AeroSafety WORLD

CONDITIONAL FOQA
Acceptance through adaptation

SMS UPDATE
State programs need work

INTO THE SEA
Flawed gas platform approach

GROUND SUPPORT
Blessings from a dispatcher

DOWN AND OUT
PILOT INCAPACITATION CONSIDERED

THE JOURNAL OF FLIGHT SAFETY FOUNDATION

JANUARY 2009

CHANGING THE Conversation

I have been in the news lately — at least in North America. I have had to make strong statements about the loss of voluntary reporting systems at a couple of the world's biggest airlines.

Flight Safety Foundation has made a major effort to protect these programs from the threat of criminalization. But this time, problems developed amid discussions among management, labor and the regulator. Disagreement developed around the extent of protection within the systems. In one case, the disagreement was triggered by a specific event, in another by the need to renew the program.

In my experience the people who participate in those discussions are real professionals. They work hard to keep industrial issues and safety issues apart. But, given the dynamics of the situation, sometimes they fail. Perhaps we are discussing these safety programs in an environment that is "spring-loaded to the screw-up position."

In both cases, the loss of the reporting system was driven by issues besides safety. Let us be realistic about the dynamic that exists in those discussions and consider if this is really where we want the fate of these vital safety programs to be determined. You have somebody representing labor who can only sit at that table if the membership believes he or she is taking an appropriately hard line with management. On the other side is a manager who can't go back to his boss and say that he or she has given the other side everything it wanted. In the middle is a regulator who will be held accountable if the resulting deal makes things look too "cozy" between the regulator and industry.

A million things can create a dysfunctional discussion. Mergers and acquisitions can put management and labor at each other's throats. A regulator may have been battered by legislator inquiries, or a labor leader may be sweating a close election. Those all affect the day-to-day operation of many large airlines. They cannot be allowed to affect the future of safety systems.

So how do we change the conversation — and the result? Maybe in the U.S. it's time to make these vital voluntary reporting systems such as flight operational quality assurance (FOQA) and aviation safety action program (ASAP) mandatory through legislation, as they are in many parts of the world. Legislation could include protection so the use of the data doesn't have to be decided at every trial. There would still be difficult implementation issues, but no longer a question as to whether these programs will exist, or if their data will be protected.

To make this work, everybody would have to give up some power and flexibility. But for us it would not be the first time. Ever since I was 16 I have made choices about how I lived my life so that, some day, a parent would feel comfortable trusting the safety of their child to me in an airplane. This is just another of those choices. If we all take a second to remember why we got into this business, I think we can agree to live with it.

William R. Voss
President and CEO
Flight Safety Foundation

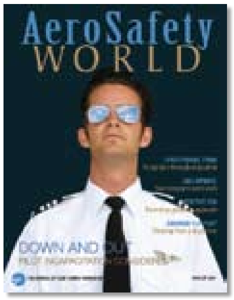
AeroSafetyWORLD

contents

January2009 Vol 4 Issue 1

features

departments



About the Cover
In-flight pilot incapacitation remains a threat.
Photo composite: pilot © istockphoto; clouds © istockphoto

We Encourage Reprints (For permissions, go to <www.flightsafety.org/asw_home.html>)

Share Your Knowledge

If you have an article proposal, manuscript or technical paper that you believe would make a useful contribution to the ongoing dialogue about aviation safety, we will be glad to consider it. Send it to Director of Publications J.A. Donoghue, 601 Madison St., Suite 300, Alexandria, VA 22314-1756 USA or donoghue@flightsafety.org.

The publications staff reserves the right to edit all submissions for publication. Copyright must be transferred to the Foundation for a contribution to be published, and payment is made to the author upon publication.

Sales Contacts

Europe, Central USA, Latin America
Joan Daly, joan@dalyllc.com, tel. +1.703.983.5907

Northeast USA and Canada
Tony Calamaro, tcalamaro@comcast.net, tel. +1.610.449.3490

Asia Pacific, Western USA
Pat Walker, walkercom1@aol.com, tel. +1.415.387.7593

Regional Advertising Manager
Arlene Braithwaite, arlenetbg@comcast.net, tel. +1.410.772.0820

Subscriptions: Subscribe to *AeroSafety World* and become an individual member of Flight Safety Foundation. One year subscription for 12 issues includes postage and handling — US$350. Special Introductory Rate — $280. Single issues are available for $30 for members, $45 for nonmembers. For more information, please contact the membership department, Flight Safety Foundation, 601 Madison St., Suite 300, Alexandria, VA 22314-1756 USA, +1 703.739.6700 or membership@flightsafety.org.

 ISSN 1934-4015 (print)/ ISSN 1937-0830 (digital). Published 12 times a year.

AeroSafetyWORLD

telephone: +1 703.739.6700

William R. Voss, publisher,
FSF president and CEO
voss@flightsafety.org

J.A. Donoghue, editor-in-chief,
FSF director of publications
donoghue@flightsafety.org, ext. 116

Mark Lacagnina, senior editor
lacagnina@flightsafety.org, ext. 114

Wayne Rosenkrans, senior editor
rosenkrans@flightsafety.org, ext. 115

Linda Werfelman, senior editor
werfelman@flightsafety.org, ext. 122

Rick Darby, associate editor
darby@flightsafety.org, ext. 113

Karen K. Ehrlich, web and print
production coordinator
ehrlich@flightsafety.org, ext. 117

Ann L. Mullikin, art director and designer
mullikin@flightsafety.org, ext. 120

Susan D. Reed, production specialist
reed@flightsafety.org, ext. 123

Patricia Setze, librarian
setze@flightsafety.org, ext. 103

STILL NEEDED: Trained People

Bearing in mind the economic chaos today around most of the world, it seems reasonable to expect that orders for new aircraft last year would have been, uh, subdued. True, it wasn't until the year was well under way that the extent of the trouble began to manifest itself, but by midyear the combination of murderous fuel prices and declining markets had all signs pointing way down.

Airlines in many regions cut or reduced routes, and flying capacity was down in key markets. Importantly, airlines imposed fuel surcharges and generally raised the price of a ticket, previously considered heresy in the context of modern airline pricing patterns.

Yet, approaching the end of 2008, when this was written, Airbus was assured of having at least its fourth best sales year ever, with around 800 net airplanes sold, and Boeing had sold around 660, a very strong year for that company, for a total of 1,460. This comes on the heels of the all-time record for sales in 2007 when the two split the market fairly evenly, selling 2,881 aircraft. Aerospace Industries of America forecasts that U.S. manufacturers' sales of civil aircraft will rise 7 percent this year.

There are three reasons that orders have stayed strong and more delivery positions haven't been canceled. The first possibility is a judgment that the current malaise is going to be short term, and growth will come storming back so strong it will make up for lost time. This has happened in the past, although not after such a steep decline. History suggests that the upward growth line will slide to the right for a year or so, then regain the growth slope registered before the downturn.

The second possible rationale is simple strategic positioning, maintaining delivery positions without a firm understanding the buyer will need or will be able to afford the aircraft, but with a conviction that someone will need them, treating the order as an aircraft futures market play.

And finally, there is the balancing strategy, available to operators with good financials, that allows for the purchase of aircraft with the assured knowledge that newer technology aircraft will reduce fuel burn, a hedge against the return of higher oil costs. This type of player is not making a pure bet for growth; a failure to achieve growth expectations can be handled by retiring older, less fuel-efficient aircraft.

All three of these scenarios are based on firm expectations of resumed growth; only the third has a moderating element. Therefore, hundreds of bets have been placed on a rosy future, and the judgment of all those smart people must be respected.

Now, let's go back to what we were talking about at the start of 2008, a shortage of trained skilled personnel to run the system — pilots, engineers, controllers and so forth — a concern that faded when fuel prices spiked.

The panic measures that airlines took to cope with those ridiculous prices that suddenly evaporated have become, instead, preemptive measures to deal with the economic crisis, and the airline industry is — surprise, surprise — not about to fall off of a cliff, and should be in decent economic health to take advantage of rebounding traffic.

Which leads to the point of this ramble: Keep your eye on the skilled-personnel issue. The smart money is on staff being needed sooner rather than much later; it is time to refocus on that issue.

J.A. Donoghue

J.A. Donoghue
Editor-in-Chief
AeroSafety World

FLIGHT SAFETY FOUNDATION

Serving Aviation Safety Interests for More Than 60 Years

Flight Safety Foundation is an international membership organization dedicated to the continuous improvement of aviation safety. Nonprofit and independent, the Foundation was launched officially in 1947 in response to the aviation industry's need for a neutral clearinghouse to disseminate objective safety information, and for a credible and knowledgeable body that would identify threats to safety, analyze the problems and recommend practical solutions to them. Since its beginning, the Foundation has acted in the public interest to produce positive influence on aviation safety. Today, the Foundation provides leadership to more than 1,170 individuals and member organizations in 142 countries.

MemberGuide

Flight Safety Foundation
601 Madison St., Suite 300, Alexandria, VA, 22314-1756 USA
tel: +1 703.739.6700 fax: +1 703.739.6708

www.flightsafety.org

Member enrollment — ext. 105
Ann Hill, director, membership and development — hill@flightsafety.org

Seminar registration — ext. 101
Namratha Apparao, membership services coordinator — apparao@flightsafety.org

Seminar sponsorships — ext. 105
Ann Hill, director, membership and development — hill@flightsafety.org

Exhibitor opportunities — ext. 105
Ann Hill, director, membership and development — hill@flightsafety.org

FSF awards programs — ext. 111
Feda Jamous, accountant — jamous@flightsafety.org

Technical product orders — ext. 111
Feda Jamous, accountant — jamous@flightsafety.org

Library services/seminar proceedings — ext. 103
Patricia Setze, librarian — setze@flightsafety.org

Web Site — ext. 117
Karen Ehrlich, web and print production coordinator — ehrlich@flightsafety.org

JAN. 13–15 ➤ Safety Manager Course. Aviation Research Group/U.S. Houston. Kendra Christin, <kchristin@aviationresearch.com>, <www.aviationresearch.com/press_detail.asp?id=46>, +1 513.852.5110, ext. 10.

JAN. 15–16 ➤ Zurich Air Operators' Safety Workshop. Unique (Zurich Airport). Zurich, Switzerland. Marc Keusch, <marc.keusch@unique.ch>, +41 43.816.47.23.

JAN. 26–28 ➤ 1st CANSO Middle East ANSP Conference. Civil Air Navigation Services Organisation. Jeddah, Saudi Arabia. Marc-Peter Pijper, <marcpeter.pijper@canso.org>, <www.canso.org/Canso/Web/events/middle+east>, +31 23.568.5386.

FEB. 3–4 ➤ Aviation Crisis Management 2009. *International Airport Review*. Abu Dhabi, United Arab Emirates. Georgina Hooton, <ghooton@russellpublishing.com>, <www.regonline.com/builder/site/Default.aspx?eventid=665587>, +44 (0)1959 563.311.

FEB. 9–12 ➤ Annual International Aircraft Cabin Safety Symposium. Southern California Safety Institute. Torrance, California, U.S. <www.scsi-inc.com>, +1 310.517.8844.

FEB. 10–12 ➤ Aviation Ground Safety Seminar. National Safety Council, International Air Transport Section. Orlando, Florida, U.S. B.J. LoMastro, <B.J.LoMastro@nsc.org>, <www.nsc.org>, +1 630.775.2174.

FEB. 11–12 ➤ ABACE2009. National Business Aviation Association. <info@abace>, <www.abace.aero>, +1 202.783.9000.

FEB. 17–19 ➤ Airside Safety Training Course. European Joint Aviation Authorities. Hoofddorp, Netherlands. <training@jaat.eu>, <www.jaa.nextgear.nl/courses.html?action=showdetails&courseid=209>, +31 (0)23 567.9790.

FEB. 22–24 ➤ Heli-Expo 2009. Helicopter Association International. Anaheim, California, U.S. <heliexpo@rotor.com>, <www.heliexpo.com>, +1 703.683.4646.

MARCH 1–4 ➤ 2nd Asian Ground Handling International Conference. *Ground Handling International*. Bangkok. Jean Ang, <jean@groundhandling.com>, <www.groundhandling.com/GHI%20Conf%202/index.html>, +44 1892 839203.

MARCH 11–13 ➤ AAMS Spring Conference. Association of Air Medical Services. Washington, D.C. Natasha Ross, <nross@aams.org>, <www.aams.org/AM/Template.cfm?Section=Education_and_Meetings>, +1 703.836.8732, ext. 107.

MARCH 16–18 ➤ 21st annual European Aviation Safety Seminar (EASS). Flight Safety Foundation, European Regions Airline Association and Eurocontrol. Nicosia, Cyprus. Namratha Apparao, <apparao@flightsafety.org>, <www.flightsafety.org/seminars.html#eass>, +1 703.739.6700, ext. 101.

MARCH 17–19 ➤ ATC Global Exhibition and Conference. Civil Air Navigation Services Organisation, Eurocontrol, International Federation of Air Traffic Controllers' Associations and International Federation of Air Traffic Safety Electronics Associations. Amsterdam. Joanna Mapes, <atcevents@cmpi.biz>, <www.atcevents.com>, +44 (0)20 7921 8545.

MARCH 18–20 ➤ MBAE 2009 and Heli-Mex. Mexican Business Aviation Exhibition and Heli-Mex. Toluca, Mexico. Agustin Melgar, <exposint@prodigy.net.mx>, <www.mbaeexpo.com>, +52 333.647.1134.

MARCH 24–26 ➤ Safety Manager Course. Aviation Research Group/U.S. Trenton, New Jersey, U.S. Kendra Christin, <kchristin@aviationresearch.com>, <www.aviationresearch.com/press_detail.asp?id=46>, +1 513.852.5110, ext. 10.

MARCH 26–27 ➤ ADS-B Management Forum. *Aviation Week*. Washington. Alexander Moore, <Alexander_moore@aviationweek.com>, <www.aviationnow.com/forums/adsbmain.htm>, +1 212.904.2997.

MARCH 29–APRIL 1 ➤ CHC Safety and Quality Summit. CHC Helicopters. Vancouver, British Columbia, Canada. Adrienne White, <awhite@chc.ca>, +1 604.232.8272.

MARCH 30–APRIL 2 ➤ International Operators Conference. National Business Aviation Association. San Diego. Dina Green, <dgreen@nbaa.org>, <www.nbaa.org/events/ioc/2009>, +1 202.783.9000.

APRIL 21–23 ➤ 54th annual Corporate Aviation Safety Seminar (CASS). Orlando, Florida, U.S. Namratha Apparao, <apparao@flightsafety.org>, <www.flightsafety.org/seminars.html#cass>, +1 703.739.6700, ext. 101.

APRIL 25–26 ➤ Regional Advanced Airport Safety and Operations Specialist School. American Association of Airport Executives. Buffalo, New York, U.S. Stacey Renfroe, <stacy.renfroe@aaae.org>, <www.aaae.org/meetings/meetings_calendar/mtgdetails.cfm?MtgID=090416>, +1 703.824.0500.

MAY 4–6 ➤ 6th International Aircraft Rescue Fire Fighting Conference and Exhibits. *Aviation Fire Journal*. Myrtle Beach, South Carolina, U.S. <avifirejnl@aol.com>, <www.aviationfirejournal.com/myrtlebeach/index.htm>, +1 914.962.5185.

MAY 5–7 ➤ Technical Symposium. Air Traffic Control Association, U.S. Federal Aviation Administration and U.S. National Aeronautics and Space Administration. Atlantic City, New Jersey, U.S. Claire Rusk, <claire.rusk@atca.org>, <www.atca.org>, +1 703.299.2430.

MAY 12–14 ➤ EBACE2009. European Business Aviation Association and National Business Aviation Association. Geneva. <info-eu@ebace.aero>, <info-us@ebace.aero>, <www.ebace.aero/2009>, +32 2.766.0073, +1 202.783.9000.

MAY 12–14 ➤ Safety Manager Course. Aviation Research Group/U.S. Denver. Kendra Christin, <kchristin@aviationresearch.com>, <www.aviationresearch.com/press_detail.asp?id=46>, +1 513.852.5110, ext. 10.

MAY 27–29 ➤ 65th Annual Forum and Technology Display: Galloping Towards New Vertical Flight Advancements. AHS International. Grapevine, Texas, U.S. <staff@vtol.org>, <www.vtol.org/forum65/forum65.html>, +1 703.684.6777.

JUNE 9–11 ➤ Aviation Ground Safety Seminar. National Safety Council, International Air Transport Section. Bournemouth, England. B.J. LoMastro, <B.J.LoMastro@nsc.org>, <www.nsc.org>, +1 630.775.2174.

Aviation safety event coming up? Tell industry leaders about it.

If you have a safety-related conference, seminar or meeting, we'll list it. Get the information to us early — we'll keep it on the calendar through the issue dated the month of the event. Send listings to Rick Darby at Flight Safety Foundation, 601 Madison St., Suite 300, Alexandria, VA 22314-1756 USA, or <darby@flightsafety.org>.

Be sure to include a phone number and/or an e-mail address for readers to contact you about the event.

Speed limits

First of all, let me thank and congratulate you for your extremely valuable and interesting publication!

While studying your article about English language proficiency requirements (*ASW*, 11/08, p. 34), I noticed (with a smile) that the cited language sample would equally serve in an article about sources of approach and landing accidents. For possibly good reasons, the pilots of an arriving aircraft request to reduce their speed. The controller's response sounds so familiar to me: "Only if you want to join the back of the pack."

The pilots, conditioned to maintain ambitious schedules, react accordingly: "Okay, we'll pin our ears back." Years of campaigns for stabilized approaches just vanished in seconds.

Both the pilot's and the controller's reaction were not adequate. Where the controller must take safe speeds into account when planning his traffic flow, the pilots must insist on their request (the controller will not take the blame for the overrun). Under any circumstance, the response to a pilot's request must never be a threat such as delaying the flight.

Thanks again for helping to keep the sky safe!

Capt. Matthias Schmid
Saferflight
Ueken, Switzerland

Safety News

ADS-B Expansion

U.S. officials have approved plans for the nationwide deployment of automatic dependent surveillance–broadcast (ADS-B), which provides for the tracking of aircraft by their satellite-based position reports instead of radar.

The European Union has inaugurated development of a similar air traffic management program using satellite navigation and data links. The SESAR system, founded by the European Community and Eurocontrol, also is supported by six regional and national air navigation service providers, manufacturers and major European airports.

The €2.1 billion SESAR system is expected to improve safety by 2020 "by a factor of 10" and to enable a threefold increase in capacity.

"The positive impact of SESAR's goals on the day-to-day activities of the airspace users, passengers, air traffic controllers and citizens will include fewer delays, lower fuel consumption, improved efficiency, time gains and increased airport capacity," Antonio Tajani, vice president of the European Commission and commissioner for transport, said as the program was launched in early December.

In November, U.S. President George Bush signed an executive order to speed up implementation of the Next Generation Air Transportation System, or NextGen, as the satellite-based air traffic control system is called.

Bush's action cleared the way for Robert A. Sturgell, acting administrator of the U.S. Federal Aviation Administration (FAA), to commission essential services for ADS-B in Florida, where 11 ground stations are being installed.

"The next generation of air travel has arrived," Sturgell said. "ADS-B is the backbone of the future of air traffic control. NextGen is real … and NextGen is now."

Sturgell said that 310 ground stations are scheduled to be in operation by 2010; by 2013, plans call for the deployment to be complete, with 794 ground stations in operation. He said that by 2013, ADS-B services will be available everywhere in the United States where radar coverage exists today, and also in the Gulf of Mexico and mountainous portions of Alaska, which currently are without radar coverage.

U.S. Federal Aviation Administration

Sturgell said ADS–B would reduce the risk of midair collisions and weather-related accidents, provide more efficient routes for flights during poor weather and improve pilots' situational awareness.

Aviation Job Growth Forecast

Despite the economic downturn, demand is likely to increase in the coming years for pilots, air traffic controllers and maintenance personnel, Roberto Kobeh González, president of the Council of the International Civil Aviation Organization (ICAO), says.

In remarks prepared for International Civil Aviation Day in early December, Kobeh said that the demand for workers would be fueled by "a massive wave of retirements" by current pilots, controllers and maintenance technicians, as well as the influx into the system of thousands of new aircraft and the development of new technologies that will "transform the very nature of aviation jobs." In addition, although the current economic recession will slow air traffic, the situation is expected to turn around by 2010, and the industry is expected to begin growing again, according to ICAO projections.

"Human resource development is vital to a safe, efficient and sustainable air transport system," Kobeh said. "ICAO recognizes that professional competence is a critical element in achieving optimum levels of safety and is developing training strategies to ensure that the future world air transport system is supported by enough competent and qualified professionals."

© Guodingping/ Dreamstime.com

ICAO's plans call for an effort to help member states maintain high standards of training by identifying not only the number of pilots, controllers and maintenance personnel that will be needed but also the related training requirements, and ensuring that ICAO standards conform with modern training methods. Other elements of ICAO's plans include identifying activities that can be initiated with partners in the aviation industry and uniting all segments of the industry around a common strategy.

Upset Recovery Training

An aviation industry working group — headed by representatives of Airbus, The Boeing Co. and Flight Safety Foundation — has developed a supplement to its *Airplane Upset Recovery Training Aid* that focuses on issues associated with flight operations at high altitudes.

The *High Altitude Operations* supplement, available on the Flight Safety Foundation Web site at <www.flightsafety.org>, is intended as a training aid for jet airplane pilots who routinely operate at altitudes above Flight Level 250 (approximately 25,000 ft).

"The goal … was to educate pilots so they have the knowledge and skill to adequately operate their airplanes and prevent upsets in a high altitude environment," the industry working group wrote in the introduction to the supplemental training aid. "This should include the ability to recognize and prevent an impending high altitude problem and increase the likelihood of a successful recovery from a high altitude upset situation should it occur."

The training aid, which discusses high altitude aerodynamics and flight techniques, was developed at the FAA's request as a result of safety recommendations issued by the U.S. National Transportation Safety Board after its investigation of a high altitude loss of control accident, as well as other recent accidents and incidents that occurred in similar high altitude conditions.

