

The first officer was the pilot flying during a medevac flight conducted in instrument meteorological conditions from Kenai, Alaska, U.S., to Ted Stevens Anchorage International Airport the night of March 5, 2012. The bleed air windshield-deicing system was engaged, but the first officer found that her windshield was covered with ice after the Learjet descended below the clouds during a global positioning system (GPS) approach.

"Although the captain's windscreen was partially covered with ice, he could still see the runway, so he took control of the airplane and continued the approach," said the report by the U.S. National Transportation Safety Board (NTSB).

The captain confirmed that the windshield bleed air deicing system was engaged and also activated the alcohol windshield-deicing system. Nevertheless, his windshield abruptly iced over as the Learjet touched down on the runway.

"Unable to see the runway ahead and with limited visibility to each side, the flight crew attempted to activate the engine thrust reversers to slow the landing roll, but the airplane subsequently veered to the right of the runway centerline, and the right wing collided with a snow berm," the report said. The Learjet then veered off the right side of the runway and came to a stop embedded in a snowbank. Damage was minor, and none of the six people aboard was hurt.

Investigators determined that the airplane had encountered severe icing conditions that exceeded the capabilities of its ice-protection systems.

The report noted that 15 minutes prior to the incident, an airport traffic controller at nearby Elmendorf Air Force Base had advised the approach control facility, which is shared by the base and the international airport, that the pilot of a General Dynamics F-16 had conducted a go-around due to severe icing of his canopy on approach.

There was no record that this pilot report of severe icing was relayed to the pilots of the Learjet or another airplane operating near the international airport. The report said that the approach controller's failure to relay the report to the Learjet crew was a contributing factor in the incident.

Runaway Baggage Tug

Boeing 737-300. Substantial damage. No injuries.

The operator of a baggage-cart tug stopped on the ramp at Los Angeles International Airport to pick up two bags the night of April 9, 2010. "He exited the tug without setting its parking brake, turning off its engine or placing the gear selector in neutral or park, which was not in accordance with the tug company's ground equipment general driving rules," the NTSB report said.

The tug operator placed one bag on the tug's passenger seat, which also was against the rules. While he was handling the other bag, the bag that had been placed on the passenger seat fell off the seat, onto the accelerator pedal.

The unoccupied tug moved forward about 30 ft (9 m), struck a hydrant fuel cart and continued toward a 737 about 130 ft (40 m) away. The airplane was being pushed back from a gate for a departure with 109 people aboard. The tug operator ran after the tug, boarded it and tried to apply the brakes, but jumped clear as the tug neared the 737.

The tug struck the airplane's left engine and lower fuselage, and came to a stop after striking the right engine. Damage was substantial, but there were no injuries.

The report noted that the tug has a backup system activated by a switch below the operator's seat that disengages the engine, if necessary, when the operator leaves the seat. Investigators found that this backup system was inoperative.

TURBOPROPS

Brakes Overheat During Taxi

Shorts 360. Substantial damage. No injuries.

The cargo airplane was about 60 lb (27 kg) over the certified maximum weight for takeoff from Houston the morning of May 17, 2012. The flight crew decided to reduce the takeoff weight by using higher-than-normal power settings to consume fuel and to use the wheel brakes to control the freighter's speed during the long taxi to the departure runway, the NTSB report said.

While the 360 was being taxied to the runway, the fusible plugs in the wheels on both main landing gear melted, causing the tires to deflate, as designed, when the wheels overheated. The pilots felt the airplane yaw at the same time they received a radio message that the right wheel was on fire. They shut down the airplane on the taxiway and attempted to put out the fire with handheld extinguishers. The fire eventually was extinguished by airport firefighting personnel, using foam suppressant.

"The fire caused severe damage to the right main gear housing, which was part of the stub wing assembly structure and incorporates the attachment fitting for the wing strut," the report said. "The operator's maintenance department believed that the fire caused substantial structural damage to the extent that repair was not practical."