"There have been … recent accidents where for various reasons (e.g., trying to top thunderstorms, icing equipment performance degradation, unfamiliarity with high altitude performance, etc.), crews have gotten into a high altitude slowdown situation that resulted in a stalled condition from which they did not recover," the working group said. "There have been situations where for many reasons (e.g., complacency, inappropriate automation modes, atmospheric changes, etc.), crews got into situations where they received an approach-to-stall warning. Some of the recoveries from these warnings did not go well."

For example, the training aid cites a recent incident in which an airplane "experienced an environmental situation where airspeed slowly decayed at altitude." In response, the pilots selected maximum cruise thrust instead of maximum available thrust, "and that did not arrest the slowdown." The pilots decided to descend but delayed long enough to obtain clearance from air traffic control; during that time, a slow speed buffet began. In response, "the crew selected an inappropriate automation mode, the throttles were inadvertently reduced to idle, and the situation decayed into a large uncontrolled altitude loss," the training aid said. "This incident may easily have been prevented had the flight crew acted with knowledge of information and techniques as contained in this supplement."

EMS Changes Proposed

The U.S. Federal Aviation Administration (FAA) has published a plan to revise regulatory requirements for helicopter emergency medical services (HEMS) operations, including stricter weather minimums and specific preflight planning for many HEMS flights.

"The FAA has determined that safety in air commerce and the public interest [require] additional hazard mitigation for HEMS operations," the agency said in its proposal, published in the *Federal Register*.

The plan says that if "any flight or sequence of flights" includes a segment conducted under Federal Aviation Regulations Part 135, "Commuter and On-Demand," then all visual flight rules segments of the flight "must be conducted within the weather minimums and minimum safe cruise altitude determined in preflight planning."

Pilots will be required during preflight planning to identify a minimum safe cruise altitude and minimum required ceiling and visibility for the flight.

wikimedia.org

The plan also says that HEMS flights conducted under instrument flight rules will be permitted to land at locations without weather reporting "if an approved weather reporting source is located within 15 nm [28 km] of the landing area or if an area forecast is available."

The FAA's action follows a rash of fatal HEMS accidents in 2008 (*ASW,* 9/08, p. 12).

Safety Audit Requirements

The International Air Transport Association (IATA) says that nine airlines have lost membership after failing to meet interim safety goals associated with the IATA Operational Safety Audit (IOSA) and, ultimately, as many as 20 may have their membership terminated.

IATA has made passing the audit a condition of membership, effective at the end of 2008. Airlines in eight countries currently are required by national law to meet IOSA standards.

IATA Director General and CEO Giovanni Bisignani said in mid-December that by the end of 2008, more than 260 airlines, including 210 IATA members, were expected to be placed on a registry of those in compliance with IOSA standards.

"IATA's biggest satisfaction is to bring all our members on board, but

© brazzo/iStockphoto

for those that do not make the standard, there is no place in our association," Bisignani said.

He said that IATA has begun to extend its auditing program to ground handling through the IATA Safety Audit for Ground Operations (ISAGO). At press time, 20 headquarters audits and 23 station audits were expected to be completed by the end of 2008, he said.

IATA data show that, on Dec. 1, the worldwide accident rate was 0.77 per 1 million flights, compared with 0.82 in 2007. For IATA members, the rate was 0.47 per 1 million flights, compared with 0.68 in 2007.

Uncommanded Engine Rollback

The U.S. National Transportation Safety Board (NTSB) is investigating a Nov. 26, 2008, incident involving an uncommanded engine rollback on a Delta Air Lines Boeing 777 during the cruise phase of a flight from Shanghai, China, to Atlanta.

The airplane was at Flight Level (FL) 390 (approximately 39,000 ft) when the rollback occurred in the right Rolls-Royce Trent 895 engine. The crew conducted the applicable flight manual procedures and descended to FL 310; the engine recovered and functioned normally for the remainder of the flight.

A similar incident involving a 777 with the same engine type occurred Jan. 17, 2008, during final approach to London Heathrow International Airport. The airplane crashed short of the runway. An investigation is continuing.

In Other News …

John McCormick will succeed Bruce Byron as director of aviation safety and CEO of the Australian Civil Aviation Safety Authority (CASA) in March. McCormick has more than 20 years of top level experience in the industry, with the Royal Australian Air Force, Qantas and Cathay Pacific. … New pilots in Australia will receive formal instruction in **critical thinking skills**, according to new requirements being implemented by CASA. Instruction will be designed to improve their communication, interpersonal dealings, judgment and decision making, and beginning in mid-2009, they will be tested on their knowledge of human factors and threat and error management. … Bluebird Cargo, based in Iceland, has begun using Q-Pulse IMS software to manage **compliance** with national and international regulations and standards.

Monitoring Pilot Brain Activity

The U.S. National Aeronautics and Space Administration (NASA) is conducting research to determine the best method of monitoring brain activity as part of a larger project to help pilots recognize if they are functioning with dangerously high levels of stress, fatigue or distraction.

© Pixac/Dreamstime.com

The research, being conducted at NASA's Glenn Research Center in Cleveland, uses a process called functional near infrared spectroscopy to measure both the flow of blood in the brain's cortex and the oxygen level of the blood. Researchers say this technology is non-invasive, safe, portable and inexpensive, and that the project is intended to "improve the interaction between the increasingly sophisticated automation being used in aircraft and the humans who operate those aircraft. The goal is to aid pilot decision making to improve aviation safety."

NASA biological engineer Angela Harrivel, who heads the project, said, "No matter how much training pilots have, conditions could occur when too much is going on in the cockpit. What we hope to achieve by this study is a way to sensitively — and ultimately, unobtrusively — determine when pilots become mentally overloaded."

Compiled and edited by Linda Werfelman.

Down

There is no checklist for pilot incapacitation, a rare but serious threat. BY MARK LACAGNINA

The risk of a pilot becoming incapacitated in flight is very low, recent studies show, but an incident early last year — and others in the past — exemplify another point made in the studies: In the rare event that incapacitation does occur, a flight can be seriously threatened.

In its report on the incident, the Irish Air Accident Investigation Unit (AAIU) said there were signs that something was not right with the first officer when he reported late for duty at Toronto's Pearson International Airport the morning of Jan. 28, 2008.[1] The commander said that the first officer appeared to be "quite harried" when he arrived on the flight deck of the Boeing 767-300. The commander assured the first officer that all the preflight preparations for the flight to London Heathrow Airport had been completed and encouraged him to "settle down."

The commander became increasingly concerned about the first officer's behavior after the flight got under way. The first officer left the flight deck several times and did not follow standard procedure when he returned.

"In conversation, he remarked several times that he was very tired," the report said. "With the workload now light in cruise, the commander suggested that [he] take a controlled rest break on the flight deck. The commander was concerned not only for the well-being of his first officer but of the possibility of having to carry out a CAT III autoland approach at Heathrow due to low weather [conditions]. He considered it prudent to let his colleague rest now and be fully alert for the descent and approach at the destination."

'Confused and Disoriented'

The aircraft was midway across the North Atlantic when "it soon became apparent that the first officer was quite ill," the report said, noting that his speech began to have a "rambling and disjointed nature." After another extended rest break, his behavior became "belligerent and uncooperative." After calling the lead flight attendant to the flight deck, the commander told the first officer that if he did not begin to cooperate, he would be considered incapacitated and dealt with accordingly.

The first officer did not respond, so the commander told the lead flight attendant to "secure the first officer away from the controls" and enlist the aid of other cabin crewmembers to remove him from the flight deck, the report said. One crewmember sustained a wrist injury while doing so. Two physicians among the 146 passengers attended the first officer, who was described as confused and disoriented.

After communicating via data-link with company dispatch personnel in Toronto, the commander declared a medical emergency and told air traffic control that he was diverting the flight to Shannon, Ireland, which had good weather conditions.

Before beginning the descent, the commander asked the lead flight attendant to check the passenger list, to see if any company pilots were aboard. "No line pilots were on board, but one of the flight attendants held a commercial pilot's license with a multi-engine rating and a noncurrent instrument rating," the report said. The commander summoned her to the flight deck.

"The flight attendant provided useful assistance to the commander, who remarked in a statement to the investigation that she was 'not out of place' while occupying the right-hand seat," the report said.

After an uneventful landing, the flight was met by physicians who assisted the first officer

© Jian Tan/Jetphotos.net

A first officer appeared to be under considerable stress as the transatlantic flight got under way and eventually would be carried off the flight deck of this 767.

and Out

© Nathan Cox/iStockphoto

and assessed his medical condition. The first officer then was transported to a local hospital. "[He] remained under hospital care for 11 days, where a gradual improvement in his condition was made," the report said. "On 8 February, he was flown home [by air ambulance] to Canada, where his care continued."

The report provided no details about the first officer's medical condition and did not specify his age.

Serious Incident

The AAIU commended the commander and flight attendants. "Incapacitation of a member of a flight crew is a serious incident," the report said. "The commander, realizing he was faced with a difficult and serious situation, used tact and understanding, and kept control of the situation at all times. The situation was dealt with in a professional manner, employing the principles of crew resource management."

The report cited a Transport Canada technical publication (TP) that provides guidance on recognizing and dealing with pilot incapacitation.[2] Differentiating between *sudden*, *serious* and *subtle* incapacitation, the TP says that the leading causes of sudden pilot incapacitation are gastrointestinal problems such as stomach cramps, nausea and diarrhea.

"Heart problems and fainting are the main causes of serious incapacitation," the TP says. "Complaints of chest pain (often confused with indigestion), weakness, palpitation or nausea should be taken seriously. Pallor [paleness], unusual sweating, repeated yawning or shortness of breath should all trigger suspicion."

Common causes of subtle pilot incapacitation include hypoxia, hypoglycemia (low blood sugar), extreme fatigue, alcohol, drugs and "other toxic substances," the TP says. Subtle incapacitation also can be triggered by a stroke or brain tumor.

Symptoms of subtle incapacitation are likely to be noticed during periods of high stress or workload. "The victim may not respond to stimulus, may make illogical decisions or may appear to be manipulating controls in an ineffective or hazardous manner," the TP says. It recommends that, if the victim does not respond normally to two consecutive challenges or one significant warning, such as when an aircraft is flown below decision height without the required visual references, the other pilot should take the following actions:

- "Do whatever is necessary to maintain control of the aircraft."
- "If you need to restrain the victim, do only what is needed to deal with an immediate threat to control. You will have time [later] to further secure the victim."
- "Climb to and maintain a safe altitude."
- "If you are on an approach which has destabilized, initiate a missed approach following standard procedures. You may not have access to a checklist, so take extra care to accomplish essential tasks."
- "Keep your thoughts organized. Saying your actions out loud may help you stay focused. If the aircraft is autopilot-equipped, engage the autopilot at an operationally safe altitude to lessen your workload."

The TP says that other crewmembers or passengers should be enlisted to secure the incapacitated pilot — by moving his or her seat to the full-aft position and tightening the shoulder harness — or to remove the pilot from the seat.

Single-Pilot Fatalities

A study by the Australian Transport Safety Bureau (ATSB) in 2007 focused on 98 pilot-incapacitation events that occurred from 1975 through March 2006.[3] Noting that these events comprised 0.6 percent of all occurrences in the ATSB accident/incident database during the period, the report said, "The results of this study demonstrate that the risk of a pilot suffering from an in-flight medical condition or incapacitation event is low."

Nevertheless, the report said that pilot incapacitation "represents a serious potential threat to flight safety." The pilot-incapacitation events included 10 fatal accidents, in which 24 people were killed, and six nonfatal accidents.

All the fatal accidents involved single-pilot flight operations, including four conducted by charter or business pilots. Eight fatalities occurred when a Beech Super King Air 200 crashed in September 2000.[4] ATSB determined that the cabin likely depressurized while the airplane was climbing to 25,000 ft for a charter flight of about 1.5 hours' duration; the King Air continued flying for about 3.5 hours after passing the destination.

Overall, the greatest cause of pilot incapacitation was acute gastrointestinal illness, typically from food poisoning, in 21 cases, followed by exposure to smoke or toxic fumes, in 12 cases. Nine pilots lost consciousness for unspecified reasons. Eight suffered heart attacks, five of which were fatal. Five pilots suffered symptoms of infectious diseases, mostly viral infections, although one case involved malaria. Five others were incapacitated by trauma resulting from bird strikes, a windshield shattered by hail and an injury during an emergency ground evacuation. Four

Recent U.S. Pilot-Incapacitation Events*

June 30, 2008 — The pilot engaged the services of a flight instructor to prepare for a re-examination required by his involvement in a previous aviation incident. During departure from Rochester, New Hampshire, the Beech 95's cabin door opened, and the pilot turned back to the airport. He did not line up properly with the runway, and the instructor assumed control. With no wheel-brake controls on his side of the cockpit, the instructor told the pilot several times to apply the brakes after landing, but there was no response. The airplane received minor damage when it overran the runway. The incident report did not specify the cause of the pilot's incapacitation.

Feb. 24, 2008 — The pilot of a Cessna 525 CitationJet was conducting a night flight with three passengers when he became woozy and declared an emergency. He landed without further incident at Worcester, Massachusetts. He was examined at a local hospital and released after no medical abnormalities were found.

Dec. 17, 2007 — Five carbon dioxide cylinders had been loaded improperly, and without safety caps over their valves, in a Beech 1900. During departure from Aniak, Alaska, the pilots heard a "hissing" sound, rejected the takeoff and taxied back to the ramp. Soon after the engines were shut down, both pilots lost consciousness; the copilot sustained minor injuries when he collapsed while trying to open the forward door.

June 17, 2007 — A Boeing 777-200 was en route from Chicago to an unspecified destination when the first officer apparently suffered a stroke. The captain returned to Chicago, where the first officer was transported to a hospital.

June 5, 2007 — The first officer of a 737-500 complained of severe stomach cramps during a fight from Tulsa, Oklahoma, to Denver. The captain requested and received expedited handling from air traffic control, and landed without further incident in Denver.

May 7, 2007 — The captain of a 737-500 suffered an apparent heart attack during a flight from Washington to Chicago. A physician assistant aboard as a passenger recommended that the captain be removed from the flight deck and placed on the floor of the forward galley for treatment. The first officer declared a medical emergency and kept a flight attendant on the flight deck to assist him during the diversion to Dayton, Ohio. "After landing, the first officer moved over to the left seat and taxied the aircraft to the gate, where emergency medical assistance was standing by," the incident report said.

May 30, 2006 — A few minutes after a Bell 206L-3 was landed on a platform off the shore of Grand Isle, Louisiana, the 55-year-old pilot was found unconscious. He was removed from the helicopter and transported to a hospital, where he was pronounced dead; the cause of death was coronary insufficiency from cardiac disease.

Aug. 28, 2005 — The captain of an Embraer 145 suffered a mild heart attack while departing from Pittsburgh for a flight to Portland, Maine. The first officer assumed control, returned to Pittsburgh and landed the airplane without further incident. "Further investigation revealed that the captain was incapacitated and unresponsive in flight and on the ground after this event occurred," the incident report said. "The captain was taken to a hospital and is expected to make a full recovery."

May 5, 2005 — The pilot of a Gulfstream 695A Commander suffered a fatal heart attack during a flight from North Las Vegas Airport to San Diego. The passenger in the right front seat, who was not a licensed pilot, flew the airplane back to the departure airport while the rear-seat passenger held the pilot away from the flight controls. Both passengers were injured, one seriously, when the Commander stalled at low altitude and struck terrain during the fourth landing attempt.

— ML

*Selected from reports compiled by Air Data Research from U.S. Federal Aviation Administration and U.S. National Transportation Safety Board databases.

pilots suffered respiratory symptoms of acute pneumonia and severe emphysema.

Noting the prevalence of gastrointestinal illness, the report said, "It is important that crew meals are prepared to the highest possible hygiene standards and that pilots receive different crew meals to help reduce the overall risk." Pilots also should be careful of what they eat and drink before flying and during layovers. "Contaminated food and water consumed in these periods may then produce an acute gastrointestinal illness some hours later," the report said.

While heart attack was involved in only eight of the 98 pilot-incapacitation events, it accounted for half of the fatal accidents and the deaths of seven passengers. The report said that "cardiovascular disease still ranks as the single biggest cause for medical disqualification of pilots" and that cardiac events may be under-reported "especially in difficult postmortem circumstances" following accidents.

The study results show that "there is a low chance of a medical condition or incapacitation event adversely affecting the outcome of a flight," the report said. "The medical certification system appears to be working well. However, it remains important that this system continues to evolve with, and be based on, the changes and developments in scientific research and medical practice."

Insidious and Dangerous

A 2004 study by the U.S. Federal Aviation Administration (FAA) focused on 47 flights during a six-year period ending in 1998 in which pilots became incapacitated or impaired — that is, able to perform only limited flight duties.[5] The report on the study said that the rate of in-flight pilot incapacitations/impairments was 0.058 per 100,000 flight hours.

The report said that safety was seriously threatened in seven events:

- A Boeing 737 first officer suffering a grand mal seizure related to alcohol withdrawal "suddenly screamed, extended his arms up rigidly, pushed full right rudder and slumped over the yoke during an approach," the report said. "The captain regained control after flight attendants pulled the first officer off the controls."
- A Douglas DC-9 first officer's foot lodged against a rudder pedal when he stiffened during a heart attack. "The captain had to apply full opposite rudder to control the aircraft until the foot could be dislodged," the report said.
- A Boeing 727 freighter captain and flight engineer temporarily lost consciousness after the flight engineer inadvertently depressurized the cabin at 33,000 ft. The first officer donned his oxygen mask and performed an emergency descent.
- While taxiing after landing, the "captain stiffened so violently during an epileptic seizure" that he suffered a broken shoulder and back, and applied sufficient pressure on the right rudder pedal and wheel brake to cause the airplane to suddenly turn and stop.
- An Airbus A300 captain suffering a cerebral infarction (blood-flow blockage) did not call for landing gear extension during approach and "simply nodded agreement when the first officer questioned him about it." While taxiing to the gate, he applied full takeoff power twice before the first officer shut down the engines and called for assistance.
- A McDonnell Douglas MD-88 captain wearing monovision contact lenses — which correct for near vision in one eye and distant vision in the other eye — perceived the airplane to be higher than it was during an overwater approach in rain and fog. "This resulted in a steeper-than-normal final approach, causing the aircraft to strike the approach lights," the report said. Three passengers sustained minor injuries during the subsequent evacuation.
- The captain and first officer were impaired by fatigue when a Douglas DC-8 freighter stalled during an approach and struck terrain. All three flight crewmembers were seriously injured in the crash.

The latter two events, the only accidents among the 47 flights, both involved pilot impairment, which the report characterized as insidious. "When a dramatic incapacitating event such as a heart attack or epileptic seizure occurs, it is often obvious and can be dealt with by the unaffected crewmember," the report said. "In the two impairments that ended in aircraft accidents, the pilots were probably not aware there was a problem. … It may be that subtle impairment of a pilot is more dangerous than obvious medical incapacitation."

Notes

1. AAIU Synoptic Report no. 2008-027. Nov. 19, 2008.
2. Transport Canada. *Pilot Incapacitation*. TP 11629E. April 2007.
3. Newman, David G. *Pilot Incapacitation: Analysis of Medical Conditions Affecting Pilots Involved in Accidents and Incidents, 1 January 1975 to 31 March 2006*. ATSB. B2006/0170. January 2007.
4. ATSB Aviation Safety Report BO/200003771.
5. DeJohn, C.A.; Wolbrink, A.M.; Larcher, J.G. *In-Flight Medical Incapacitation and Impairment of U.S. Airline Pilots: 1993 to 1998*. Civil Aerospace Medical Institute. DOT/FAA/AM/04/16. October 2004. Reprinted in *Flight Safety Digest* Volume 24 (January 2005): 1–23.

Further Reading

Snyder, Quay. "Missing Perspectives." *ASW* Volume 2 (October 2007): 22–23.

Rosenkrans, Wayne. "Cabin Fever." *ASW* Volume 2 (August 2007): 22–26.

Werfelman, Linda. "Too Old to Fly?" *ASW* Volume 2 (February 2007): 11–15.

GROUND SUPPORT

A good dispatch team enhances safety and efficiency while reducing disruptions.

BY PATRICK CHILES

Well-trained and well-equipped dispatchers who can help attend to the myriad details of planning and conducting flights are a boon to any busy flight department. Most *ASW* readers are probably familiar with the airline model of operational control, which comprises dispatchers, schedulers, maintenance controllers and pilots working together to direct the intricate ballet of a day's flying.

In a tightly scheduled airline hub system, even the good days can be a running battle against disruption. Besides keeping the system on time, safety and compliance must remain as paramount goals. The same basic issues apply to a similar operation without a fixed schedule, like a large fractional ownership or charter company.

© Chris Sorensen Photography

Flight control center personnel provide a 'second set of eyes' for flight crews in NetJets' worldwide operations.

© NetJets

© NetJets

NetJets' U.S.-based operation, for example, has a fleet of more than 400 aircraft in worldwide service. Each day's schedule is shaped not by an economic analysis of demand between city pairs, but by the personal demands of thousands of individual share owners and charter clients. So, imagine having a route system the size of a major international airline's — and taking a big eraser to the schedule every day, if not every few hours.

This creates enormous challenges across the system. Scheduling, logistics, safety and compliance are put to the test by a constantly evolving demand structure. And the end result — safely delivering exceptional service — has to be as transparent as possible to the passengers. Although passengers generally accept uncontrollable disruptions like weather, everything else is expected to run like clockwork. To stretch the analogy a bit further: How does this happen when nobody knows exactly what the clock may look like from one day to the next? And how is it managed without compromising safety?

© NetJets

Andrew Wuertzer, dispatch tactical manager, and Aaron Chamberlain, ATC specialist, work out details for an upcoming flight.

Early Challenges

Early in the program's history, many arrangements were delegated to the flight crew. Fleet chief pilots were always available to help with problem solving, a practice that continues today. But, while employees at the Columbus, Ohio, operations center managed schedules and logistics, most operational and safety decisions were left to the pilots.

Route planning and the related calculations were accomplished by individual flight crewmembers before each leg, while the operations center could provide computerized weight-and-balance data and field-length performance calculations. It remained the flight crew's responsibility to check the numbers, in addition to preparing and filing their own flight plans.

As the fractional program grew and daily flight counts continued to rise, it became clear that pilots needed to be unburdened from dispatch-related tasks. The type and quality of ground support had to improve. Implementing an airline-style flight dispatch organization was seen as the best way to simultaneously improve fleet utility and safety.

There were, and still are, many challenges to this approach. Figuring out personnel, licensing and equipment needs was comparatively straightforward — the more amorphous questions of "how" would take years to work out. At the rate the company expanded during the 1990s, any major new programs were likened to changing tires on a moving car.

Shared Responsibility

As Peter V. Agur Jr. pointed out in a previous issue of *ASW* (3/08), one of the biggest hurdles in developing the needed ground support system was indeed "people-related" — the necessary cultural change was not to be taken lightly. With so many pilots coming from corporate or charter aviation, some were reluctant to accept the shared-responsibility concept — as some would say, "No one is about to tell *me* how much fuel to carry!"

Moving beyond this required demonstrable expertise, while making clear that the pilots were getting help and not another layer of management. Having round-the-clock access to chief pilots for each aircraft type helped everyone through this growing pain.

To be fair, it was not merely an ego clash. Responsibilities in the airline world are clearly defined and supported by decades of organizational experience. Beyond any legal requirement, airlines see this relationship as an accepted best practice for managing complex systems, and their crewmembers are generally more amenable toward it. But tailoring this model to fit a general aviation environment created as many questions as

© Chris Sorensen Photography

it answered. For example: How do you grant nearly 50 dispatchers, who technically are not required, the authority to be effective without simultaneously undermining the captain's authority?

Ultimately, the pilot-in-command still has final authority to conduct, cancel or change a flight. How does that work in practice? In our case, decisions to release flights and requests by scheduling or customers for operational diversions must also go through the dispatchers. Any diversions for such matters as aircraft malfunctions, equipment problems or weather are decisions that remain with the crew.

Over time, the dispatcher's second set of eyes has undoubtedly enhanced safety. For every flight, licensed dispatchers create a release package that contains weight-and-balance data, takeoff and landing performance calculations, a computerized flight plan, weather information and notices to airmen (NOTAMs).

As mentioned, crewmembers are still required to check relevant details and calculations before accepting a release, but they no longer have to work it out on the run. This means turn times are more productively spent actually getting the airplane ready to fly. For an operation that is governed by the regulatory requirements for fractional ownership operations, charter operations and supplemental air carrier operations, this has become an absolute necessity.

Ultimately, the pilot-in-command still has final authority to conduct, cancel or change a flight.

Patrick Chiles

With weather, weight-and-balance and scheduling information at his fingertips, Mike Olson prepares a BBJ flight release.

Pieces in Place

The big picture is managed through a proprietary reservation and flight-following program called IntelliJet II. Anyone in the company with a hand in creating or managing trips uses this as their access point. Every flight goes from initial booking to crew and aircraft scheduling, through airport review, feasibility and logistics, and finally to dispatch and flight following.

The program is also integrated with Jeppesen's flight planning software and UltraNav's takeoff performance tool. Other tools, like Flight Explorer and Jeppview electronic charts, round out the information at the dispatcher's fingertips.

Different teams of specialists have a hand in each trip at different steps along the way. Initial booking of a new flight immediately generates activity through airfield analysis and trip feasibility. Analysts review airport suitability and look for any potential show-stoppers on each trip. By the time a flight makes it to the dispatcher for release, there is usually little question remaining as to whether it can run as planned.

This is not to say that problems never appear — some things just cannot be known until it's time for the rubber to meet the road. NetJets dispatchers have unique value in the customer service arena as creative problem solvers. Coordinating among multiple departments, they have the technical expertise and big-picture view to develop options for trips with go/no-go challenges. This makes the outright canceling of trips a rare occurrence.

Collective Knowledge

Work on an individual flight typically begins several hours ahead of departure. While preparing a flight plan and release, dispatchers are not entirely on their own — supporting them are teams of meteorologists, air traffic control (ATC) coordinators and Jeppesen international handlers.

NetJets participates in the U.S. Federal Aviation Administration's Air Traffic Control System Command Center collaborative decision making program, and most company ATC specialists are former controllers. This enables the dispatchers to have a complete picture of national flow control programs, in addition to access to the company's internal route database. Built over several years of experience, the database includes thousands of preferred routes between common city pairs.

This advance coordination and collective knowledge gives dispatchers the ability to quickly create more accurate flight plans. There are obvious benefits — for example, routes that ATC is more likely to clear as filed mean more predictable arrival times and fuel burns.

While accurate flight plans are the goal, tools like the route database are crucial in enabling dispatchers to manage their workload. And that load can be considerable. Customer demand, crew disconnects, broken airplanes and bad weather may converge — often all at once — to make the flight schedule a constantly moving target. The rapid pace can be both frustrating and exhilarating, testing even the most three-dimensional thinker. One dispatcher can easily release up to 50 flights on a shift, not counting those that end up in the trash bin because of schedule changes.

After the final flight plan is filed and uplinked to the airplane, centers of gravity are checked via a weight-and-balance tool integrated with the flight release program. It is a relatively simple calculation using standard average weights by seat location. A more complex application is the UltraNav takeoff performance tool, which uses airplane flight manual performance data to determine field-length limits and climb capability.

The dispatcher can input the published climb gradient and minimum safe altitude from a published standard instrument departure, or a controlling obstacle if there is a published departure procedure for avoidance. The exception to this practice is with the Boeing Business Jet fleet, which relies on Boeing's Onboard Performance Tool. Instead of using charted procedures, this tool directly calculates regulatory takeoff performance against a runway and obstacle database. This real-time runway analysis generally allows higher maximum takeoff weights for a given condition.

Off to the Races

Once the flight is airborne, dispatchers are able to monitor its progress using Flight Explorer, a commercially available product. It enables them to view flight plan tracks layered with any number of informational displays. Satellite views, prognostic charts, icing reports and temporary flight restrictions are most commonly used.

Communications are maintained with several tools, including the airborne flight information system (AFIS), aircraft communications addressing and reporting system (ACARS), satellite phones and sometimes even a good old-fashioned ARINC phone patch.

As mentioned before, non-emergency diversions are coordinated through the dispatch team. Many diversions are "self-inflicted," resulting from owners' needs changing in flight. Pilots would agree that dedicated specialists on the ground, evaluating each diversion as it happens, are worth their weight in gold.

The dispatch team also has enabled the company to better manage fuel consumption by using computerized flight planning and by tankering fuel through high-cost locations. Beyond saving money, tracking planned versus actual fuel burn has improved safety by enabling the company to accurately fine-tune the airplane cruise databases.

For example, a thorough analysis of Dassault Falcon 2000 fuel consumption was a key factor in increasing payload on winter flights to Hawaii while keeping a generous reserve margin. A similar fuel-burn study enabled reliable scheduling of nonstop trips between New York and London by the Cessna Citation X with similar safety margins. Actual burns regularly end up well within 1 percent of the flight plan estimates.

Safety Firewall

Ultimately, fuel-burn management is not why this program was started. When the fractional-ownership program took off in the 1990s, flight dispatch was created as a way to deal safely with the increased operating tempo.

The shared responsibility concept creates a firewall against rushed decision making in a rapidly changing environment. These benefits are more difficult to quantify, but anecdotal evidence from employees on both sides of the process have cemented the belief that this model has successfully cut off any number of potential hazards before they could materialize.

Threat and error management has been getting more deserved attention of late, and it is clear that a robust, well-qualified dispatch team mitigates numerous threats before airplanes even leave the ramps. Any flight department with a heavy operational tempo or complex scheduling would be well served to consider the benefits of similar practices.

Patrick Chiles is manager of technical operations for the NetJets Large Aircraft program. He is a member of the Flight Safety Foundation Corporate Advisory Committee and the Society of Aircraft Performance and Operations Engineers.

Further Reading

Agur, Peter V. Jr. "Real Time Risk Management." *ASW* Volume 3 (March 2008): 19–22.

Chiles, Patrick. "VFR in the Himalayas." *ASW* Volume 3 (April 2008): 22–26.

Chiles, Patrick. "Planning the Departure." *ASW* Volume 2 (July 2007): 26–32.

Snyder, George H. Jr.; Agur, Peter V. Jr. "High Culture." *ASW* Volume 2 (June 2007): 12–21.

Chiles, Patrick. "ETOPS Redefined." *ASW* Volume 2 (March 2007): 12–16.

Into the MAINSTREAM

Although many operators will miss ICAO's January deadline for implementation of a safety management system, the SMS concept is gaining ground.

BY LINDA WERFELMAN

© Tobiasjo/iStockphoto

Propelled into more widespread existence by a 2009 deadline, safety management systems (SMSs) — the subject of years of discussion and planning — are taking hold within airlines and aviation maintenance organizations worldwide. But implementation cannot be completed without the adoption of state safety programs (SSPs) by national governments worldwide.

By mid-December 2008, the number of airlines with an SMS in place or under development had increased dramatically from the 10 percent estimated one year earlier, according to Miguel Ramos, technical officer in the Integrated Safety Management Section of the International Civil Aviation Organization's (ICAO's) Air Navigation Bureau. Ramos said, however, that ICAO lacks a precise count of how many airlines and aviation maintenance organizations are developing an SMS — or exactly how many had one in place as the organization's January 2009 deadline neared.

Even without knowing exact numbers, Ramos said, it is clear that "SMS has really evolved."

He noted that airlines and other service providers — including airports, maintenance organizations, regulators and air traffic management organizations — are moving away from the *reactive* mode of managing safety in which safety advances typically follow accident investigations and the resulting investigations, and toward the more *predictive* mode of managing safety in which data collection and analysis enable risks to be identified and addressed before they cause an accident or serious incident.

"That's a major improvement," Ramos said. "SMS is now being considered a major system involved in running an airline or another aviation service provider."

In recent months, in response to complaints about vague requirements for SMS — defined by ICAO as "a systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures" — ICAO overhauled its *Safety Management Manual (SMM)*.[1]

The second edition, still in the final editing process in late 2008, provides guidance to civil aviation authorities for the development of the regulatory framework for SMS, to service providers for the implementation of SMS, and to ICAO member states for the establishment of SSPs — all in greater detail than the first edition, published in 2006.

"That doesn't mean that the guidance material will be perfect for everything and everyone," Ramos said. "Everything that's in there, people have to adapt to their own operations."

The *SMM* describes an SMS as similar to "a toolbox that contains the tools that an aviation organization needs to be able to control the safety risks of the consequences of the hazards it must face during the delivery of the services that are the reason why the organization is in business. …

"SMS simply is a protective shell that ensures proper and timely storage, availability and utilization of the tools needed to deliver specific safety management processes in the organization. Without the proper tools inside, SMS is only an empty shell."

The *SMM* describes how airlines and other service providers might fill those empty shells — for example, with safety audits, surveys, safety libraries, flight data analysis and other safety tools — and how safety management must permeate a service provider's organizational chart.

'Complex' Implementation

One of the first civil aviation authorities to start work on SMS regulations was Transport Canada (TC), which began its SMS efforts in 1999.

"On the surface, it appeared quite a simple task: Develop a set of regulatory instruments and the supporting tools to facilitate the implementation of SMS in Canadian aviation," said Jacqueline Booth-Bourdeau, chief of technical program evaluation and coordination in the TC Standards Branch. "SMS regulation and implementation in Canada were infinitely more complex than we had first imagined."[2]

In a presentation to Flight Safety Foundation's October 2008 International Air Safety Seminar in Honolulu (see "SMS Implementation Experiences," p. 28), Booth-Bourdeau said that

Wayne Rosenkrans

Booth-Bourdeau

the implementation of SMS required organizations to change the ways they manage safety and to enhance their internal safety culture.

Canadian Aviation Regulations define an SMS as "a documented process for managing risks that integrates operations and technical systems with the management of financial and human resources to ensure aviation safety or the safety of the public."

Booth-Bourdeau said that, "from a practical perspective, this means that an organization must develop, maintain and integrate a management system comprised of six basic components: a safety management plan, training, safety oversight (reactive and proactive), documentation, quality assurance and emergency response preparedness."

In recent years, critics have challenged TC's approach to SMS as a form of deregulation or industry self-regulation.

"None of these things is true," Booth-Bourdeau said. She cited a May 2008 report by the Office of the Auditor General of Canada, noting the office's finding that TC, the first civil aviation authority in the world to produce SMS regulations, had "developed appropriate procedures and processes for SMS implementation and made efforts to apply them consistently."[3]

The auditor general's report also noted "several weaknesses" in TC's management of the transition to SMS and issued nine recommendations — including calls for improved transition planning, a better defined standard for an acceptable level of oversight and establishment of performance indicators to evaluate the extent to which SMS and other programs are contributing to TC's long-term objectives. TC accepted all nine recommendations.

Phased Implementation

At press time, the Australian Civil Aviation Safety Authority (CASA) was reviewing aviation industry comments on proposals to require SMS for all regular public transport operations. CASA planned to adopt the proposals as amendments to the Civil Aviation Orders on Jan. 1, 2009, with a phased implementation schedule "to assist

Canada was an early SMS adopter. Shown here is Toronto Pearson International Airport.

the aviation industry [in managing] the work and costs of developing and putting in place safety management systems, human factors training and non-technical skills assessment."

CASA's proposed schedule would give operators six months to develop an SMS implementation plan and up to two years to complete the implementation.

The agency said that the changes eventually would be incorporated into Civil Aviation Safety Regulations.[4]

"At that time, the requirements will be extended to cover all air transport operations, including charter flights," CASA said. Many major airlines, including Qantas, and smaller operators already have implemented SMS, in advance of the regulatory requirements.

Missed Deadline

A number of operators also have implemented SMS in the United States, where the Federal Aviation Administration (FAA) is continuing its efforts to develop specific SMS requirements. The FAA planned to file a difference with ICAO to explain that, although the agency intends eventually to develop SMS regulations and policies, they would not be ready in time to meet the Jan. 1 deadline.[5]

In a memo to operators, the FAA said that, although it has not developed SMS regulations, it has encouraged adoption of SMS within the industry and has published Advisory Circular 120-92, *Introduction to Safety Management Systems for Air Operators*, which contains information on the development and implementation of SMS on a voluntary basis. Additional supporting material is being developed, the FAA said.

Management for Managers

As airlines and other service providers have moved ahead, Ramos said, it has become clear that they have made considerably more progress with SMS than most regulatory authorities have made with development and implementation of their internal safety management apparatus — the SSP.

Few regulatory authorities have a fully functioning SSP, Ramos said, noting that the *SMM* devotes separate guidance to the regulators responsible for that program, defined by ICAO as "a management system for the management of safety by the state."

An SSP has four components: state safety policy and objectives, including a legislative framework, accident and incident investigation and enforcement policy; state safety risk management, including safety requirements for the SMSs operated by service providers; state safety assurance, including safety data collection, analysis and exchange; and state safety promotion, including internal and external training, communication and dissemination of safety information.

ICAO considers implementation of an SSP a prerequisite for the implementation of effective SMSs by service providers.

© Marcus Obal/Wikimedia.org

SMS Implementation Experiences

In addition to the presentation by Jacqueline Booth-Bourdeau of Transport Canada (see "Into The Mainstream," p. 24), three other panelists described their experiences with safety management system (SMS) implementation during the Joint Meeting of the Flight Safety Foundation 61st annual International Air Safety Seminar, International Federation of Airworthiness 38th International Conference and International Air Transport Association in Honolulu. Moderator David Mawdsley, aviation safety adviser for Super Structure Group and an instructor at Cranfield University, said that many aviation organizations find change management to be the greatest implementation challenge.

"An airline or other enterprise is composed of a system of systems, which are integrated and inter-supported," Mawdsley said. "With SMS implementation comes the need [first] to integrate SMS within the organization as a whole. In the next 10 to 15 years, emphasis on integration of SMS will be increased, changing from integration within an organization to integration across the interface [with the industry]."

Peter Simpson, manager, air safety, Cathay Pacific Airways, believes that some SMS guidance material unwittingly has discouraged organizations by framing the implementation process at the outset as "costly, time-consuming, troublesome and difficult." A more positive and productive approach is to recognize existing capabilities and simplify implementation from the existing elements: "There is no airline or other organization in aviation that has to start from scratch," Simpson said. "If your organization has passed the International Air Transport Association Operational Safety Audit [IOSA], and has IOSA accreditation, that also implies that you've got the building blocks, the basic components of the SMS. The real challenge is to make that SMS effective. Assessing risk is perhaps the most complex or over-complicated part. It is quite misunderstood, but it doesn't need to be."

Wayne Rosenkrans

Simpson

Extensive guidance resources, templates and examples — many already compiled in one place by Eurocontrol's SKYbrary Web site <www.skybrary.aero> — answer common questions about accepted ways of conducting risk assessment activities, he said.

A complication for large organizations is deciding how SMS, as a concept originated among safety specialists, will be relevant given line managers' existing commitments to other corporate systems. "Some airlines have integrated safety, security, quality and environmental management [departments], yet people in the departments do not speak to each other," he said. "An integrated SMS is the way to go."

The SMS at Qantas Airways is the evolutionary product of nine years of learning, feedback and operational adjustments, added Robert Dodd, the airline's general manager, group safety. "For an SMS to be effective, it has to be like any other element in aviation engineering; you cannot just throw all these elements together and not think about the way they feed back on each other and the way they work," he said. "Safety management is done by line managers, people who control resources, not by safety departments. Those line managers have lots of other things to do; they don't just know how to manage safety. There aren't a lot of resources [or] time, and we can't expect managers to turn themselves into safety experts overnight. If they have a comfort level with certain aspects of existing systems or reporting, you need to build on that. You're not trying to make SMS work for the safety manager, you are trying to make it work for the line manager."

Integrated safety data from multiple sources — such as safety reports, telephone calls and line operations safety audits — have a critical function in the SMS concept, but making decisions and taking action to mitigate known risks are more important than collecting and manipulating data.

"Qantas makes sure that safety data are of value to the line managers, that we measure the effectiveness of what they do based on data, and that [data] that tell senior management how part of the business is going are the same data that the manager sees — so there is no 'second set of books' going on," he added.

"We put a lot of focus on the assessment process, which basically looks at three dimensions: Does the organization have the capability to do this? Are people implementing the [plan, for example] to train people, and have they rolled this out to their business? Are people … actually performing against the plan? A large number of organizations go part way through the [SMS] process. They collect enough information to adequately describe the nature of a problem. What they don't do is put as much energy into making sure that they actually have fixed it."

Since 2005, airports worldwide have discovered advantages during SMS implementations, said Gerhard Gruber, manager, rescue and airport operations, Vienna (Austria) International Airport. Regardless of the wide diversity among airport implementations, the SMS has helped many of them to cope with difficult operational pressures linked to rapid traffic growth, airport privatization and compliance with harmonized international standards.

"The optimum use of existing infrastructure is a challenge," Gruber said. "You have airports that already have a safety system in place — they just name it 'SMS' and [other] airports do not have a single element of SMS. … Any inconsistency, carelessness or deviation from safety standards [such as snow-covered runways, low visibility or missing/misleading visual aids] may result in a disaster." The airport operator's scope of responsibility for an SMS includes a comprehensive safety policy; a person dedicated to running the SMS; staff awareness and training; and safety interface with contractors, such as ramp service companies and other third parties.

A special challenge for airports has been some airside employees' low level of education, sometimes coupled with low personal motivation, compared with the personnel in areas like flight operations and air traffic control (ATC), Gruber said. Awareness, data presentations and training therefore have to be tailored to what each individual needs to know — including simplified SMS theory — in order to do their part. "Everyone should understand what SMS means to be able to follow the ideas and the policies," he said.

When people see themselves as elements of a larger system beyond their immediate job, the level of safety increases. "For example, an aircraft taxiing out for departure [at Vienna] missed an intersection," Gruber said. "ATC gave alternative instructions and, finally, the aircraft had to make a sharp turn, 140 degrees. This turn was not designed for aircraft [crews] taxiing without a yellow centerline, however, and the inner gear of this aircraft flattened the edge lights of the taxiway, then the crew completed the takeoff.

"This was observed by a marshaller from a distance of 1.5 km [0.8 nm]. The marshaller reported to the operations officer that he saw the [aircraft wheels crush the] edge lights. The operations officer informed ATC, and ATC informed the pilot that there might be tire damage and [risk of] an unsafe landing. [Using SMS practices,] we had a discussion with Vienna ATC and found out that ATC was not aware that there was no yellow centerline and that the routing assigned should not have been used. … The pilot involved had never had training for a taxi turn more than 90 degrees, so his company subsequently implemented that training."

— Wayne Rosenkrans

"One of the objectives of an SSP is to generate a context that supports the implementation of SMS by service providers," the *SMM* said. "The service providers' SMS cannot effectively perform either in a regulatory vacuum or in an exclusively compliance-oriented environment. In such environments, service providers will only implement and demonstrate, and the state authorities will only assess, the tokens of SMS. [Effective performance of] SMS by service providers can only flourish under the enabling umbrella provided by an SSP. The SSP is therefore a fundamental enabler for the implementation of effective SMS by service providers."

The *SMM* laid out several steps to implementing an SSP. First, a "gap analysis" should be conducted to assess the status of existing programs that might constitute elements of an SSP. The analysis should be followed by development of legislation and operating regulations for the SSP.

Early in the implementation process, a training program should be developed for employees of regulatory authorities to ensure that they understand safety management concepts and related ICAO standards and recommended practices (SARPs), and to ensure that they have the knowledge to "accept and oversee" implementation of the key components of an SMS, in compliance with national regulations and ICAO SARPs.

In order for an SSP to specifically support SMS implementation, additional steps are required — the development of SMS requirements for service providers and related guidance materials, and the revision of the civil aviation oversight authority's enforcement policy.

"During the course of normal safety management activities under the respective SSP and SMS, the state and the service providers will exchange safety data," the *SMM* said. "The service providers' safety data received by the state will be [proprietary] data, a part of which the state will convert into aggregate data. A significant amount of all these data will reasonably refer to safety concerns

"The service providers' SMS cannot effectively perform either in a regulatory vacuum or in an exclusively compliance-oriented environment."

identified through the normal course of the service providers' SMS processes. If the response to this data by the civil aviation oversight authority is enforcement action, the safety management process in the state will grind to a halt."