The operator told investigators that the pilots had been trained not to "ride the brakes" while taxiing. "The captain stated that he did not realize that he was in danger of blowing the tires, much less causing a fire; otherwise, he would not have attempted to burn off excess fuel while taxiing," the report said.

'Fixation' Leads to Flameout

Pilatus Turbo Porter. Substantial damage. Two fatalities.

The aircraft had sufficient fuel for seven hours of flight when it departed from Balikpapan, Indonesia, with the pilot and a passenger aboard for a six-hour aerial survey flight the afternoon of April 25, 2012. About 4.5 hours later, the passenger sent a text message to his employer, stating: "Run out of fuel, landing on road."

The wreckage was found the next day on a slope near a mining road. The Turbo Porter had been in a descending right turn toward the road when it crashed, and both occupants had been killed. Examination of the aircraft showed that the engine had flamed out and the propeller had been feathered, with no sign of rotation on impact, said the report by the National Transportation Safety Committee of Indonesia.

"Both of the main fuel tanks were empty, with no evidence of fuel leak and smell at the site," the report said.

The two main tanks are in the wings and hold 170 gal (643 L) of fuel. The aircraft also had two auxiliary tanks mounted on pylons beneath the wings. The auxiliary tanks hold 126 gal (477 L) of fuel, which is transferred to the main tanks by manually activated electric pumps.

"The transfer of fuel from the underwing auxiliary tanks to the main tanks should be performed when the main tanks are less than three-quarters but not less than half full," the report said.

The pilot, who had fewer than 100 flight hours in type and was conducting only his third survey flight, likely was experiencing an elevated level of stress exacerbated by the "highly demanding survey operator," the report said.

Noting that aerial surveys typically are flown between 1,500 and 2,500 ft above the ground, the report said, "The pilot likely fixated on the survey-flight execution and lost awareness of his fuel situation. The transfer of fuel from the auxiliary tanks was not performed during the flight, as required."

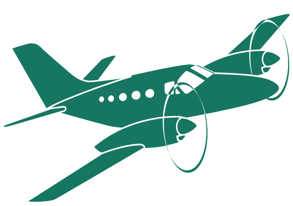
Propeller Blade Fractures

ATR 72. Substantial damage. No injuries.

The aircraft was departing from Taipei, Taiwan, for a scheduled flight with 72 passengers and four crewmembers the evening of May 2, 2012, when the left engine fire-warning light illuminated. The flight crew requested radar vectors from ATC to return to the airport.

The report by the Aviation Safety Council of Taiwan (ASC) indicated that the crew had some difficulty while returning to the airport. The aircraft deviated from assigned headings, and the crew received several enhanced ground-proximity warning system (EGPWS) warnings and then several stall warnings while climbing. The crew subsequently was able to complete an ILS approach and land the aircraft without further incident.

Investigators found that an oil-scavenge pipe on the left engine had been damaged by debris from a fractured propeller blade and had leaked oil onto an exhaust pipe, causing the fire. ASC determined that the propeller blade fracture had resulted from a molding defect introduced during the manufacture of the blade.



PISTON AIRPLANES

Porous Fuel Caps

Beech 58 Baron. Substantial damage. One fatality.

Investigators determined that the left engine lost power shortly after the Baron departed from a private airstrip in Calhoun, Kentucky, U.S., the afternoon of April 1, 2012, to refuel at a nearby airport. The airplane rolled left and struck wooded terrain in an inverted attitude, killing the pilot.

Tests of the engines revealed no mechanical discrepancies. However, examination of the fuel system showed signs of "long-term water contamination," the NTSB report said. The condition of the outer O-rings on both fuel caps had deteriorated. Rust-colored water was found in various fuel system components, and the lines to the fuel system drains were blocked by rust particles.

NTSB concluded that the probable cause of the accident was "the failure of the pilot to maintain airplane control after experiencing a loss of power from the left engine due to water contamination of the fuel system." The pilot's inadequate preflight inspection of the airplane and an inadequate annual inspection five months before the accident were contributing factors.