To prevent such situations, the *SMM* said, revision of enforcement policies is required "to ensure continuing flow and exchange of proactive and predictive safety management data with service providers who operate under an SMS environment."

The *SMM* recommended that the SSP include provisions to ensure that, although "gross negligence, reckless conduct and willful deviations should be dealt [with] through established enforcement procedures," some specific safety concerns should be handled internally by airlines and other service providers and within the context of the provider's SMS.

'Ambitious Undertaking'

One of the few regulatory authorities to have implemented an SSP is the U.K. Civil Aviation Authority (CAA), which in late 2008 published the supporting document.[6]

In the foreword to the document, Peter Griffiths, the U.K. director general of civil aviation, described development of the SSP as an "ambitious undertaking."

He added, "For a state to produce an SSP, it requires the state to examine its own legislation, policies and processes in a new light. Although it may be assumed that all was in order, the SSP may reveal issues that should be resolved to improve the way in which aviation safety is managed in the state."

For the CAA, development of the SSP was complex because of the involvement of other organizations — most notably the Department for Transport and the European Aviation Safety Agency (EASA) — in the regulation of aviation in the U.K. and the need to accommodate the U.K.'s relationships with its territories and dependencies overseas. In addition, because military aircraft are so active within U.K. airspace, the CAA decided that the SSP would address both civil and military aviation.

Details of the roles to be played by EASA and the European Community will be described in the Community Safety Programme (CSP) being developed by EASA. The CSP, which will be EASA's version of an SSP, is expected to be issued in 2009.

The gap analysis found that although "most essential elements of the safety framework are well established," some items were identified for improvement, Griffiths said.

Training Sessions

For regulatory authorities still without an SSP, ICAO plans to conduct training beginning in March to aid in SSP development and implementation, as well as the collection, analysis and exchange of aviation safety data.[7]

The training, which will be offered, on request, to personnel in regulatory authorities, is designed to aid in the development of the resources required to implement their SSPs and to extend their safety data management capabilities. The objective is to encourage self-sufficiency in SSP operations and in the handling of safety data.

ICAO Secretary General Taïeb Chérif said that, in addition, countries that have developed an SSP are expected to cooperate to help regulatory personnel from other countries, "thus achieving the synergistic partnership recognized as necessary for the global implementation of safety management practices."

Flight Safety Foundation's International Advisory Committee (IAC) said some of the benefits associated with SMS already are being realized, "not only in terms of safety, but [SMS] has given greater clarity to air transport organizations and resulted in enhanced operational efficiency."

Nevertheless, the IAC said, "SMS implementation is proving to be a tougher road than expected."

Notes

1. ICAO. *Safety Management Manual*, second edition, unedited draft. Montreal, 2008.
2. Booth-Bourdeau, Jacqueline. "Assessing Compliance in a SMS Environment: A Systems Approach to Oversight." In *Proceedings of the 61st annual International Air Safety Seminar*. Alexandria, Virginia, U.S.: Flight Safety Foundation, 2008.
3. Office of the Auditor General of Canada. *2008 May Report of the Auditor General of Canada*, "Chapter 3 — Oversight of Air Transportation Safety — Transport Canada." <www.oag-bvg.gc.ca/internet/English/parl_oag_200805_03_e_30699.html#appa>.
4. CASA. *Notice of Proposed Rule Making: Implementation of Safety Management Systems (SMS) and Introduction of Human Factors (HF) Training and Non-Technical Skills (NTS) Assessment*. Proposed amendments to Civil Aviation Orders (CAOs) 82.3 and 82.5. Document NPRM 0803OS, November 2008. Also, *The CASA Briefing*. November 2008. <www.casa.gov.au/corporat/casabriefing/08nov.htm>.
5. FAA. *Information for Operators: FAA Safety Management System (SMS) Developments — No. 2*, InFO 08053, Nov. 26, 2008.
6. U.K. CAA. *State Safety Programme for the United Kingdom*, Civil Air Publication (CAP) 784. October 2008.
7. Chérif, Taïeb. Letter to regulatory personnel, "Implementation of the State Safety Programme (SSP) in States." Nov. 13, 2008.

Further Reading From FSF Publications

Stimpson, Edward W.; McCabe, William O. "Managing Risks in Civil Aviation." *AeroSafety World* Volume 3 (November 2008): 10–14.

Deb, Sushant. "An SMS Standard for All Airports." *AeroSafety World* (May 2008): 42–45.

When the Royal Aeronautical Society published its Specialist Document "Smoke and Fire in Transport Aircraft" (SAFITA) in February 2007, the document said that in the United States an average of one airplane each day diverts due to a smoke event. However, new information from the FAA now puts that average at more than two diversions daily. Improved reporting of events accounts for much of the increase, but it is clear that the problem of smoke in aircraft is not improving across the industry.

Everyone in the industry remembers well the tragic loss of Swissair Flight 111, a McDonnell Douglas MD-11 that crashed near Halifax, Nova Scotia, on Sept. 2, 1998. The Transportation Safety Board of Canada (TSB) investigated the accident and wrote a comprehensive report that detailed the ways in which this accident was an example of the potential extreme consequences of a smoke/fire/fumes event in an aircraft. Following the recommendation of the TSB, improvements were made in the MD-11's thermal acoustic blankets. While

Continued on page 34

It's time to implement recommendations for mitigating smoke/fire/fumes events.

NO SMOKING in the Cockpit

BY JOHN COX

© Chris Sorensen Photography

Smoke, Fire and Fumes Events in the United States and Canada, October–November 2008

Event Date	Flight Phase	Event Airport	Event Classification	Event Sub-classification	Aircraft Model	Operator Name
Oct. 8, 2008	Climb	La Guardia, New York (LGA)	Return to airport	Smoke alert	EMB-145LR	Chautauqua Airlines
After takeoff from LGA, flight crew received an EICAS lavatory smoke indication.						
Oct. 7, 2008	Climb	Portland, Oregon (PDX)	Return to airport, unscheduled landing	Smoke in cockpit	A320	Allegheny Airlines
5 minutes after takeoff, smoke started coming out of center glareshield panel.						
Oct. 7, 2008	En route	Denver, Colorado (DEN)	Diversion, unscheduled landing	Fumes in cabin	DC-9	American Airlines
Crew reported strong electrical smell in aft cabin. Flight attendant and passengers nauseous.						
Oct. 30, 2008	En route		Diversion, unscheduled landing	Fumes in cabin	A320	United Air Lines
Flight diverted after electrical smell in cabin.						
Oct. 3, 2008	Descent		Emergency landing	Smoke in cabin	EMB-145LR	American Eagle Airlines
On approach, cabin started filling with hazy smoke. Emergency descent to landing initiated.						
Oct. 29, 2008	En route	Memphis, Tennessee (MEM)	Emergnecy landing	Smoke in cockpit	727	Federal Express
At FL350, electrical odor was noted; donned O_2 masks and ran "Smoke" checklist. Smoke visible near first officer's LIDO bag.						
Oct. 29, 2008	En route		Diversion	Smoke in cockpit, fire in cockpit	Beech 58	Corporate
Pilot smelled smoke and saw flames coming out of propeller heat circuit breaker switch.						
Oct. 28, 2008	Climb	Charlotte, North Carolina (CLT)	Return to airport, emergency landing	Smoke in cabin	ERJ190	Allegheny Airlines
Smoke/fumes in aft galley. Captain requested emergency equipment upon return to airport.						
Oct. 27, 2008	Climb	Dallas, Texas (DAL)	Return to airport, emergency landing	Smoke alert, smoke in cabin	737	Southwest Airlines
Both lavatory smoke alarms sounded; flight attendants reported haze in cabin.						
Oct. 24, 2008	Descent		None	Smoke in cockpit	Saab 340	Colgan Airways
Smoke in cockpit during descent.						
Oct. 24, 2008	Climb		Return to airport, unscheduled landing	Smoke in cockpit	EMB-120ER	Sky West Airlines
After takeoff, smell of smoke in flight deck, lavatory smoke detector activated.						
Oct. 23, 2008	En route	Columbus, Ohio (CMH)	Return to airport, unscheduled landing	Smoke in cockpit, smoke in cabin	EMB-145LR	American Eagle Airlines
On climbout, flight crew observed smoke in the cockpit and cabin.						
Oct. 23, 2008	Climb	Jamaica, New York (JFK)	Return to airport	Odor in cockpit, odor in cabin	ERJ190	JetBlue Airways
Burning odor detected in cockpit and cabin.						
Oct. 2, 2008	Climb		Unscheduled landing	Smoke in cockpit	Lear 60	Corporate
Upon leveling off at FL410, flight crew observed smoke in the area of the copilot's control yoke.						
Oct. 19, 2008	Climb		Return to airport, emergency landing	Fumes in cockpit	A320	Allegheny Airlines
Captain donned O_2 mask and declared emergency after fumes in cockpit.						
Oct. 17, 2008	Climb	Kansas City, Missouri (MCI)	Return to airport, unscheduled landing	Smoke in cabin	EMB-145XR	Continental Express
Flight crew reported smoke in the cabin shortly after takeoff.						
Oct. 17, 2008	Climb	Atlanta, Georgia (ATL)	Return to airport, unscheduled landing	Smoke in cabin	DC-9	American Airlines
During climbout, flight attendant reported white smoke in cabin.						
Oct. 17, 2008	Climb	Jamaica, New York (JFK)	Return to airport, unscheduled landing	Smoke in cabin	767	American Airlines
Crew reported smoke in cabin.						
Oct. 16, 2008	Climb		Return to airport, unscheduled landing	Smoke in cockpit, smoke in cabin	CL600	Sky West Airlines
After takeoff, aircraft filled with smoke. Toilet smoke caution received.						

Smoke, Fire and Fumes Events in the United States and Canada, October–November 2008

Event Date	Flight Phase	Event Airport	Event Classification	Event Sub-classification	Aircraft Model	Operator Name
Oct. 10, 2008	En route	Florence, South Carolina (FLO)	Diversion, emergency landing	Smoke in cockpit	Dash 8	Henson Aviation
Flight crew diverted to FLO with smoke in the cockpit and burning smell in cabin.						
Nov. 30, 2008	En route	Managua, Nicaragua (MGA)	Diversion, emergency landing	Smoke in cabin	737	Continental Airlines
Crew declared an emergency following engine problems. During diversion the cabin started to fill with smoke.						
Nov. 28, 2008	En route		Diversion, emergency landing	Smoke in cabin	737	Southwest Airlines
Declared an emergency with smoke in the cabin.						
Nov. 28, 2008	En route	Charleston, West Virginia (CRW)	Diversion	Smoke in cockpit	CRJ-200	Atlantic Southeast Airlines
Diverted after the crew smelled smoke in the cockpit. Landed approximately 15 minutes later.						
Nov. 26, 2008	Climb	Minneapolis, Minnesota (MSP)	Return to airport, unscheduled landing	Smoke alarm, fumes in cabin	CL600	Mesaba Aviation
Amber caution smoke in lavatory. Flight attendant reported fire odor. Aircraft landed overweight.						
Nov. 25, 2008	Climb		Return to airport, unscheduled landing	Smoke in cabin	EMB-135BJ	Corporate
Immediately after departure crew noted the cabin filling with smoke.						
Nov. 25, 2008	Takeoff		Aborted takeoff	Smoke in cockpit	EMB-135KL	American Eagle Airlines
At 80 kt on takeoff roll, cockpit became hazy with smoke accompanied by odor.						
Nov. 25, 2008	Climb	Jamaica, New York (JFK)	Return to airport, emergency landing	Smoke in cockpit, smoke in cabin	ERJ190	JetBlue Airways
Smoke in cabin and cockpit.						
Nov. 24, 2008	Descent		Emergency landing	Smoke in cabin	MD-88	Delta Air Lines
Smoke in cabin, both aft lavatory smoke detectors alarmed.						
Nov. 24, 2008	Climb	Houston, Texas (IAH)	Return to airport, unscheduled landing	Smoke in cabin	CL600	Chautauqua Airlines
Flight attendant reported smoke rising from the floor distribution ducts.						
Nov. 23, 2008	En route	Buffalo, New York (BUF)	Diversion, emergency landing	Smoke in cockpit	ERJ190	JetBlue Airways
Cockpit smoke smell at FL380, EICAS failure, multiple faults.						
Nov. 20, 2008	Climb	Fort Myers, Florida (RSW)	Return to airport, unscheduled landing	Smoke in cabin	EMB-145LR	Continental Express
Flight attendant reported smoke in the cabin.						
Nov. 17, 2008	Climb		Return to airport, emergency landing	Smoke in cockpit, smoke in cabin	Lear 35A	Corporate
On takeoff, crew noted smoke and fumes in aircraft, aircraft pressurization was in emergency.						
Nov. 17, 2008	Takeoff	Burbank, California (BUR)	Aborted takeoff	Smoke in cockpit	CL600	Mesa Air Group
Flight crew aborted takeoff and returned to gate due to smoke in the cockpit.						
Nov. 15, 2008	Climb		Return to airport, emergency landing	Smoke in cockpit, smoke in cabin	Emb135KL	American Eagle Airlines
Crew reported smoke detected in cabin and cockpit 30 seconds after takeoff.						
Nov. 12, 2008	Climb		Unscheduled landing	Smoke in cockpit, smoke in cabin	MD-88	Delta Air Lines
Smoke in cabin and cockpit.						
Nov. 11, 2008	En route	Jacksonville, Florida (JAX)	Diversion, emergency landing	Smoke in cabin	717	AirTran Airways
Crew declared an emergency due to smoke in the cabin.						
Nov. 11, 2008	Takeoff	Winnipeg, Canada (YWG)	Aborted takeoff	Smoke in cabin	CRJ-200	Sky West Airlines
Rejected takeoff due to fire alert in rear lavatory, with smoke. Two hours later, the same aircraft attempted takeoff again with the same warning.						

EICAS = engine indicating and crew alerting system

Source: FAA, SDR (Service Difficulty Reports) data compiled by Safety Operating Systems this was a needed improvement, it was not all that needed to be done.

In February 2006, a McDonnell Douglas DC-8 freighter landed in Philadelphia with a cargo fire. The U.S. National Transportation Safety Board (NTSB) investigated the accident. In its report, the NTSB cited the need for improved "Smoke/Fire/Fumes" checklists and recommended widespread adoption of a new checklist developed by industry initiative, concurring with a recommendation made by the TSB.

Flight Safety Foundation led an industry group to develop an improved checklist used by flight crews facing an in-flight smoke/fire/fumes event. Boeing, Airbus, Embraer and Bombardier have agreed to begin using this improved checklist, an agreement that is a step forward in helping flight crews to successfully deal with in-flight fires.

The incorporation of the new checklist is one of 18 recommendations in SAFITA. SAFITA, like the TSB and NTSB reports, recommends specific improvements to reduce the likelihood and severity of a fire aboard an airplane. The U.S. Federal Aviation Administration (FAA) recently adopted another of the recommendations by requiring improved maintenance programs for aircraft wiring. This is a good step to reduce the source of ignition.

Have we done enough? Based on the recent experience of a flight crew that diverted to South Florida because of a smoke event, more needs to be done. This flight crew suddenly had dense smoke in the flight deck, followed by a windshield beginning to crack. The inner pane of the windshield shattered. Fortunately, the source of the smoke was located and electrical power removed. A successful unscheduled landing followed, just one of that day's several smoke-caused diversions.

This Florida diversion reminds us of the needs pilots have for oxygen to breathe, to keep smoke out of their eyes and to see the flight instruments. Pilots must be able to fly the aircraft, accomplish the checklist, set up the approach procedure and successfully land the aircraft. Reinforcing the importance of protecting a pilot's ability to perform, the International Federation of Air Line Pilots' Associations (IFALPA) considers a pilot who cannot see his or her flight instruments to be incapacitated.

Improved flight crew training can make a significant difference in the outcome of a smoke/fire/fumes event. Many newer flight simulators use theater smoke to realistically simulate a smoke event. This more realistic simulation shows the challenges in communications between the crewmembers and with air traffic control, and the difficulty of programming flight management computers under such conditions. Improved training is one of the SAFITA recommendations.

While it is tempting to look back and believe that we have not had a serious fire event since 1998, investigation proves otherwise. In 2007, a widebody jet experienced a serious fire just after engine start. The crew only became aware of electrical anomalies following the second engine start. Maintenance technicians found evidence of a considerable fire in the electronics bay.

The FAA said in November 2005 in a notice of proposed rulemaking, "We have concluded we are unlikely ever to identify and eradicate all possible sources of ignition."

Accepting that aircraft will continue to have smoke events, the industry must develop multiple layers of mitigation to reduce the hazard to an acceptable level. The NTSB, TSB and SAFITA each recommend steps we can take to lower the risk. By reviewing and implementing these recommendations we can reduce the chance of a fire and the impact on the flight, and increase the probability of a successful outcome.

Aircraft are one of the worst places a fire can break out. In flight, a fire must be extinguished with the items on board; expert training and good equipment are essential. Operators should improve maintenance practices to inspect thermal acoustic blankets, which can provide fuel if a fire breaks out. Each of the multiple layers of mitigation is a step to risk reduction. It is time to implement the recommendations made by the NTSB, TSB and SAFITA.

Flight Safety Foundation is working with the Royal Aeronautical Society and others to enlighten the industry about this issue's importance. By working together, successful cost-effective mitigations can and should be implemented. The Swissair Flight 111 tragedy happened more than 10 years ago — we must not let time dim the memory of the importance of that accident. We have analyzed accidents and incidents involving in-flight smoke/fire/fumes. It is now time to act and implement the recommendations.

Capt. John Cox is chief executive officer, Safety Operating Systems. He is a 25-year veteran of flying for a major U.S. airline. He served as executive air safety chairman for the Air Line Pilots Association and participated in accident investigations, including USAir 427.

(Editor's note — This article and chart introduces a new feature in *AeroSafety World*, a quarterly chart that is intended to focus attention on a continuing risk factor: significant smoke, fire and fumes events in the U.S. This information is drawn from available U.S. sources. However, should information from other nations or regions become available we will endeavor to use it.)

BY NICHOLAS A. SABATINI

Managing Safety From the Inside Out

When Jerry Lederer started Flight Safety Foundation in 1947, U.S. air carriers averaged a major accident every 16 days, for a fatality rate that approached 2,000 fatalities per 100 million people flown. Today, that rate is down dramatically to an average of 2.5 fatalities per 100 million people flown. While the overall rate is higher on a global scale, the strong safety record in most regions of the world is a remarkable achievement.

Yet, we can never rest. With aviation's vital importance, we must build on this achievement. The U.S. Federal Aviation Administration (FAA) is taking a two-pronged approach to manage risks and keep improving safety. To begin, the FAA is managing risk from the "inside out." The FAA's Aviation Safety Organization has been undergoing a rigorous self-examination — looking at how it is organized, at processes, and at internal measures and accountability. At the same time, the FAA must focus outward on the entities and individuals that it regulates.

In his book, *Managing the Risks of Organizational Accidents*, James Reason discusses the importance of such an inside-out approach. He says you must manage risks from inside because an organization, such as the FAA, could unwittingly contribute to an unsafe condition or unsafe practices.

Organizational risk is not new in aviation. It was present at Kitty Hawk with Orville and Wilbur Wright and machinist Charlie Taylor. It was present in the 1940s with accidents every 16 days. Yet, organizational risk was largely undetected because it was overshadowed by greater risks — such as engine failure, controlled flight into terrain, loss of control, and approach and landing accidents. Now that we have fundamentally addressed those common causes, we need to identify and address other vulnerabilities, including organizational risk, which now may pose greater concern. Metaphorically, organizational risk is taller due to the flatness of the surrounding terrain.

As a regulator, the FAA requires regulated organizations to operate with a safety management system (SMS) and to have a safety culture. It is essential that the FAA hold itself to the same high standards to which it holds industry. The FAA's Aviation Safety Organization — with its nearly 7,000 employees and many more designees who act on behalf of the FAA administrator — is moving to an SMS. The organization developed an SMS doctrine in concert with industry and

Nicholas A. Sabatini recently retired as FAA associate administrator for aviation safety.

is moving ahead with an implementation plan for an integrated system safety approach across the organization.

SMS is built on the foundation of a quality management system (QMS), which the Aviation Safety Organization implemented through ISO 9001 standards in 2006. QMS addresses processes — their standardization and consistency — as well as continuous improvement. It is essential to add safety management to assure that risk management is incorporated into key processes. Yet, both QMS and SMS are processes executed by humans. For safety's sake, processes must exist in a safety culture. Getting the culture right is more important than the systems used. This is what is most important about managing from the inside out.

For safety's sake, processes must exist in a safety culture. Getting the culture right is more important than the systems used.

What about the second prong — the regulator's essential external focus? What can we do to manage risk more effectively across civil aviation? With an air carrier fatality rate of 2.5 per 100 million people flown, some might think the accident rate has reached such a low level that we should no longer expect sudden and sustained breakthroughs in future rates.

I disagree. The aviation community is on the threshold of the next level in aviation safety. This will be possible by managing risk far more effectively. The way to do this is through gathering and sharing key safety data, using sophisticated data analysis to identify precursors and detect emerging risks, and prioritizing and measuring mitigations.

Today, with the Aviation Safety Information Analysis and Sharing (ASIAS) initiative, the FAA is gathering crucial safety information from a number of data sources. Furthermore, with sophisticated analysis tools, we are detecting trends, identifying precursors and assessing — and addressing — risks.

Here's an example of how data analysis and sharing can make a big safety difference. In 2007, several airlines reported that their digital recorder data, or flight operational quality assurance data, showed that they were getting warnings from their terrain awareness and warning systems (TAWS) at several airports with adjacent mountainous terrain in Northern California.

That was one data point: the finding that several airlines received TAWS warnings in the same area. ASIAS analysts reviewed multiple data sources to get a clearer and fuller picture of the problem. They analyzed minimum vectoring altitudes (MVAs), plotted TAWS warning locations in relationship to these MVAs and overlaid radar track data from arriving flights to reveal a relationship. Then, they overlaid the terrain database combining, or fusing, it with the MVA and TAWS data.

With all of this, the analysts were able to see a causal relationship that could not be seen from any one data source. The experts call what they did "fusion." The single data point — the TAWS warnings — was just that: a single piece of information. But fusing the data sources, including the MVAs, radar track data and more, provided a larger picture, a more complete understanding of the issues, and enabled the FAA Air Traffic Organization and Aviation Safety Organization to work together based on solid objective information.

From those TAWS warnings in Northern California airspace, thanks to data gathering, sharing and analysis, FAA is making flying safer — in the way it designs MVAs, how it vectors traffic, the design of TAWS software and much more.

With ASIAS, we are making a game-changing move from gathering data after accidents, in what has been termed a "forensics" approach, to *preempting* accidents. The more complete data, coupled with advanced analysis, help us find emerging threats and identify precursors — precursors that could be buried in terabytes of safety data. This gives us advance warning and a tremendous advantage in preemptively managing risk.

Years ago, Jerry Lederer said, "Risks are ever-present, must be identified, analyzed, evaluated and controlled." In today's interconnected world — with far greater demand and vastly increased complexity — Lederer's guidance is more prescient than ever. The aviation community must manage risk. It is imperative that we manage risk together.

Donoghue Recognized

for Career Achievements in Aviation Journalism

J.A. Donoghue, Flight Safety Foundation director of publications and editor-in-chief of the Foundation's monthly magazine *AeroSafety World*, has received the 2008 Lauren D. Lyman Award for outstanding achievement in aviation journalism.

"Jay's contribution to the aviation industry spans three decades," said Jay DeFrank, vice president–communications for Pratt & Whitney, part of United Technologies Corp. (UTC). "His stories on air safety and technical-related developments truly exemplify the standards and skills by which Deac Lyman lived and worked."

The award is named after Lauren "Deac" Lyman, a Pulitzer-prize winning aviation reporter for the New York Times who later had a distinguished career as a public relations executive with United Aircraft, a predecessor to UTC.

Donoghue, who has more than 30 years experience covering aviation and 3,500 flight hours as a pilot, began his career in aviation journalism in 1976 as a staff reporter for *Aviation Daily*. Moving to *Air Transport World* in 1980, he held a number of positions before becoming editor-in-chief in 1991 and editorial director of the ATW Media Group in 2002.

"I am overwhelmed to be included in the ranks of past Lyman award winners," Donoghue said in his acceptance speech. "As *Air Transport World*'s third editor-in-chief in its 45-year history, I'm especially pleased to join the Lyman list with Jim Woolsey, the man who hired me and taught me much, especially about the use of photography and graphics in the magazine, and *ATW*'s founder, the late and unquestionably great Joe Murphy. Also, *ATW*'s long-time London correspondent, Arthur Reed, now departed."

Donoghue has won numerous awards for excellence in aviation journalism, including the Royal Aeronautical Society Journalist of the Year recognition in 2004. A former U.S. Army helicopter pilot, his service included a year in Vietnam with the 4th Infantry Division flying Bell UH-1 "Hueys" and Huey gunships. His commercial pilot license includes ratings for helicopters, airplanes and gliders, and he remains an active glider pilot.

Joining Flight Safety Foundation in 2006, he oversaw the transition from seven monthly and bi-monthly newsletters to a new monthly four-color magazine, *AeroSafety World*, which currently has a circulation of 40,000 hard copies and Web downloads per issue.

First presented in 1972, the award goes to a journalist or public relations professional in aviation who exhibits Lyman's high standard of excellence. UTC is the long-time sponsor of the award.

"I find the mission of the Foundation to be highly motivating and the quality of what is done there to be inspiring," Donoghue said. "I couldn't be having more fun and still get paid for it.

"In the end, I've always felt honored to be a member of the aviation trade press and to be a small part of this incredibly exciting aerospace community. The quality of that industry's journalism makes any award presented by our peers special, and none more than this one."

‘Flying Into the Sea’

BY LINDA WERFELMAN

© Elnur/Dreamstime.coom

Investigators said that a lack of visual cues likely led the pilots of an SA 365N to lose control during a nighttime approach to an Irish Sea gas platform.

The crew of a CHC Scotia Aérospatiale SA 365N Dauphin 2 lost control during a nighttime approach to a gas platform in the Irish Sea, overflying the landing site and striking the water. The helicopter disintegrated on impact and sank in the Dec. 27, 2006, crash, killing the two pilots and all five passengers.

The U.K. Air Accidents Investigation Branch (AAIB), in its final report on the accident, cited three contributory factors, including the lack of a “precise” transfer of control from the copilot to the commander after the copilot lost control of the helicopter during the approach in poor weather conditions. Four seconds elapsed after the copilot’s request for help before the commander took control of the helicopter, the report said.

“The commander’s initial actions to recover the helicopter were correct, but the helicopter subsequently descended into the sea,” the report said.

The AAIB also cited “the approach profile flown by the copilot, [which] suggests a problem in assessing the correct approach descent angle, probably … because of the limited visual cues available to him.”

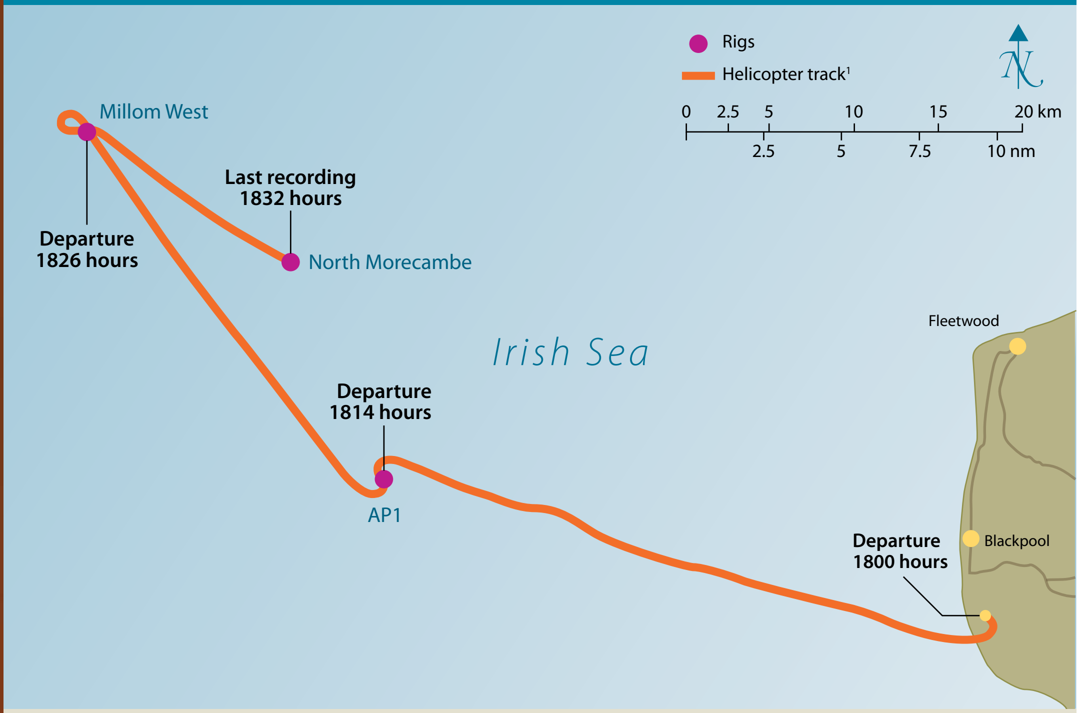
The third contributing factor was the company’s failure to use “an appropriate synthetic training device,” although one was available, the report said. “The extensive benefits of conducting training and checking in such an environment were therefore missed.”

The report said that the helicopter had departed at 1800 local time from Blackpool Airport, a base for helicopter support for gas operations in the East Irish Sea, for a planned eight-segment flight to offshore gas production platforms operated by Hydrocarbon Resources Limited (HRL).

The crew had flown a similar multisegment flight earlier in the day and had completed the first two segments of the accident flight without incident. As they began the third segment, from the Millom West platform, five passengers boarded. Plans called for a seven-minute flight to the North Morecambe platform to pick up a passenger and some freight before continuing to another platform.

The helicopter left Millom West at 1826, climbed to 500 ft and accelerated to 125 kt. The automatic flight control system was engaged, and the helicopter

Route of Accident Flight



Note:

1. The helicopter's track was derived from its combined voice and flight data recorder.

Source: U.K. Air Accidents Investigation Branch

Figure 1

his sighting of the platform but climbed to just over 400 ft and then began another descent.

The helicopter's combined voice and flight data recorder (CVFDR), which records five hours of data and one hour of audio from the commander's, copilot's and cockpit area microphones, at 1832:21, recorded the commander saying, "You get no depth perception, do you?"

The copilot replied, "Yeah, not on this one, not tonight, no." During this part of the approach, there were "steady increases in the collective, tail rotor input, cyclic pitch and cyclic roll input," and radio height decreased, then increased, the report said.

At 1832:33 — with cyclic pitch and roll inputs increasing and oscillating, the collective increasing at an escalating rate and the helicopter pitching nose down and rolling right — the commander asked, "You all right?" and the copilot answered, "No, I'm not happy, mate."

As the combined engine torques exceeded 100 percent, the commander asked, "We going round?" and the copilot replied, "Yeah, take … help us out."

The report said, "This request was not initially understood by the commander, and the copilot

was in the normal stabilization mode for flight, the report said. The commander, the pilot not flying, confirmed that lights on the North Morecambe platform were properly illuminated.

"Shortly after the 4 nm [7 km] GPS [global positioning system] call made by the commander, the crew became visual with the rig, and the copilot said, 'I got the deck now,'" the report said. "Allowing for the speed of the helicopter at the time, this equates to a visual range of about 6,800 m [4 mi]. The commander then completed before-landing checks, which included arming the floats."

The helicopter was at about 270 ft when the copilot announced reiterated his request, saying, 'Help us out.' The commander took control approximately four seconds after the initial request for help and said, 'I've got it, I've got it, I have got it, I have control, I have control.'" At the time, the helicopter's right bank angle increased to 38 degrees, its nose was about 38 degrees down, indicated airspeed (IAS) was 90 kt and increasing, and radio altitude was 290 ft, with a descent rate of 2,000 fpm.

A second after the commander took control, the report said, "a large left cyclic roll input was made, followed one second later by an aft cyclic pitch input." The helicopter's bank angle shifted to 7 degrees left, and pitch attitude shifted to 13 degrees nose-down; as the helicopter descended through 180 ft, IAS increased through 100 kt. Over the next six seconds, IAS continued to increase; vertical speed, which initially had been reduced to 1,320 fpm, increased to 1,690 fpm.

'You All Right?'

"At 1832:45, the copilot uttered an expletive, as though disappointed, and the commander asked, 'You all right?'; the copilot said, 'Yep … no,' in a resigned manner," the report said. At 1832:47, the automatic voice alert device, which provided audio warnings of the helicopter's height above the surface, sounded a "100 feet" call.

The report described cockpit communications as "calm" and said that there were no indications of other problems. The helicopter was last recorded at 30 ft in a 12-degree nose-down attitude, a 20-degree right bank and an IAS of 126 kt. The recording ended at 1832:50.

Witnesses on the North Morecambe platform told investigators that the helicopter appeared to be on a standard approach until it "appeared to initiate a go-around, although it seemed faster and closer to the platform than normal," the report said. The helicopter then banked right and disappeared into darkness before the witnesses heard an impact with the water.

The fuselage broke apart on impact, and most sections of the helicopter sank. Rescue boats arrived 16 minutes after the crash from a multipurpose standby vessel that was near the platform. Bodies of six of those in the helicopter were recovered, but the seventh was not found.

The commander, who had flown helicopters in the Morecambe Bay gas field for 20 years, was the base chief pilot, a line training captain and a crew resource management instructor. He had an airline transport pilot license and an instrument rating, and had accumulated 8,856 flight hours, including 6,156 hours in type. Records showed he had completed 34 instrument approaches and 37 night deck landings in the 90 days before the crash.

The copilot had received helicopter flight training in the British Army and had flown emergency medical services helicopters for 2 ½ years. He had been working for CHC Scotia for 13 months at the time of the accident and had 3,565 flight hours, including 377 hours in type. He had 467 hours of night flight — three of which were recorded in the three months prior to the accident. He had completed nine instrument approaches and seven night deck landings in the 90 days before the crash.

The helicopter was manufactured by Aérospatiale (now Eurocopter) in 1985 and had accumulated 20,469 airframe hours and 13,038 cycles. Records showed that it had been maintained in accordance with an approved maintenance schedule and was in compliance with all applicable airworthiness directives. Maintenance records for the 12 months preceding the accident showed no defects had been reported that related to the crash. A routine 50-hour maintenance check had been performed the day of the accident, and no problems were reported.

'A Particularly Dark Night'

Weather at the time of the accident included visibility of 3 to 7 km (2 to 4 mi) in mist and light rain or drizzle, scattered to broken clouds with a base at 700 ft, broken to overcast clouds with a base at 1,200 to 1,500 ft and surface wind from 130 degrees at 15 kt. A weather observer on a platform near the accident site said that conditions about 90 minutes before the accident included 4,000 m (2.5 mi) visibility in rain and skies obscured; an accurate assessment of the cloud base was not possible because the observer did not have appropriate equipment to measure it.

The report said that, although there was a half moon, the clouds completely obscured any light from the moon, and "it was a particularly dark night."

Data from the helicopter's integrated health and usage monitoring system (IHUMS), which incorporated the CVFDR, showed that no system fault warnings were activated during the accident flight. Two main gearbox exceedances were recorded — the first, when the combined engine torque exceeded 100 percent at an airspeed below 75 kt, and the second, after the commander took the flight controls, when the torque exceeded 94 percent with the airspeed above 75 kt.

Data also showed that, during the accident segment of the flight, the autopilot heading hold, IAS hold, altitude hold and area navigation (RNAV) modes were not used.

Two Distinct Phases

The report said that, because there was no evidence of any technical problem, investigators focused on human factors issues "to understand why two experienced pilots were unable to stop a serviceable helicopter [from] flying into the sea."

Investigators identified "two distinct phases" of the final approach. The first involved a "steady reduction in collective demand and a steady, positive change in pitch attitude," the report said. The second — which began after the commander's callout of "fifty-five," a reference to airspeed — involved a steady increase in collective demand as the helicopter began to climb, suggesting "a change in the appreciation of the helicopter's position or motion relative to the deck," the report said.

"The approach was flown essentially by reference to visual cues. In dark, overcast conditions, it is likely that some cues were degraded or absent. For example, without a distinct horizon, the assessment of pitch attitude and approach angle (by reference to the depression of the deck below the horizon) would be compromised."

The report noted that if recommended changes in helideck lighting had been implemented, better visual cues might have been available, perhaps enabling the crew to determine earlier in their approach that they had deviated from a safe approach path. The recommendations — to be mandated by the International Civil Aviation Organization beginning in 2009 — call for installing green lights instead of yellow lights on helideck perimeters as a means of enhancing pilot situational awareness. Further trials by the U.K. Civil Aviation Authority (CAA) have led to the development of other helideck lighting patterns now being tested on offshore platforms.[1]

The report said that judging the approach angle apparently had presented the crew with a significant challenge that might have been met by minimizing the number of variables involved — "by commencing the descent at a specified height and range, and maintaining a stable pitch attitude and a fixed relationship to the intended landing area" — or by using instrument references in

Aérospatiale SA 365N Dauphin 2

© Darren Wilson/Airliners.net

The Aérospatiale (now Eurocopter) SA 365N, first flown in 1979, is a twin-engine helicopter designed to carry two pilots and up to eight passengers. It is equipped with Turbomeca Arriel 1C gas turbine engines, each rated at 530 kW (710 shp).

Empty weight is 2,017 kg (4,447 lb) and maximum takeoff weight is 4,000 kg (8,818 lb). Maximum cruising speed at sea level is 140 kt, maximum rate of climb is 1,515 fpm, and service ceiling is 15,000 ft. Maximum range, with standard fuel at sea level, is 475 nm (880 km).

Source: *Jane's All the World's Aircraft,* U.K. Air Accidents Investigation Branch addition to the limited visual cues. However, the radio altimeter was not in a location that enabled it to be conveniently included in the copilot's instrument scan, the report said, and the cockpit voice recorder indicated that the crew was not "using range information to determine the initiation of the descent or cross-checking with height, and except for the 'fifty-five' call and one height call at 400 ft, the commander did not provide any information that may have assisted the copilot.

"The nature of the copilot's difficulty is open to conjecture; he may have commenced the descent too early or initially too steeply; or he may have used an inappropriate control strategy or inadvertently changed the pitch attitude. The underlying causes, however, most likely stem from the limited visual cues available and the paucity of instrument checks. Inadequate monitoring of the approach by the commander must also be regarded as a contributory factor."

The report also said that the commander appeared "ill-prepared" to take control of the helicopter and that both the go-around decision and the subsequent transfer of control to the commander appeared to have been handled inappropriately.

"It is possible that more positive crew interaction and a more active participation in approach profile monitoring by the non-handling pilot may have resulted in a positive outcome," the report said.

Monitoring the Approach

The report included a safety recommendation that CHC Scotia review its standard operating procedures (SOPs) for helideck approaches "to ensure that the non-handling pilot actively monitors the approach and announces range to touchdown and height information to assist the flying pilot with his execution of the approach profile."

The recommendation said that the non-handling pilot's assistance is especially important when an SA 365N copilot is flying an approach in poor visual conditions "and cannot easily monitor a poorly positioned radio altimeter."

A second recommendation to the operator called for a review of all SOPs concerning helideck approaches flown by all of its types "with the aim of ensuring safe operations."

Another recommendation called on the European Aviation Safety Agency (EASA) to ensure the prompt completion of research into instrument landing systems that would aid helicopter crews in monitoring approaches in poor visual conditions to oil and gas platforms.

A second recommendation to the EASA said the agency should investigate methods of increasing the conspicuity of immersion suits worn by flight crewmembers. Rescuers had told accident investigators that the yellow immersion suits worn by passengers of the accident helicopter were easier to see than the blue suits worn by the pilots.

The AAIB also recommended that the CAA ensure that recurrent training and checking of JAR-OPS (Joint Aviation Requirements–Operations), Part 3 approved operators be conducted in an approved synthetic training device.

A second recommendation to the CAA called on the agency to ensure that personnel who conduct weather observations from offshore facilities are "suitably trained, qualified and provided with equipment than can accurately measure the cloud base and visibility." The report noted that the employee who compiled weather data on the evening of the accident had not received formal training and had no equipment to aid in his observations.

After the accident, the operator provided more specific procedures and guidance for actions to be taken in the event of pilot disorientation or incapacitation; developed go-around procedures that included use of the autopilot coupler; developed and published a night circuit pattern; and continued development of its policy to train all pilots in synthetic training devices.

This article is based on AAIB Accident Report No. 7/2008: *Report on the Accident to Aerospatiale SA 365N, Registration G-BLUN, Near the North Morecambe Gas Platform, Morecambe Bay, on 27 December 2006.*

Note

1. CAA. *Enhancing Offshore Helideck Lighting*, CAA Paper 2004/01.

Fairly Disciplined

Shanghai Airlines reports positive results after launching China's first conditional nonpunitive FOQA program.

BY WAYNE ROSENKRANS

Airlines, pilots and civil aviation authorities worldwide have struggled for decades to reconcile their conflicting interests to obtain maximum benefits from flight operational quality assurance (FOQA) programs, also known as flight data monitoring. They all want to be successful in detecting accident precursors and unsafe trends in routine flight data. They also want to foster a work environment in which flight crews readily report deviations from standard operating procedures (SOPs) and cooperate in analysis of flight parameter exceedances.

Airlines in China, as in most countries, this year will redouble efforts to integrate existing FOQA programs into their implementation of safety management systems (SMSs), according to a presentation and *ASW* interviews during the Joint Meeting of the Flight Safety Foundation 61st annual International Air Safety Seminar, International Federation of Airworthiness 38th International Conference and International Air Transport Association in Honolulu. Some could replicate the approach of Shanghai Airlines, which decided that nonpunitive FOQA policies stand a greater chance of success than punitive policies of the past. Because of culturally ingrained beliefs about individual accountability for complying with safety rules, however, some aspects of Shanghai Airlines' policies have caught off-guard aviation safety professionals in North America and Europe.

Unlike the 20 U.S. airlines — out of 68[1] — that voluntarily analyze

© Florian Trojer/AirTeamImages

Wayne Rosenkrans

Fan

parameters of daily airplane operations captured by quick access recorders (QARs), all airlines in China for about 12 years have been required to install QARs on their airplanes, except those that are technically incompatible, and to conduct a FOQA program.

Encouraging China's airlines to also adopt a nonpunitive FOQA policy has become a strategic priority of the Civil Aviation Administration of China (CAAC). "Right now, there is a 90 percent–plus QAR installation rate for all Chinese airlines," says Fang Jun, coordinator for international safety programs at CAAC headquarters. "FOQA is not so new for Chinese airlines, but SMS is. Since we are advocating and pushing the implementation of SMS, the FOQA programs are essential."

Early Adoption of QARs

In 1997, CAAC issued an airworthiness directive requiring all Chinese airlines to equip their aircraft with QARs or equivalent equipment. Policy details for routine flight data monitoring and analysis, however, were left to each airline.

Data collection with QARs was seen as a way for CAAC and airlines to reduce delays in obtaining recorded parameters to conduct aircraft incident investigations, recalls Fan Hai-xiang (Steven), deputy general manager, flight technical, and director, Flight Training Center, at Shanghai Airlines. Removing the digital flight data recorder, which primarily is designed for crash investigations, and leaving it at a laboratory for several days of data readout and analysis had proved too cumbersome. "Today, if the airline doesn't have the QAR or equivalent equipment on a technically compatible airplane, the airplane is not airworthy," Fan said.

His airline's effort to introduce FOQA, and overhaul initial assumptions and policy, has been singled out by CAAC as a benchmark for all Chinese airlines. "Shortly after issuing the airworthiness directive, CAAC realized that having QARs on airplanes was not enough," Fan said.

An unintended consequence of sparse QAR and FOQA requirements was free rein for airlines to discipline pilots for any exceedances of aircraft parameters deemed to indicate non-adherence to SOPs (Table 1). This soon caused resentment and resistance among flight crews rather than

© The Boeing Co.