The report noted that Beech Aircraft had revised the maintenance manuals for some 55- and 58-series Barons to require periodic fuel-cap overhauls. This action followed the findings of an investigation of an accident involving fuel contamination that occurred in Canada in September 2008. However, the serial number of the Baron that crashed in Calhoun was not included among those requiring fuel-cap overhauls.

"Since this accident, the manufacturer has revised its Beech 55 and 58 maintenance manuals to include the fuel cap overhaul requirement for all potentially affected airplanes," the report said.

Faulty Fuel Gauge

Aero Commander 500B. Substantial damage. Two minor injuries.

Before taking off from Broomfield, Colorado, U.S., the afternoon of March 1, 2013, for a test flight following installation of a new left engine, the pilot checked the fuel gauge, which indicated 65 gal (246 L). "Due to the design of the fuel system, it is not possible to visually check the fuel level to confirm that the fuel gauge is accurate," the NTSB report said.

Shortly after takeoff, the pilot was reducing power for the climb when the left engine surged and lost power. "He immediately turned left back toward the airport and contacted the control tower to advise that he was making a single-engine, straight-in approach to land," the report said.

After the landing gear was extended, the right engine surged and lost power. The pilot declared an emergency, retracted the gear and landed the Aero Commander on a nearby golf-course fairway. The airplane's fuselage, left wing and left-engine propeller blades were damaged during the forced landing, and both occupants sustained minor injuries.

Investigators determined that the loss of power had been caused by fuel exhaustion. "Post-accident application of battery power to the airplane confirmed that the fuel gauge indicated 65 gallons," the report said. "However, when the airplane's fuel system was drained, only about 1/2 gallon [2 L] of fuel was recovered."

HELICOPTERS

Inexperience Cited in Control Loss

Bell 206B JetRanger. Destroyed. One fatality, four minor injuries.

The JetRanger struck a steep slope near Loder Peak, Alberta, Canada, about 13 minutes after departing from Kananaskis for an aerial tour the morning of March 30, 2012. The four passengers sustained minor injuries, and the pilot died of head and neck injuries about five hours after the crash.

The pilot's inexperience in mountain flying was a factor in the accident, according to the report by the Transportation Safety Board of Canada. He had no previous mountain-flying training or experience and had logged only 2.6 flight hours, in a Robinson R44, in the 21 months before being hired by the tour operator in February 2012.

"Based on the pilot's self-reports of having approximately 500 hours of helicopter flight experience in British Columbia and no accidents, the company considered the pilot to have adequate knowledge, skill and experience to safely conduct mountain tour flights with minimal recurrent flight training and check-out," the report said.

"The pilot had demonstrated a strong reluctance to fly in close proximity to mountain slopes during the [company] training flights," the report said. However, after departing on the tour flight, he flew very close to mountainous terrain and "attempted to cross a mountain ridge at an altitude that did not provide safe terrain clearance." A visual illusion associated with the absence of a horizon likely caused the pilot to make inappropriate control inputs while attempting to turn away from the slope.

"The helicopter either sustained a tail-rotor strike on terrain or, more likely, entered a condition of aerodynamic loss of tail-rotor effectiveness, resulting in an uncontrolled rotation, loss of control and collision with terrain," the report said. The wreckage was found 600 ft (183 m) below the crest of a 7,300-ft (2,225-m) ridge.

Fueling Mat Neglected

Robinson R44. Substantial damage. No injuries.

A line technician neglected to remove a rubber mat from the fuselage after refueling the R44, and the pilot did not notice the mat before departing from Tulsa, Oklahoma, U.S., for a short business flight the night of Feb. 6, 2012.

The helicopter was climbing through 150 ft when the pilot heard a loud bang and lost control of the tail rotor. The fueling mat had been blown off the fuselage and had struck the tail rotor, resulting in the fracture of both tail rotor blades, the NTSB report said. The pilot subsequently conducted an autorotative landing on an airport ramp without further incident.