Consequences of Hard Landings for Flight Crews in China

Normal Operations	Airline FOQA Program Monitors QAR Data and Interacts With Crews				CAAC Investigates Landing Event	
	Hard Landing Severity					
<+1.1 g Normal landing	+1.4 g or less Minor exceedance	+1.6 g Moderate exceedance	+1.8 g Severe exceedance	+2.0 g Severe hard landing	>+2.0 g or incident (damage)	Accident
	Typical FOQA Program in China					
No monitoring/ actions	Crew counseled	Discipline for these FOQA exceedances, at discretion of airline mid-management, may include fine, suspension and crew identification in notice to fleet			Consequences determined outside of FOQA program	
	Conditional Nonpunitive FOQA Program at Shanghai Airlines					
No monitoring/ actions	Only trend monitoring if event reported within 48 hours, validated by data and not repeated in 12 months	Crews counseled but not identified to mid-management unless they failed to report event within 48 hours	Crew disciplined but any notice to fleet will not identify them unless event recurs or they fail to report it within 48 hours	Crew suspended, possibly fined, retrained and identified in notice to fleet regardless of event report	Consequences determined outside of FOQA program	

FOQA = flight operational quality assurance; CAAC = Civil Aviation Administration of China; g = 1.0 times acceleration of gravity; QAR = quick access recorder

Source: Shanghai Airlines

Table 1

cooperation in the analysis of events flagged by analytical software.

"The CAAC began to realize there was something not quite right," Fan said. "Airline managers would talk to the crew and ask them what happened, then the pilots would be punished. This was something that should not happen, and CAAC in 2003 called on the airlines to start creating nonpunitive FOQA programs." The regulator also invited airlines, pilots, airframe manufacturers and FOQA-related vendors to take part in annual FOQA seminars in different regions of China.

"Some cultures have approached FOQA programs by using data obtained from flight data recorders to punish the pilots for even minor exceedances of parameters," said Frank M. Hankins, a training captain in China for The Boeing Co. and Fan's co-author of the IASS presentation. "Such is the case in most of mainland China and some other countries in Asia. The pressure on flight crews to fly by the book — knowing that the 'QAR police' are looking over their shoulders — has a very debilitating effect on … their judgments, which jeopardizes the safety of flight."

Shanghai Airlines had chosen hardware and software vendors in 1998, but implemented its FOQA program in 2000, somewhat later than other large airlines in China. Because of the extended implementation time, the company was less vested in the industry's prevailing orientation toward punitive FOQA programs.

"From 2000 to 2004, we did parameter development with emphasis on hard landings; sink rate warnings and high speed at low altitudes; landing long; and unstabilized approaches," Fan said. "The event reports were very few, not enough, so we fine-tuned the parameters and the trigger conditions. We analyzed the event and interviewed the crew. The pilots also got called in by their mid-manager and got punished … we then issued notices to the fleet with pilot identifications. A lot of pilots felt hurt; they did not want to be identified. When we tried to talk to the crews, they would try to keep quiet, saying as little as possible so they would not make trouble for themselves or colleagues. When we could get information, it probably was two or three weeks old … or not enough. Another negative aspect was that the captains started to fly the airplane more; they would not let the first officers fly because if the first officer made a mistake, the captain also got punished. I felt that this was not conducive to effective crew resource management and diminished safety."

Seeds of a major change were sown when Fan approached the airline's senior management about trying something different, drawing from his own safety literature review and visits to nonpunitive FOQA programs in several Western countries. The airline's original FOQA program had failed to live up to expectations, and Fan and his staff were anxious to devise a new nonpunitive reporting policy.

In his pitch to senior management, Fan argued that unjustifiably disclosing flight crew names in notices to the fleet undercut corporate values of fairness and objectivity. "You usually must deidentify them in order to have a fair solution," he said.

One factor in his favor was peer scrutiny of his initial ideas outside China — including at a 2004 regional safety seminar organized by the International Civil Aviation Organization. The audience questioned his reasoning when they heard him propose limited disciplinary measures within Chinese FOQA programs.

Some people who heard him speak, for example, asked him to categorize his proposal as either punitive or nonpunitive. Fan answered, "Our system will be less punitive." Similarly, they asked why airlines ever should disclose the names of flight crews to mid-managers and/or all the fleet pilots. "I admitted that identifying the crew is a punishment," he recalls. "I said, 'Changing that is difficult, but we will try.' Their input really inspired me toward turning my airline's system in a nonpunitive direction."

Shanghai Airlines began with an assumption that flight crews are tempted to conceal mistakes for fear of disciplinary action, lack of confidence that the system would treat them fairly and/or embarrassment. Policy changes would have to address every concern.

"Throughout much of Asian culture, including in China, people believe that if you make a mistake, it is right to discipline and to administer some punishment," Fan said. "It is acceptable, expected and part of who we are as a people. Even pilots who have made big mistakes tell us, 'Punishment is OK, no problem. It's right. I was wrong. I am sorry for that.' But when pilots did not have good protection, or we punished them for minor exceedances, they would say, 'No, this is not fair — why should I be disciplined?' and then they would stay quiet."

Early advocacy of nonpunitive FOQA could not budge senior management from one fixed position. For the most serious FOQA exceedances, a notice to the fleet about each event was considered warranted, including disclosure of the names of the pilots involved. Senior management was willing, however, to require all mid-managers to shift their focus from disciplining individuals to solving systemic problems.

"I told senior management that the situation was like having one window in a room," Fan said. "If this window were open, mid-management only would look out, they would not look at things happening inside the room. But if we shut the window, then they would have to look in other directions for how to solve the problem. That's why I got senior management support."

The company in 2005 had a successful trial run of its revised policy, calling it a *conditional nonpunitive FOQA program*; the program was fully implemented in 2006. It includes objective validation with data of non-normal operational events in the interest of accuracy, consistency and fairness; elimination of disciplinary action — including crew identification — for minor and moderate exceedances of FOQA parameters; and strong incentives/reduced discipline for crews to report non-normal operational events. A few exceptions made the nonpunitive policy "conditional," and the concept still falls within the bounds of *just culture* used in international aviation, Fan believes.

"It's conditional — that's the magic word; our own way of designing a nonpunitive reporting system is probably not the same as that of others," Fan said. *Conditional* means that there are prerequisites for deidentified, nonpunitive handling of a minor or moderate exceedance: The crew must report the event within 48 hours (Figure 1), the report has to be validated by corresponding QAR data, and the crew must not have had a related exceedance within the previous 12 months.

Even with high-level support, Fan and other safety professionals soon encountered opposition at the mid-management level. He attributes this resistance to mid-managers' perceived loss of a management tool/control and to traditional cultural concepts of "father-to-son discipline" that spill over into professional relationships.

"In the past, the mid-managers knew that when they received a FOQA notice to the fleet, they would know who had the problem, who made the mistake, who had the exceedances," Fan said. "Now, the typical report to the fleet just says what happened and how the event happened, but not who did it. During the trial run of conditional nonpunitive FOQA in 2005, the majority of pilots were delighted, but not all of them agreed."

The logic of the new policy still escapes mid-managers who adhere to traditional cultural values. "When we issued the first notice to the fleet with no crew identification on it, the mid-manager responsible for two Boeing 737 fleets asked me, 'Can you tell me who made this mistake?' I said, 'Why do you want to know?' He said, 'If it's another mid-manager's fleet, then it is his problem — I am not going to do anything within my fleets.'" When told that the exceedance had involved a 737, the mid-manager insisted on knowing the crew names and whether the captain or first officer should be held responsible. Fan told him, "This is why I don't want you to tackle the problem by finding a person — I want you to solve this problem in your fleet."

Conditional nonpunitive FOQA offers greater objectivity and fairness than in the past, when disciplinary action varied for the same exceedance severity. The key reason is that mid-managers now have significantly reduced jurisdiction and discretion. "By deidentifying pilots if the event was just a minor exceedance of the set parameters, mid-managers cannot apply any punishment," Fan said.

As in many countries, the Shanghai Airlines personnel handling FOQA data adhere to internal rules of strict confidentiality. No flight crew's identity is disclosed in connection with a FOQA event except by an independent quality supervisor in flight operations.

Reports Pour In

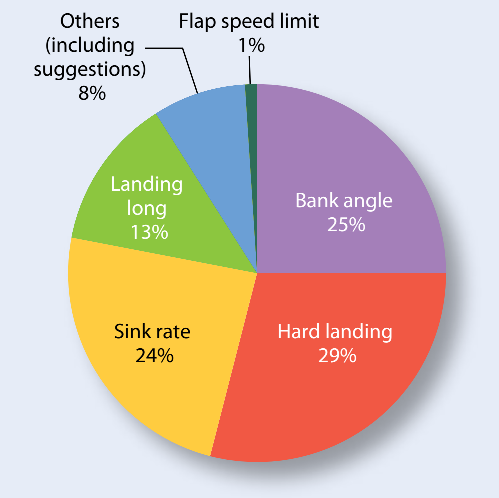
The company said that from February 2005 through December 2007, flight crews submitted 1,518 reports — most pertaining to what pilots suspected were hard landings, landing long or other misconceptions of what constituted a "QAR" event (Figure 2). "Although the reports kept growing, the exceedances rate did not go up," Fan said. These events led to a total of 77 notices to the fleet, in which the names of flight crews were disclosed nine times.

The FOQA office staff analyzes all flight data and also cross-checks the required flight crew event reports to see if an exceedance of parameters occurred and determine the significance of any confirmed event. If not confirmed, no further action is required.

"If there is an exceedance, the FOQA office sends it to the quality supervisor, who talks to the crew and decides whether the fleet needs to be notified or not, and whether the crew needs to be identified or not," Fan said. Exceedances can be minor, moderate or severe. Only severe exceedances trigger automatic notification of the fleet and disclosure of the crew names. Consequences for a pilot responsible for a severe exceedance include a monetary fine, 30-day suspension from flight duty and counseling/retraining in a simulator but do not include termination of employment. For events other than a severe exceedance, the program's conditions come into play.

Among disciplinary actions, disclosure of names to peers is considered personally embarrassing yet acceptable to most pilots. "If we are announcing that somebody made a mistake … everybody knows," Fan

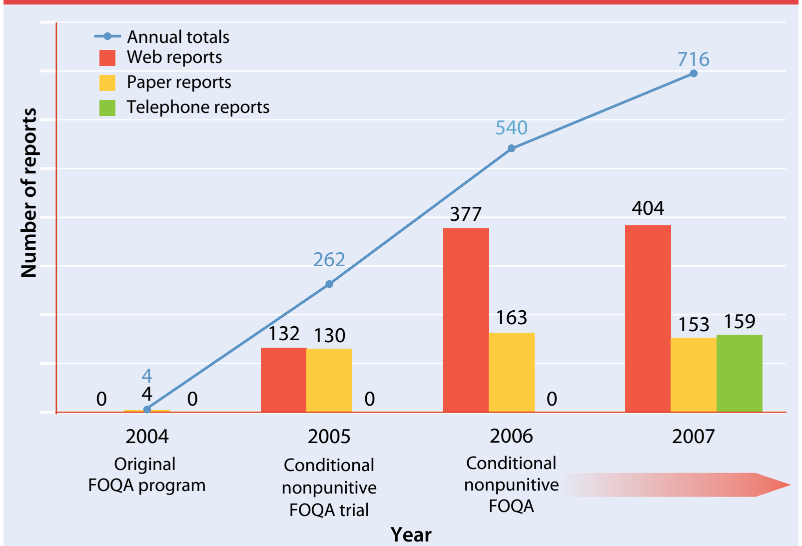
Predominant Flight Crew Event Reports, February 2005–December 2007



Source: Shanghai Airlines

Figure 1

Flight Crew Event Reports Increase



FOQA = flight operational quality assurance

Source: Shanghai Airlines

Figure 2

said. "Identifying all flight crew names, including who was the captain, who was the pilot flying, who was pilot monitoring is a form of punishment."

He draws a distinction between punishment, a matter of justice, and motivating an aviation professional to improve his or her performance. "If we publish the pilots' names in the notice to the fleet, that is not for encouragement or motivation — it is just a lesson for them, a kind of criticism of the crew," Fan said.

Another reason why these pilots have accepted the idea of conditions is that line pilot representatives had a voice in determining which of thousands of flight parameters are recorded and what constitutes an exceedance during data analysis. "It's quite an extensive communication between our office and the pilots," Fan said. "We had wanted to identify flight crews for one type of exceedance, but the pilots said, 'We don't want to be identified for that.'"

Secure Web Site Access

Shanghai Airlines prefers input of flight crew event reports via a secure Web site but also accepts reports on paper and by telephone. Deidentified FOQA information on this special Web site is accessible only by company pilots. They can retrieve, for any listed event, the report title, airplane type, phase of flight, crew narrative of what occurred and lessons learned.

Beyond increased event reporting — which enables timely safety actions by the company — the conditional nonpunitive FOQA program has been successful in other respects, he said. "The pilots are now comfortable about reporting deviations, and they feel comfortable letting the first officers fly," Fan said.

Whether other airlines follow this evolving model remains to be seen. "We have established a CAAC-approved nonpunitive program … but that's not enough," Fan said. "We want to increase the depth and breadth of the trend analysis program to establish the SMS within Shanghai Airlines, and design a vehicle for incorporating trend analysis data into the SMS. We also need to apply the lessons learned to enhance flight operations processes and pilot skills training — especially during flight simulator sessions."

All airlines send to CAAC regional offices monthly reports of deidentified trend data. The regulator usually does not look at FOQA parameter exceedances of a specific flight but retains the right to obtain that data.

FOQA Benefits CAAC

CAAC oversees the safety of aviation from headquarters in Beijing through regional administrations and local field offices within each region. Its primary involvement in FOQA programs is inspections for QAR compliance and existence of a FOQA program, and safety guidance.

"We still have a lot of work to do to be more successful with FOQA programs in China," said CAAC's Fang. "We leave this job to the CAAC regional level. The regional administrations oversee the installation of the QARs and also the FOQA program of the airlines within each respective region. CAAC has given airlines a lot of freedom to do these programs. The Shanghai Airlines program is a benchmark." CAAC in the near future will issue to airlines a second management document that is more explicit about its expectations of nonpunitive FOQA programs, he said.

"We have realized that programs using FOQA data mainly to punish the pilots still exist in some of the airlines," Fang said. "The next management document will have a statement that a FOQA program should be used only to improve safety. It cannot be used for other than that purpose. Corporate safety is more important than the individual saving face."

Unlike the European Aviation Safety Agency and the U.S. Federal Aviation Administration, CAAC does not collect Chinese airlines' FOQA aggregate data at headquarters and conduct trend analysis. "I think that is our future direction, however," Fang said. "FOQA data are fundamental to improve safety … foster a positive safety culture, and provide a forum or channel for pilots to communicate with each other, find problems and correct them in a timely manner."

As more airlines decide how to evolve toward nonpunitive FOQA policies, CAAC remains optimistic. "Before launching nonpunitive FOQA, an agreement on conditions should be reached between the management and the line pilots, especially on the nonpunitive policy," Fang said. "I am not sure about other world regions, but in Asia, it is hard — but not impossible — to adopt even a conditional program because of the culture. It is possible because if the airline leaders, the top management, realize the significance, they will be supportive."

Note

1. FAA. "Statement of Nicholas A. Sabatini, Associate Administrator for Aviation Safety, Before the Committee on Transportation and Infrastructure on 'Critical Lapses in FAA Safety Oversight of Airlines: Abuses of Regulatory 'Partnership Programs.'" April 3, 2008. Air carriers with annual operating revenue greater than US$20 million as of December 2008 included 44 major/regional passenger air carriers and 24 cargo air carriers, according to the U.S. Bureau of Transportation Statistics. Smaller airlines also may qualify to operate FAA-approved FOQA programs but typical participants come from the same categories as these 68 air carriers.

Disparate Measures

Continuing a long-term trend, charter operations had higher accident, fatal accident and fatality rates than scheduled flights in Australia.

BY RICK DARBY

The Australian fatal accident rate for chartered flights increased in 2007 from the previous three years and continues at a higher rate than for scheduled operations, the Australian Transport Safety Bureau (ATSB) reported.[1] The rate for all air transport accidents increased year-over-year (Figure 1). All rates were calculated per 100,000 flight hours.

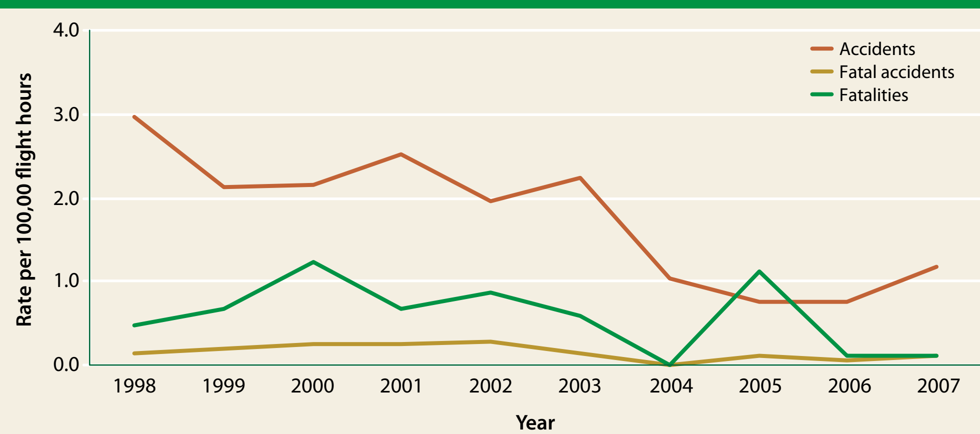
Australian scheduled aviation — called regular public transport — is subdivided into high capacity and low capacity.[2] The high capacity accident rate in 2007 was 0.30, a 43 percent increase from the rate of 0.21 in 2006 (Table 1, p. 50). The 2007 rate was, however, 13 percent lower than the average of 0.34 in the previous nine years.

The 2007 low capacity accident rate, at 0.63, compared with zero in 2006. The 2007 rate was still lower than the average for the previous nine years, which was 0.94.

Throughout the study period, the accident rate for charter operations ranged from about four to 60 times higher than for high-capacity regular public transport. The disparity also fell into that range in 2007, with an accident rate of 2.94 and a fatal accident rate of 0.37.

The accident rate for charters, although 40 percent higher than the previous year's, was 38 percent lower than the 1998–2006 average of

Australian Air Transport Accident and Fatality Rates, 1998–2007



Source: Australian Transport Safety Bureau

Figure 1

4.78. The fatal accident rate, a 76 percent jump from that of 2006, was 23 percent down from the previous nine-year average of 0.48.

In total, the 2007 air transport accident rate of 1.16 was the highest since 2003 but lower than in any of the first six years in the study period. The fatal accident rate, double the rate for 2006, was 25 percent lower than the 1998–2006 average of 0.16. The fatality rate held steady at 0.12, with only 2004 having a lower rate during the study period.

After two years in which there were no business aviation accidents, the 2007 rate was 2.57, with a fatal accident rate of 0.64 (Table 2). The accident rate was an improvement on the 1998–2006 average of 2.0, but the fatal accident rate was higher than the nine-year fatal accident rate of 0.42, which notably included six years without any fatal accidents.

For general aviation — which includes aerial work, flight training and private flying in addition to business operations — in 2007, the

Australian Air Transport Accident and Fatality Rates, by Category, 1998–2007

Category	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
High capacity										
Accidents	0.14	1.13	0.39	0.38	0.42	0.13	0.11	0.11	0.21	0.30
Fatal accidents	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fatalities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Low capacity										
Accidents	0.70	1.05	1.05	1.20	1.92	1.52	0.00	1.00	0.00	0.63
Fatal accidents	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.50	0.00	0.00
Fatalities	0.00	0.00	2.80	0.00	0.00	0.00	0.00	7.53	0.00	0.00
Charter										
Accidents	8.29	4.17	5.68	6.92	4.53	6.33	3.13	1.87	2.10	2.94
Fatal accidents	0.40	0.60	0.63	0.86	0.91	0.47	0.00	0.21	0.21	0.37
Fatalities	1.42	1.98	2.31	2.16	2.72	1.88	0.00	0.62	0.42	0.37
Total										
Accidents	**2.96**	**2.13**	**2.15**	**2.52**	**1.97**	**2.24**	**1.03**	**0.75**	**0.75**	**1.16**
Fatal accidents	**0.13**	**0.20**	**0.26**	**0.26**	**0.29**	**0.14**	**0.00**	**0.12**	**0.06**	**0.12**
Fatalities	**0.47**	**0.67**	**1.24**	**0.66**	**0.88**	**0.58**	**0.00**	**1.12**	**0.12**	**0.12**

Note: Rates are per 100,000 flight hours.

Source: Australian Transport Safety Bureau

Table 1

Australian Business Aviation Accident and Fatality Rates, 1998–2007

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Accidents	7.23	3.86	2.16	2.73	0.69	0.00	1.38	0.00	0.00	2.57
Fatal accidents	1.81	1.29	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.64
Fatalities	3.62	1.29	0.00	0.00	0.00	0.00	4.14	0.00	0.00	1.29

Note: Rates are per 100,000 flight hours.

Source: Australian Transport Safety Bureau

Table 2

Australian Accidents, Serious Incidents and Incidents, 1998–Sept. 30, 2008												
Category	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**Total**
Accident	230	196	224	203	164	157	167	133	103	153	131	**1,861**
Serious incident	1	7	9	9	8	6	20	28	24	40	37	**189**
Incident	4,991	5,377	5,764	5,491	5,841	4,856	5,129	6,712	7,483	7,780	5,990	**65,414**
Total	**5,222**	**5,580**	**5,997**	**5,703**	**6,013**	**5,019**	**5,316**	**6,873**	**7,610**	**7,973**	**6,158**	**67,464**

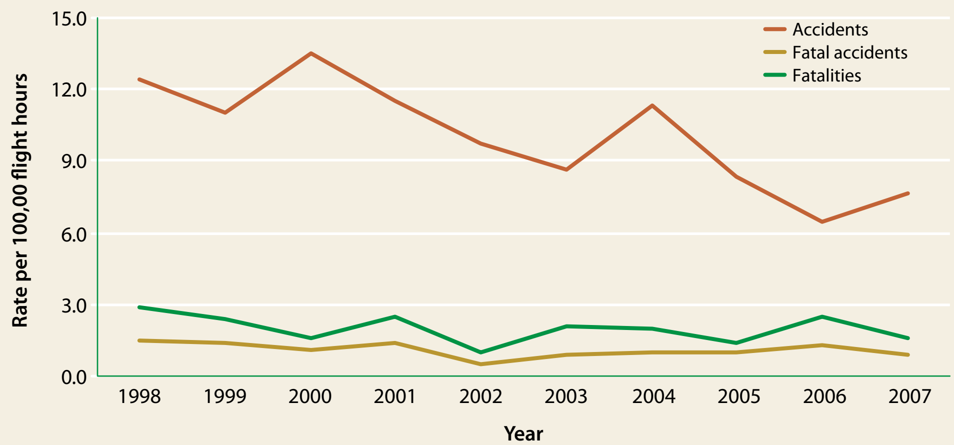
Source: Australian Transport Safety Bureau

Table 3

accident rate was up but the fatal accident rate and fatality rate were down (Figure 2).

The numbers of accidents, serious incidents and incidents all increased year-over-year in 2007 (Table 3).[3] The report noted that "the significant increase in incident numbers from 2003 [is] likely to be the combined result of an increase in activity and healthy reporting culture in Australia, supported by the introduction of the Transport Safety Investigation Act 2003 and Transport Safety Investigation Regulations in mid-2003, which better specified a comprehensive range of specified incidents that are required to be reported to the ATSB."

Australian General Aviation Accident and Fatality Rates, 1998–2007



Note: General aviation includes aerial work, business, flying training and private flying.

Source: Australian Transport Safety Bureau

Figure 2

Notes

1. *Aviation Statistics: 1 January 1998 to 30 September 2008*, report AR-2008-057, published November 2008. Available via the Internet at <www.atsb.gov.au/publications/2008/AviationStats.aspx>.

2. *High capacity* involves an aircraft with a maximum capacity of more than 38 seats or a maximum certified payload of more than 4,200 kg (9,259 lb). Less than either measurement is considered *low capacity*.

3. An *accident* is defined as an event in which any person suffers death or serious injury, or the aircraft incurs substantial damage or structural failure, or the aircraft is missing or inaccessible. A *serious incident* is defined as an occurrence associated with the operation of an aircraft that affects or could affect the safety of the aircraft or that involves circumstances indicating that an accident nearly occurred. An *incident* is defined as an occurrence, other than an accident or serious incident, associated with the operation of an aircraft that affects or could affect the safety of the aircraft. "In practice, this definition is broadly interpreted and the incident reporting system accepts any reports, requests, complaints and suggestions which relate to aviation safety," the report said.

Picture This

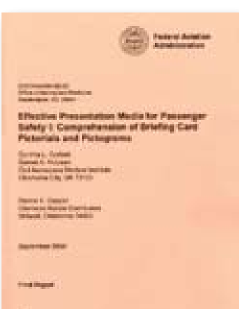
Illustrated safety briefing cards score poorly for comprehension.

REPORTS

Cabin Safety's Image

Effective Presentation Media for Passenger Safety I: Comprehension of Briefing Card Pictorials and Pictograms

Corbett, Cynthia L.; McLean, Garnet A.; Cosper, Donna K. U.S. Federal Aviation Administration (FAA) Office of Aerospace Medicine. DOT/FAA/AM-08/20. Final report. September 2008. 58 pp. Figures, tables, references, appendixes. Available via the Internet at <www.faa.gov/library/reports/medical/oamtechreports/2000s/media/200820.pdf> or from the National Technical Information Service.*



A picture is supposed to be worth a thousand words, but apparently not on passenger safety briefing cards, according to this study of comprehension.

U.S. Federal Aviation Regulations require airlines to give safety briefings and provide briefing cards to explain routine and emergency safety procedures to passengers. "The exact content and presentation media used for safety briefings and cards [aboard] transport airplanes are the responsibility of the airlines to implement, as long as the minimum safety information required by the FAA is delivered," the report says. The researchers cite several other studies showing that passenger attention to safety information is "waning" and that "many of the deficits in passenger knowledge of aviation safety information continue to prevail."

One study by the Australian Transport Safety Bureau using focus groups to evaluate safety briefing cards found that "effectiveness of the safety cards reportedly suffered from excessive graphical clutter, overly complex drawings and overly simplistic illustration, considered unrealistic or unclear."

In a further effort to test passenger comprehension of pictorial instructions, this study's researchers recruited 785 participants from high schools, government offices, cabin safety workshops and the SAE Cabin Safety Provisions Committee. The participants were about evenly distributed by gender and ranged in age from 15 to 63, with educational levels from current high school attendance to doctoral graduates. About 47 percent had taken between zero and two flights in the previous two years, and about 19 percent had taken more than 13 flights. Participants included some active-duty flight attendants.

Pictorials and pictograms selected from safety briefing cards currently used by airlines, as well as symbols approved by the American National Standards Institute (ANSI) and commonly found in buildings and transportation, were presented to participants in open-ended question format. The ANSI symbols were included to provide researchers with an estimate of subjects' general "symbol literacy."

The test booklet presented, for example, a series of illustrations showing oxygen masks dropping, a woman placing one over her nose and mouth, and then helping a child seated next to her to don a mask. The booklet said, "Fully describe what you think the counter [indications of elapsed time, in seconds, in successive drawings] is telling you? Why do you think it is important?"

Comprehension responses for each participant were graded for correctness, categorized as "certain," "likely," "arguable," "suspect," "opposite," "wrong," "none" — meaning the response was “don’t know” — and “blank” — no response. “Categorized responses were then transformed, using a weighting algorithm, to yield pictorial/pictogram comprehension scores,” the report says. “Pictorial/pictogram comprehension scores were further analyzed with respect to subject demographics, particularly gender, flight history, and cabin safety procedures knowledge and experience.”

The results confirmed those of the earlier studies cited. Comprehension scores ranged from 28.8 percent to 96.3 percent, averaging 65 percent. Two international organizations with acceptability criteria for pictorial/pictogram information are the International Association for Standardization (ISO) and ANSI. Even with experienced travelers and aviation professionals among the participants, 45.8 percent of the scores satisfied the ISO acceptability standard and only 8.3 percent met the ANSI criteria. In comparison, the average “symbol literacy index” was 75 percent.

“Comprehension scores based on the individual question(s) for each pictorial/pictogram ranged from 28.8 percent [for ‘flotation device usage’] to 96.3 percent [for ‘no smoking in the lavatory’],” the report says. Composite scores, derived from a combination of the responses to individual questions about the particular pictorial/pictogram, ranged from 39.8 percent (“warning”) to 85.3 percent (for “seat belt usage”).

Correlations among demographic variables were related to the “progressive expertise associated with advancing age, education and number of flights,” the report says. No gender differences were found.

“The test booklet questions … received a wide range of responses, especially for pictorials that contained multiple elements and/or multiple actions,” the report says. “The variety of responses was also greater for pictograms in which serial actions were not tightly linked pictorially. Participants also missed specific details in certain pictorials, especially when the details were not the main focus of the intended message. Often such details would only be identified by those who were not the main focus of the intended message.”

Cabin safety specialists are, thus, faced with a paradox: Illustrated briefing cards are best understood by frequent fliers who have the least need for them. The report says, “The results indicate that safety briefing card pictorials/pictograms need to be designed and implemented with respect to novice passengers, i.e., those who do not have [greater] understanding of the design and operation of transport aircraft, emergency equipment and/or aircraft emergency procedures.”

Safety briefing cards would benefit from “well-known educational principles and instructional techniques from outside aviation, whether produced by professional graphics designers or in-house airline cabin safety professionals,” the report says. It also warns against a problem familiar to anyone who has tried to puzzle out furniture assembly or advanced audio and video equipment instructions, produced by an “expert system” in which the designers cannot put themselves in the place of the non-expert.

Illustrated briefing cards are best understood by frequent fliers who have the least need for them.

“Excessive graphical clutter, overly complex drawings and overly simplistic illustrations considered unrealistic or unclear suggest a reliance on briefing card designers who know the information so well that their attention naturally focuses on the elements that best portray the message and disregards information or structure that detracts,” the report says. “Failure to test the comprehension of briefing card materials adequately obscures such shortcomings.”

Although briefing cards are designed to be understood without reference to any particular language, the report says that some additional text would “focus attention, highlight concepts and simplify complex pictorials/pictograms.” In addition, “standardization of validated safety briefing card information and presentation methods across the airline industry would provide not only a well-founded, consistent safety message, but also a degree of familiarity and, therefore, comprehension never before seen.”

The Long and the Short of It

Analysis of Aircraft Overruns and Undershoots for Runway Safety Areas

Hall, Jim; Ayres, Manuel Jr.; Wong, Derek; et al. Washington, D.C.: Transportation Research Board of the National Academies, Airport Cooperative Research Program (ACRP) Report 3. 59 pp. Figures, tables, references, list of abbreviations. Available via the Internet at <onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_003.pdf> or from the Transportation Research Board of the National Academies.**

The report covers four areas:

- Research on accident/incident data for runway overruns and undershoots;
- An inventory of conditions related to each event;
- An assessment of risk in relation to the runway safety area (RSA); and,
- Discussion of alternatives to the traditional RSA.

"The traditional approach to mitigate risk associated with accidents or incidents is to enlarge the runway safety area, but many airports do not have sufficient land to accommodate standard [U.S.] Federal Aviation Administration or International Civil Aviation Organization recommendations for RSAs," says Michael R. Salamone, staff officer of the Transportation Research Board, in the foreword. "Airports that pursue this approach face extremely expensive and controversial land acquisition or wetlands filling projects to make sufficient land available."

The report uses a probabilistic assessment of the efficacy of the standard 1,000-ft/300-m RSA and looks at alternative possibilities for mitigating the risk of overruns and undershoots. "The report also assesses the factors that increase the risk of such accidents occurring, helps with understanding how these incidents may happen and suggests that aircraft overrun and undershoot risks are related to specific operational factors," Salamone says.

As derived from a database of 459 accidents and incidents, about 60 percent were landing overruns and 20 percent each were landing undershoots and takeoff overruns. Factors associated with the accidents and incidents, described as "anomalies," were categorized as aircraft system fault; wildlife hazards; weather conditions; human errors; runway surface conditions; and approach/takeoff procedures. These basic categories were themselves subdivided.

It was found that for landing overruns, the most frequent anomalies were contaminated and wet runways, sometimes in combination. "For contaminated runways, ice was the most predominant contaminant in the accidents and incidents evaluated," the report says. "Three additional factors with high incidence for landing overruns are long touchdown, high speed during the approach and the presence of rain."

In landing undershoots, the most frequent anomaly was low visibility, followed by rain, particularly for the accidents. Gusting conditions were also common. "As expected, approaches below the glide path are an important anomaly for this type of event," the report says. "Visual illusion was a significant factor only for landing undershoots."

Rejected takeoffs at high speeds led to the most takeoff overrun accidents and incidents. "The second most important anomaly was incorrect planning, such as aircraft overweight, short takeoff distance available and incorrect load distribution in the aircraft," the report says. "Basically, the factors are equally frequent for accidents and incidents, except for the presence of rain, gusting and crosswind conditions," the report says. "These were more important for accidents."

Aircraft system faults were found most frequently in takeoff overruns, showing up in 51 percent of incidents and 33 percent of accidents. They were least frequent in landing undershoots. Wildlife hazards were rare in any category, and absent in landing overruns. They were found in 5 percent of takeoff overrun accidents and an equal percentage of incidents.

The report calculates average costs for the types of accidents. "Most of the cost for landing overruns is attributed to loss of property or aircraft damage," it says. "On the other hand, loss of dollars due to injuries is significantly higher for landing undershoots, most likely due to the high speed and energy during these accidents."

Using mathematical models, the report "introduces a more comprehensive approach to evaluate the degree of protection offered by a specific RSA, and provides a risk-based assessment procedure that is rational and accounts for the variability of several risk factors associated with aircraft overruns and undershoots. In addition, this study provides risk models that are based on comprehensive evidence gathered from aircraft accidents and incidents in the United States and other countries. Information gathered from these events has been organized into a database that may be used for future studies on airport risk assessment."

Say Again

Pilot English Language Proficiency and the Prevalence of Communication Problems at Five U.S. Air Route Traffic Control Centers

Prinzo, Veronika O.; Hendrix, Alfred M.; Hendrix, Ruby. DOT/FAA/AM-08/21. Final report. October 2008. 32 pp. Figures, tables, references, appendixes. Available via the Internet at <www.faa.gov/library/reports/medical/oamtechreports/2000s/media/200821.pdf> or from the National Technical Information Service.*

The report describes a study aimed at determining the degree to which deficits in English-language ability contributed to communication problems during a six-month period at five U.S. air route traffic control centers.

"Unlike readback errors and requests for repeats, communication problems that involved a breakdown in communication may require multiple exchanges between the pilot and controller before the problem is identified, understood and resolved," the report says. At worst, communication breakdown can pose a safety threat ("Language Barrier," *ASW*, 8/08, p. 41). But even without any immediate risk such as loss of separation, the extra effort required for clarification can take up controller and pilot time and attention that could be better used.

The report gives this example of a communication breakdown between a pilot and air traffic control (ATC):

ATC: "[Name] fifty, can you accept Runway two seven right full length, affirmative or negative?"

Pilot: "Be back, uh, [Name] fifty heavy."

ATC: "[Name] fifty heavy, I'm sorry, was that affirmative or negative for two seven right full length?"

[Pilot] "Negative, [Name] fifty heavy."

[ATC] "Okay, uh, one more time, sir, affirmative or negative, I'm missing part of your transmission."

[Pilot] "Negative, [Name] fifty heavy, we cannot accept."

[ATC] "You cannot accept, negative, okay, thank you."

This exchange required seven transmissions in total during the busy approach phase of flight and while the controller might have been arranging the arrival of several aircraft. Neither the question nor the answer was especially complex; the extraneous effort resulted from poor understanding of the other's speech by one or both parties.

Communications were analyzed from 832 aircraft, of which 74 percent were operated by U.S.-based airlines. Aircraft call signs were used to identify transmissions by aircraft registry — U.S. and non-U.S. — and the official language of the country of registry — English or non-English. Communications therefore fell into three classifications: U.S.-English, non-U.S.-English or non-U.S.-other.

"The communication problems were classified into three major categories: readback errors, requests for repeat and breakdowns in communication," the report says. "For U.S.-registry aircraft transactions with one communication problem, 51 percent involved readback errors, 34 percent requests for repeat and 15 percent breakdowns in communication. In contrast, 23 percent of the [non-U.S.]-registry aircraft transactions with one communication problem were readback errors, 62 percent were requests for repeat and 14 percent involved breakdowns in communication. Of the transactions with multiple problems, more than 75 percent involved [non-U.S.]-registry aircraft."

In 64 percent of the readback errors made by pilots in the non-U.S.-other category, their accented English made it difficult for the controller to understand what was being said. "Of the

transactions involving a breakdown in communication, runway assignment and route clearance transactions were especially problematic for the pilots of [non-U.S.]-other registry aircraft," the report says. "The problem may be partially due to controllers' and pilots' use of plain language and the pilots' pronunciation and fluency. Notably, accent affected the intelligibility of 40 percent of the pilots' messages."

The report says that "when the registry of an aircraft was [non-U.S.] and its primary or official language was not English, not only did pilots spend more time communicating with ATC, they also exchanged more transmissions and had more communication problems in their transmissions. The additional pilot messages may have resulted from attempts to resolve some of the communication problems. In these situations, a pilot's English language proficiency — especially his/her accent — often resulted in the controller not being able to completely understand what the pilot was attempting to say."

Proficiency in English beyond the minimum specifications in the ICAO language proficiency scales "must be realized if communication problems are to decline," the report says.

WEB SITES

The School of Experience

Lessons Learned From Aviation Accidents Library, <accidents-ll.faa.gov>

The U.S. Federal Aviation Administration (FAA) recently launched an "online safety library that teaches 'lessons learned' from some of the world's most historically significant transport airplane accidents."

For the online library's introductory phase, the FAA identified 11 major accidents from 1959–2002 that "made an impact on the way the aviation industry and the FAA conduct business today." More accidents that shape policy will be added to the online library annually.

The Web site's introduction explains that accidents are arranged in predefined groups or "perspectives" to "illustrate the complex interrelationship of accident causes" — airplane life cycle, accident threats and accident common themes. For example, the "accident common themes" group identifies accidents by human error, flawed assumptions, unintended effects, pre-existing failures and organizational lapses.

Each accident entry contains links that open windows to specifics: an overview; a summary of the accident investigation report and a link to the full report; the accident report's recommendations; relevant regulations; cultural and organizational factors; unsafe conditions; safety assumptions; precursors; resulting regulatory and policy changes; resulting airworthiness directives; lessons learned; common themes; and a list of related accidents. Entries may contain graphics, photographs and links to Internet sites with additional information.

Researchers can locate accidents by reviewing the predefined groups, using the Web site's search/sort feature or selecting from lists on the site map. In addition to a list of all accidents in the database, the site map contains a list of videos and animations of accidents. Videos and animations with audio and audio transcripts explain causes and contributors. Two examples are an animation comparing the Air Florida Flight 90 takeoff in icing conditions from National Airport, Washington, D.C., to a normal takeoff on the same runway; and an animation and explanation of the fire that developed and spread on British Airtours Flight KT28M at Manchester Airport, England.

The Web site contains technical information for downloading and viewing. Contact information for submitting questions and comments is also provided.

Sources

* National Technical Information Service <www.ntis.gov>

** Transportation Research Board <www.national-academies.org/trb/bookstore>

— Rick Darby and Patricia Setze

'Don't Say Anything'

Unreported ground accident causes cabin depressurization.

BY MARK LACAGNINA

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

JETS

Fuselage Skin Torn Near Cargo Door

McDonnell Douglas DC-9-30. Substantial damage. No injuries.

After departing from Syracuse, New York, U.S., for a scheduled flight to Detroit on May 18, 2007, the DC-9 was climbing through 20,000 ft when the flight crew heard a loud pop and the cabin depressurized. "The flight crew donned their oxygen masks and initiated an emergency descent to 10,000 ft," said the report by the U.S. National Transportation Safety Board (NTSB).

After reaching 10,000 ft, the crew diverted to the closest suitable airport, Buffalo Niagara (New York) International, where the airplane was landed without further incident. None of the 95 passengers and four crewmembers was injured. "After landing, the airplane was inspected by airport emergency personnel and taxied to the gate," the report said.

A postflight examination by a U.S. Federal Aviation Administration (FAA) inspector revealed a 12-in by 5-in (30-cm by 13-cm) tear in the fuselage skin about 6 ft (2 m) forward of the forward cargo door on the right side of the airplane. "Further inspection revealed that a crease in the skin of the fuselage existed forward of the tear, consistent with the skin being damaged by a foreign object," the report said.

Airline personnel and FAA inspectors found metal shavings on the ramp where the DC-9 had been parked at Syracuse Hancock International Airport. "Examination of the belt loader used during the loading process revealed that [it] had red paint flakes adhering to the front right-hand corner, which matched the height of red paint scrape marks on the front left bumper of a luggage tug. The top right-hand forward corner of the luggage tug exhibited scrape marks, missing paint and exposed metal."

The airline's station manager and ground agents for the contracted ramp-service company told investigators that the belt loader's engine had failed either while luggage was being off-loaded or loaded before the accident flight. "Three of the contractor's ground agents attempted to manually push the belt loader away from the airplane but were unable to do so," the report said. "The senior of the three decided to use the luggage tug to push the belt loader away from the airplane."

The senior ground agent positioned the luggage tug parallel to the airplane's fuselage and within the designated safety zone in which luggage-tug operations are prohibited. "At some point during or immediately after pushing the belt loader away from the airplane, the upper right-hand side of the tug's cab contacted the fuselage," the report said. "The senior ground agent then advised 'don't say anything' to one of the other ground agents who was working the flight with him."

"The upper right-hand side of the tug's cab contacted the fuselage."

NTSB determined that the probable cause of the accident was "the senior ground agent's failure to follow written procedures and directives." The report said that among actions taken by the contractor after the accident was publication of a memo to station personnel that stated: "It is imperative that when a piece of equipment comes in contact with an aircraft, leaving a scratch, dent, hole, etc., the incident must be reported immediately. … It is beyond a concern of potential discipline; it is the ultimate significance of ensuring there is no risk to the safety of flight."

Low Energy, Wind Shear Lead to Tail Strike

Avro RJ100. Substantial damage. No injuries.

Inbound from Zurich, Switzerland, the flight crew was conducting an instrument landing system (ILS) approach to Runway 28 at London City Airport the morning of Aug. 18, 2007. Visual meteorological conditions (VMC) prevailed, and surface winds were from 190 degrees at 10 kt.

"At between 50 and 30 ft above the runway, the pilots felt the aircraft 'dropping,' and the commander … pulled back on the control column to prevent a hard landing," said the report by the U.K. Air Accidents Investigation Branch (AAIB). The Avro's pitch attitude increased to 9.3 degrees, and the lower aft fuselage struck the runway before the aircraft touched down on the main landing gear.

There were no injuries among the 88 passengers and five crewmembers. "Neither the pilots nor the cabin crew were aware that there had been a tail strike, although the rear cabin crewmember reported that there had been a loud noise on touchdown," the report said.

An analysis of RJ100 and BAe 146 tail-strike events by British Aerospace showed that key causal factors are: airspeeds below the target landing reference speed (VREF); high rates of descent leading to higher pitch attitudes in the flare; and excess speed causing the aircraft to float and touch down with a high pitch attitude.

London City's Runway 28 has an available landing distance of 1,508 m (4,948 ft), and the ILS glideslope angle is 5.5 degrees. "For a successful steep approach onto the relatively short runway, a high degree of accuracy needs to be achieved," the report said, noting that thrust settings typically are lower than normal during such an approach.

The Avro had encountered turbulence during the approach, and recorded flight data showed that airspeed was 4 kt below VREF when the slight, variable headwind sheared to a slight tailwind about 50 ft above ground level (AGL) at the same time the commander moved the thrust levers to flight idle.