Preliminary Reports, January 2014

Date	Location	Aircraft Type	Aircraft Damage	Injuries
Jan. 3	Las Vegas, Nevada, U.S.	Boeing 737-800	substantial	none
Calm winds and good visibility prevailed when the 737's tail struck the runway on landing.				
Jan. 5	Jaipur, India	Airbus A320-231	substantial	179 NA
Low visibility in fog prevailed when the A320's left wing struck trees as the aircraft touched down on soft ground left of the runway.				
Jan. 5	Madinah, Saudi Arabia	Boeing 767-300	substantial	315 NA
The right main landing gear either was not extended or collapsed on landing. The 767 came to a stop with the right engine on the runway. About 29 passengers were injured.				
Jan. 5	Aspen, Colorado, U.S.	Bombardier Challenger 604	destroyed	1 fatal, 2 serious
The flight crew reported a tailwind of 33 kt when they rejected an approach to Runway 15 at Aspen-Pitkin County Airport. They requested and received vectors for another approach to the runway. Surface winds were from 320 degrees at 14 kt, gusting to 25 kt, when the Challenger bounced on touchdown and crashed inverted. One pilot was killed.				
Jan. 10	Pontiac, Michigan, U.S.	Cessna 310R	destroyed	1 fatal
The 310 was being positioned for a cargo flight when it struck terrain short of the runway during an instrument landing system approach in night instrument meteorological conditions (IMC).				
Jan. 12	Trier, Germany	Cessna Citation I/SP	destroyed	4 fatal
A local station was reporting 400 m (1/4 mi) visibility in freezing fog and a vertical visibility of 100 ft when the Citation struck a powerline pylon and crashed 3.8 km (2.1 nm) from the threshold during approach to Trier-Föhren Airport.				
Jan. 14	Savannah, Georgia, U.S.	Gulfstream 200	substantial	2 none
The airplane was climbing through 16,000 ft during a post-maintenance functional check flight when the auxiliary power unit access door opened and struck the bottom of the rudder. The flight crew landed the Gulfstream without further incident.				
Jan. 18	Saltillo, Mexico	McDonnell Douglas DC-9	destroyed	3 none
Visibility was 800 m (1/2 mi) in fog when the freighter veered off the runway on landing.				
Jan. 18	Olive Creek, Guyana	Cessna 208B	destroyed	2 fatal
The Grand Caravan struck terrain shortly after taking off for a cargo flight.				
Jan. 19	Tual, Indonesia	Piper Chieftain	destroyed	4 fatal
Day IMC prevailed when the Chieftain struck treetops on approach and crashed short of the runway during a scheduled flight.				
Jan. 20	Addis Ababa, Ethiopia	Antonov 28	destroyed	2 serious
The aircraft crashed on approach during an attempted emergency landing at Addis Ababa Bole International Airport after engine problems occurred during a positioning flight from Uganda to Yemen.				
Jan. 20	Petreasa, Romania	Britten-Norman Islander	substantial	2 fatal, 5 serious
The pilot and a passenger were killed when the Islander struck a 4,500-ft mountain during an emergency landing after engine problems were encountered during a medevac flight from Bucharest to Oradea.				
Jan. 23	Ashland, Missouri, U.S.	Cessna 414A	substantial	3 none
The pilot landed the 414 in a field after both engines lost power during descent to land at Jefferson City.				
Jan. 26	Honiara, Solomon Islands	Boeing 737-300F	substantial	3 none
IMC prevailed when the freighter's right main landing gear collapsed on landing.				
Jan. 27	Silt, Colorado, U.S.	Bell 206L-3	destroyed	3 fatal
The LongRanger was on a powerline-inspection flight when it struck a tower static line and crashed.				
Jan. 28	Paris, France	Saab 2000	substantial	19 none
The nose landing gear failed when the aircraft bounced and touched down hard again while landing at Paris-Charles de Gaulle Airport.				
Jan. 29	Ilulissat, Greenland	de Havilland Canada Dash 8	substantial	3 minor, 15 none
Surface winds were from 110 degrees at 29 kt, gusting to 40 kt, when the Dash 8 veered off the left side of Runway 07 on landing and traveled down a steep slope.				

NA = not available

This information, gathered from various government and media sources, is subject to change as the investigations of the accidents and incidents are completed.