"The aircraft was already in a low energy state; then thrust was reduced," the report said. "A combination of these factors reduced the energy of the aircraft, which was felt as a 'sink' by the pilots." The commander's instinctive movement of the control column caused pitch attitude to increase above the tail-strike attitude of 7 degrees. Vertical acceleration was 2.3 g when the tail struck the runway.

Incorrect Stabilizer Trim Cited in Overrun

Dassault Falcon 900. Substantial damage. No injuries.

While preparing for a flight from Santa Barbara, California, U.S., to Tampa, Florida, the afternoon of June 10, 2007, the first officer calculated a gross takeoff weight of 45,400 lb (20,593 kg) and entered a rotation speed of 129 kt on the takeoff and landing distance (TOLD) card. He did not calculate the center of gravity (CG) location.

Before takeoff, the flight crew set the stabilizer trim at minus 5.5 degrees, which corresponds with an aft CG. The takeoff range for stabilizer trim is minus 4.5 degrees to minus 7.5 degrees, according to the NTSB report.

The captain, the pilot flying, told investigators that the takeoff roll was normal until the first officer called "rotate." The captain pulled back on the control column (yoke), but the Falcon did not respond. "When the speed was well into the upper 130-kt range, he relaxed the yoke, then pulled aft again; and, again, there was no response from the airplane," the report said.

The captain said that the airplane "did not even try to lift off" and, with the runway end approaching rapidly, he decided to reject the takeoff because "the odds of a possible airborne crash were greater than a runway/clearway type of incursion."

He pulled the thrust levers back to the stops and applied maximum brake pressure and full forward pressure on the control column. He also told the first officer and passengers to brace themselves. The airplane overran the 6,055-ft (1,846-m) runway, struck a berm and came to a stop 580 ft (177 m) beyond the threshold.

The nosegear separated during the overrun, and the forward section of the Falcon's pressure vessel was damaged substantially. There were no injuries among the 15 people aboard the airplane.

Investigators determined that the Falcon's takeoff weight was 1,081 lb (490 kg) heavier than the first officer had calculated, the correct rotation speed was 131 kt and the CG was at minus 15.73 percent mean aerodynamic chord. "The right setting for the stabilizer trim should have been between minus 7.0 and minus 7.5 degrees," the report said.

Tests in a Falcon 900 flight simulator showed that at the accident airplane's gross weight, stabilizer setting and calculated rotation speed, there is a delay of 2 to 4 seconds between up-elevator input and the airplane's reaction to the control input. "When the simulator was configured with the stabilizer trim set to minus 7.0 degrees and the V-speeds set for 46,480 lb [21,083 kg], there was no delay in airplane response to elevator input," the report said.

Towing Error Damages Two Aircraft

Bombardier Global Express. Substantial damage. No injuries.

The aircraft was being towed to a parking area on a closed runway at Dublin (Ireland) Airport the afternoon of July 4, 2007, when its right wing tip struck the nose of another Global Express that was parked on the runway. The towed aircraft's right wing pushed the parked aircraft's nose sideways and onto the roof of a crew van. Both aircraft and the van were substantially damaged, but no one was injured, said the report by the Irish Air Accident Investigation Unit.

The tug driver told investigators that before he had attached the towbar to the aircraft, the tug's windshield had cracked and fallen into the cab. "He secured the windscreen alongside himself in the cab and decided to undertake the tow," the report said. "There was no radio on the tug, so ATC [air traffic control] clearance was coordinated by a marshaller who was driving [the] crew van."

The parked aircraft had been correctly positioned behind a red line on the runway that designated the parking-area boundary. The report noted, however, that there were "a significant number of lines or markings on the disused runway, [including] old runway markings, roadway markings …, old taxiway lines and new taxi lines."

The tug driver told investigators that he was confused by two taxi lines on the runway. "The driver did not follow either but went to some extent between them," the report said. "He kept to the right of the new … taxi line and to the left of the old taxi line, which led directly up the white centerline of the runway."

The tug driver told investigators that he was confused by two taxi lines on the runway.

The marshaller drove the crew van ahead of the tug. After passing the parked Global Express, she stopped the van beside it, got out and removed chocks that were in the intended parking space for the towed aircraft. The tug driver said that he "knew she wanted him to go past the [parked] aircraft and reverse in," the report said. "He slowed down [and] saw the marshaller standing on the red line, but she did not signal any warning. He then felt a bump."

The marshaller said that after removing the chocks, she "moved back to wing-mark [the towed aircraft] into place [but] had not reached the van when the impact occurred."

"Though there was no disagreement between the statements of the tug driver and the marshaller regarding the position of the marshaller at the time of the incident; both stated that no wing-marker [wing-walker] was in position," the report said. "However, the driver should have stopped and either waited until the marshaller was in a position to act as wing-marker or otherwise communicated to the marshaller that one was required in position in accordance with the aerodrome procedures in force at the time."

Delaminated Tire Bursts on Takeoff

Boeing 737-800. Minor damage. No injuries.

The 737 was accelerating though 100 kt on takeoff from Phoenix Sky Harbor International Airport the night of Nov. 25, 2007, when the "ANTISKID INOP" warning light illuminated. "The takeoff was continued, and no other anomalies were noted," the NTSB report said. "Soon after leveling at [Flight Level] 330, the crew was advised by ATC that tire fragments had been found on the runway and that they had possibly had a tire failure on takeoff."

The flight crew then noticed that hydraulic system A was losing fluid and decided to land at the nearest suitable airport, Denver International. "After declaring an emergency, the crew made an overweight landing using 40 degrees of flap," the report said. "The crew allowed the airplane to roll almost the full length of the runway and stopped on a taxiway. The airplane was then towed to the gate." None of the 160 passengers and six crewmembers was injured.

"Tread on the right outboard tire had come off and had struck the inboard and mid-span flaps."

"Postaccident inspection revealed the tread on the right outboard tire had come off and had struck the inboard and mid-span flaps, necessitating their replacement," the report said. "In addition, the leading edge of the right horizontal stabilizer had been struck and required replacement."

NTSB determined that the probable cause of the incident was "delamination of the right outboard tire during the takeoff roll due to underinflation and/or overloading during use in service."

Dual Flameout Remains a Mystery

Gates Learjet 25B. Substantial damage. No injuries.

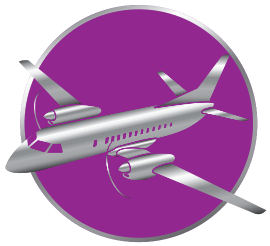
The flight crew was conducting a positioning flight to St. Augustine (Florida, U.S.) Airport in VMC the afternoon of July 21, 2007. The Learjet was at 5,000 ft, about 5 nm (9 km) from the destination, when both engines flamed out after the first officer, the pilot flying, moved the power levers back to begin the descent, the NTSB report said.

The captain attempted unsuccessfully to restart the engines. He then took control and landed the airplane on St. Augustine's Runway 13. After touching down hard just past the threshold of the 7,996-ft (2,437-m) runway, both main landing gear tires burst. "A postaccident inspection by an FAA inspector revealed that the airplane had incurred substantial damage to the wings and fuselage during the landing," the report said.

The investigation failed to determine conclusively why the engines had flamed out. "Both engines were test-run following the accident at full and idle power with no anomalies noted," the report said.

However, the report noted some "issues" found in the Learjet's aftermarket throttle quadrant: "The power lever locking mechanism pins, as well as the throttle quadrant idle stops for both engines, were worn. The power lever locking mechanism internal springs for both the left and right power levers were worn and broken. Additionally, it was possible to repeatedly move the left engine's power lever directly into cutoff without first releasing its power lever locking mechanism; however, the right engine's power lever could not be moved to the cutoff position without first releasing its associated locking mechanism.

"Other than the throttle quadrant issues, no other issues were identified with either the engines or airframe that could be [attributed] to both engines losing power simultaneously."



TURBOPROPS

Close Call in Blowing Snow

Swearingen Metroliner. No damage. No injuries.

Weather conditions at Denver International Airport the morning of Jan. 5, 2007, included 1/2-mi (800-m) visibility in light snow and mist, a 600-ft overcast and surface winds from 030 degrees at 12 kt. The Metroliner pilot received instructions from the airport ground traffic controller to taxi from the cargo area, which is on the south side of the airport, to Runway 34R for takeoff.

The instructions called for the pilot to taxi north on a taxiway that parallels Runway 35L, which is on the east side of the airport, and then turn left on a taxiway leading to Runway 34R, which is on the west side of the airport.

The pilot told investigators that the blowing snow reduced his visibility and that snow covering the taxiway leading from the cargo area prevented him from seeing the taxiway-centerline lighting. "As he attempted to find the centerline lighting, he saw blue taxi lights, followed them and turned onto Runway 35L," said the NTSB report. The Metroliner entered Runway 35L near the approach threshold, and the pilot began to taxi north on the runway.

About one minute later, the ground controller asked the pilot for the airplane's position. The pilot replied that he was abeam the general aviation fixed-base operator. "According to the pilot, once the controller asked for his location, he noticed that he was on a runway," the report said.

Meanwhile, the flight crew of an Airbus A319, inbound from St. Louis with 50 people aboard, was conducting an ILS approach to Runway 35L and had been cleared to land by the local traffic controller.

The A319 first officer, the pilot flying, told investigators that the airplane broke out of the clouds at about 600 ft AGL. "[The captain and I] looked down the runway and confirmed verbally to each other that the runway was clear," he said. "We didn't see the [Metroliner] until we were about 100 to 50 ft or so above the deck. When it did come into sight, it was at least 2,000 ft [610 m] down the runway. The winds, combined with the prop wash from the aircraft [and] the blowing snow, had caused it to be obscured and out of sight. I immediately commenced a go-around."

The A319 crew already had initiated the go-around when the airport movement area safety system (AMASS) generated an aural and visual alert in the control tower. "Four seconds later, the [local] controller instructed [the A319 crew] to go around," the report said. "The aircraft missed colliding by approximately 50 ft."

NTSB concluded that the probable cause of the incident was the Metroliner pilot's inadvertent entry onto the active runway. "A contributing factor to the incident was the failure of the Denver tower ground and local controllers to detect the aircraft on the [AMASS] display and issue a go-around instruction to the arrival flight crew."

Flight Continued With Open Door

Let L410. Minor damage. No injuries.

The unpressurized twin-turboprop aircraft was departing with 16 passengers from Belfast City (Northern Ireland) Airport the morning of April 28, 2008, when the right nose baggage door opened. "The crew reduced speed to 120 kt and, as there was no vibration and the door appeared to be stabilized in the open position, decided to continue to their destination [Ronaldsway, Isle of Man]," said the AAIB report.

The commander, who was a company line training captain, told ATC that the baggage door had opened, but he did not declare an emergency. "On the approach to Ronaldsway, the crew requested, and were given, wide vectoring for a long final," the report said. The L410 was landed without further incident. The baggage door had buckled and was torn near the latching mechanism, and one piece of baggage was missing.

"The incident occurred because the right nose baggage door had probably been incorrectly closed prior to departure," the AAIB said. The report noted that the latch can be placed flush with the door, giving the appearance that the door is locked, even though the inner hook has not engaged the catch. "A modification is available to fit a physical indicator to the front door locking mechanism, but the modification had not been incorporated on this aircraft," the report said.

Bad Weather in a Mountain Pass

Cessna 208B Caravan. Destroyed. Two fatalities.

After a sales-demonstration flight in Thermal, California, U.S., on March 28, 2006, the pilots were conducting a positioning flight over mountainous terrain to Ontario, California. "One of the two pilots requested, and received, an abbreviated weather briefing prior to departure … and filed an instrument flight rules (IFR) flight plan," the NTSB report said.

Nevertheless, the departure was conducted under visual flight rules (VFR), and the pilots told an air traffic controller that they would continue under VFR and open their IFR flight plan after exiting a mountain pass. "The flight was likely in at least intermittent, if not mostly solid, instrument meteorological conditions as it flew through the pass," the report said.

The Caravan was nearing the end of the pass when the controller told the pilots that ATC radar showed they were heading toward rising terrain. The controller asked if they had the terrain in sight, and one pilot responded, "We're maneuvering away from the terrain right now."

A review of ATC radar data indicated that the Caravan was in a steep climbing turn when it apparently stalled at about 8,800 ft, descended rapidly and struck terrain at 6,073 ft near Oak Glen, California. Witnesses said that they had seen the airplane emerge from the clouds "almost straight nose-down." Examination of the wreckage revealed no sign of mechanical malfunction or failure, the report said.

PISTON AIRPLANES

Valley Airport Blanketed by Fog

Cessna 340. Destroyed. Three fatalities.

Most of the area near the business flight's destination had VMC, with clear skies and almost unlimited visibility, the morning of Nov. 6, 2007. However, the destination, Garberville (California, U.S.) Airport is located in a narrow river valley and was covered with a layer of fog about 250 ft thick, the NTSB report said. The uncontrolled airport had no instrument approaches.

"Witnesses reported that the pilot flew at low level up the valley and eventually entered the fog," the report said. "About one mile prior to reaching the airport, the pilot attempted to climb out of the valley, but the airplane began impacting trees on the rising terrain [about 0.25 mi (0.40 km) from the airport]. All of the witnesses stated that the engines ran strong and smooth until the final impact."

Engine Failure Leads to Ditching

Piper Cherokee Six. Destroyed. Four minor injuries.

The pilot of the single-engine aircraft was conducting a VFR charter flight from Horn Island to Warraber Island, both in Queensland, Australia, the morning of May 23, 2007. Before boarding the three passengers, he briefed them on the Cherokee's emergency equipment, including the life jackets, said the report by the Australian Transport Safety Bureau.

The islands are about 75 nm (139 km) apart in Torres Strait. "The planned cruise altitude was 1,500 ft, but, due to some cloud and turbulence at that altitude, the pilot revised the cruise altitude to 3,500 ft," the report said.

The Cherokee was about 25 nm (46 km) from the destination when the pilot attempted to reduce power to begin the descent. However, propeller speed momentarily increased to 3,000 rpm before a total power loss occurred and the constant-speed propeller "began slowly windmilling in a shuddering manner," the report said.

The pilot attempted unsuccessfully to restart the engine. He radioed the company that the flight was "going down," then told the passengers to don their life jackets but not to inflate them. "He then donned his own life jacket and prepared the aircraft for ditching," the report said. "When the aircraft impacted the water, it pitched steeply nose-down, then settled back into a near-level attitude." All the occupants sustained minor injuries but were able to exit the Cherokee before it sank.

A search-and-rescue helicopter crew dropped two life rafts, but the survivors did not know how to inflate them. After spending nearly an hour in the water, the survivors were winched aboard a rescue helicopter.

The Cherokee was not recovered, and investigators could not determine conclusively what caused the engine failure. However, the report said that it likely was caused by a problem with the forward crankshaft bearing.

Corrosion Cited in Wing Separation

Helio Super Courier. Substantial damage. Four fatalities.

The float-equipped airplane was being used to transport sport fishermen from a remote lake to a lodge near King Salmon, Alaska, U.S., on Sept. 30, 2007. "The pilot contacted lodge personnel while en route and estimated his arrival time in about three minutes," the NTSB report said. "When the airplane failed to arrive, an aerial search discovered the wreckage about 10 miles [16 km] from the lodge."

Examination of the wreckage showed that a corrosion-induced fatigue fracture had caused an attachment fitting in the left wing to fail. The report said that this resulted in an uncontrolled descent when the left wing partially separated from the fuselage.

The Courier had accumulated about 8,700 flight hours, including about 1,800 hours since the wings were replaced following an accident in October 2000. The new wings had been acquired from a salvage dealer that closed in 2006 and retained no records of the transaction.

HELICOPTERS

Test Flight Ends With Fuel Exhaustion

Aerospatiale AS 342J Gazelle. Destroyed. Two minor injuries.

On March 22, 2007 — the day before the helicopter was to be delivered to its new owner, a company based in Italy — two ferry pilots arrived in Broby, Sweden, to conduct a brief test flight. "One of the pilots was trained on the type and was to be the commander, while the other, without training on the type, was to be a passenger," said the report by the Swedish Accident Investigation Board.

The previous owner told investigators that the preflight preparations were rushed, "as if the pilot was in a hurry." The report said that the helicopter had less than 50 L (13 gal) of fuel and that the low-fuel warning lights likely illuminated before takeoff from a farm field.

The previous owner and another witness saw the Gazelle hover over the field for several minutes before flying a circuit around the field, landing, lifting off and beginning another circuit of the field. They said that the Gazelle was at about 500 ft AGL when the engine failed. "This caused no immediate alarm, as extensive open fields were available to the pilot to make a controlled landing," the report said.

As the witnesses drove toward the assumed landing site, however, they saw the pilots walking toward them and the helicopter on its side, badly damaged. "The fact that the helicopter was equipped with safety [harnesses] of four-point type may explain why those on board were not seriously injured," the report said.

Estimating that the helicopter had used 43 L (11 gal) of fuel during the 11-minute flight, the report said that the cause of the accident was "engine failure because of a lack of fuel due to inadequate preflight preparations."

Pilot Struck by Turning Rotor Blades

Bell 407. No damage. One fatality.

The pilot shut down the engine after landing at Morristown, Tennessee, U.S., on Nov. 9, 2007, but did not tighten the cyclic friction lock. After escorting the passengers to the fixed-base operator, the pilot was walking back toward the helicopter when he was struck by the still-moving main rotor.

A witness said that the rotor blades were tilted forward and that the blade tip path was about 5 1/2 ft (2 m) off the ground.

"The flight manual did not describe a procedure for the pilot to exit the helicopter while the engine and rotor continued to operate but did state that during shutdown, the pilot should 'remain on the flight controls until the rotor has come to a complete stop,'" the NTSB report said.

Preliminary Reports

Date	Location	Aircraft Type	Aircraft Damage	Injuries
Nov. 1, 2008	Western Guyana	Beech King Air A90	NA	3 NA
The King Air was reported missing during a survey flight over a remote area and was not found during a five-day search.				
Nov. 1, 2008	Near Vaalwater, South Africa	Cessna 208B	destroyed	1 serious, 5 none
After touching down in a game preserve, the pilot realized that he was on the wrong runway and initiated a go-around. The Caravan overran the runway at 80 kt and burst into flames.				
Nov. 1, 2008	Toksook Bay, Alaska, U.S.	CASA 212-200	substantial	2 minor
The right engine did not respond when the copilot attempted to increase power while turning onto final approach. The pilot initiated a go-around, but the cargo airplane yawed right and descended rapidly. The linkage between the right power lever and the propeller pitch control was found disconnected.				
Nov. 2, 2008	Graz-Thalerhof, Austria	Piper Seneca III	destroyed	3 fatal
The Seneca was completing a charter flight from Salzburg when it crashed in a wooded area during approach.				
Nov. 3, 2008	Punta Chivato, Mexico	Beech Super King Air 200	destroyed	1 fatal
Witnesses said that the airplane stalled and crashed after barely clearing a small hill on departure.				
Nov. 4, 2008	Mexico City, Mexico	Learjet 45	destroyed	8 fatal
The Learjet may have encountered wake turbulence from a preceding Boeing 767 before it crashed in an industrial/residential area during approach. Several people on the ground also were killed or injured.				
Nov. 6, 2008	Fakfak, Indonesia	Dornier 328	substantial	36 none
The landing gear separated and the left wing was damaged when the Dornier touched down 3 m (10 ft) short of the runway and then struck the raised threshold.				
Nov. 7, 2008	Bathurst, Australia	Piper Chieftain	destroyed	4 fatal
During departure, the Chieftain struck a hill about 3 nm (6 km) from the airport.				
Nov. 8, 2008	Mount Kilimanjaro, Tanzania	Cessna U206F	destroyed	4 fatal, 1 serious
The airplane crashed at 14,200 ft on Mawenzi Peak during a sightseeing flight. The pilot was the sole survivor.				
Nov. 10, 2008	Rome	Boeing 737-800	substantial	172 none
Multiple bird strikes to the nose, wings and engines occurred during approach, and the left main landing gear collapsed on touchdown.				
Nov. 13, 2008	Detroit	Bombardier CRJ200	substantial	24 none
The airplane collided with a tug on a taxiway at Detroit Metropolitan Wayne County Airport. The tug driver sustained a minor head injury. Firefighters sprayed foam on fuel that leaked from a punctured tank.				
Nov. 13, 2008	Al Asad, Iraq	Antonov An-12B	destroyed	7 fatal
The airplane crashed shortly after departing from a U.S. air base for a cargo flight to Baghdad.				
Nov. 16, 2008	Thormanby Island, Canada	Grumman G-21A Goose	destroyed	7 fatal, 1 serious
The airplane struck a hill during a charter flight from Vancouver to a work site at Powell River.				
Nov. 18, 2008	Göteborg, Sweden	British Aerospace Avro RJ100	minor	63 none
The airplane was en route from Stockholm to Brussels, Belgium, when an unidentified object struck the windshield and the cabin began to depressurize. The flight crew conducted an emergency landing at Landvetter Airport.				
Nov. 22, 2008	God's Lake Narrows, Canada	Beech King Air A100	destroyed	5 minor
The King Air struck terrain while returning to the airport after a cockpit fire erupted during departure for an air ambulance flight.				
Nov. 23, 2008	Recife, Brazil	Beech Super King Air 200	destroyed	2 fatal, 8 NA
The airplane stalled and crashed in a residential area after both engines failed due to fuel exhaustion on approach to Guarapes Airport. No one on the ground was hurt.				
Nov. 27, 2008	Perpignan, France	Airbus A320-200	destroyed	7 fatal
The A320 was on a postmaintenance test flight when it struck the Mediterranean Sea on approach to Perpignan Airport.				

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.


EASS
21st annual European Aviation Safety Seminar
Nicosia, Cyprus
March 16–18, 2009
FLIGHT SAFETY FOUNDATION
era
european regions airline association
EUROCONTROL
To receive agenda and registration information, contact Namratha Apparao,
tel: +1 703.739.6700, ext. 101; e-mail: apparao@flightsafety.org.
To sponsor an event, or to exhibit at the seminar, contact Ann Hill, ext. 105; e-mail: hill@flightsafety.org.
© Dainis Derics/iStockphoto