AeroSafety WORLD

NIGERIA'S RECOVERY

SAFETY ON THE RISE

HEMS RISK STUDY
Operators face challenges

AFRICAN OVERSIGHT
Progress discussed

CARAVAN MISTAKE
Visibility, wind make trouble

BIRTHS ON BOARD
Crew response crucial

THE JOURNAL OF FLIGHT SAFETY FOUNDATION

MAY 2009

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— Will Dirks, VP Flight Operations, Cessna Aircraft Co.

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FLIGHT SAFETY FOUNDATION

LISTENING TO THE Data

As I mentioned last month ("Safety in Bad Times," *ASW*, 4/09, p. 1), we are seeing a disturbing set of accidents that seem to lack a common thread. We can now add the tragic crash of a FedEx MD-11 to that list. As random as these recent accidents look, though, one factor does connect them. We didn't see them coming and *we should have*.

Before, we could blame technology. There was no affordable way to collect and analyze data. Well, we don't have that excuse anymore. Now we look at these accidents and have to admit the data were trying to tell us something but we weren't listening.

We failed to heed the data in a couple of ways. In many cases, flight data monitoring was available but was not being used. Look at the accident record and count the number of carriers that were not using FDM or FOQA.

Second, look at the number of accidents where the data were there but their significance was lost on us. Only after the runway confusion crash of Comair was the U.S. Federal Aviation Administration (FAA) able to dig through the mountains of data and find that departures on the wrong runway were surprisingly common <www.asias.faa.gov/pls/portal/docs/page/asias_pages/asias_studies/pdfs/asiaswrongrunwayreport.pdf>. After the Spanair crash, it took *USA Today* to look at the data and find 55 reports of flap extension errors on takeoff since 2000 in the United States alone <www.usatoday.com/travel/flights/2008-10-22-madridcrash_N.htm>. In these cases, the data were there but we didn't find the implications in time. I am sure that safety managers read accident reports, but from where they sat they couldn't see the pattern.

So how do we do better? Obviously, those segments of the industry that are holding out on data collection systems like FDM and FOQA need to reconsider their positions. I am still at a loss to explain why FOQA isn't a requirement in the United States. At the same time, those countries and airlines that have not committed to voluntary reporting systems need to look for the best practices in put them in place. Those have to include strong protection for the data, not just from actions by the regulator, but by courts as well. I don't think any place in the world has this exactly right yet, but there are plenty of guides to get started. For example, Australia is adopting a sweeping new aviation policy, and the United States is looking at a new FAA authorization bill under a new administration. The opportunities are out there if we look for them.

Finally, the tougher challenge is to share the data to allow us to see problems early on. If several airlines share data, occasional events that once appeared random may be more clearly seen to be part of a pattern that allows a common safety threat to be understood. This isn't exactly a new idea. The U.K. Flight Safety Committee has been doing this in a low-tech way since 1959.

But now we have other technical opportunities. The FAA is starting to fuse data from dozens of carriers, some of them international, in a program called Aviation Safety Information Analysis and Sharing (ASIAS). Efforts like these point us to the next generation of safety improvements. Looking back over the past few months reminds us that we still have to get better at looking forward.

William R. Voss
President and CEO
Flight Safety Foundation

AeroSafetyWORLD

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Airlines return to Nigeria as safety improves.
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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.

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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.

Member**Guide**

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OVERSIGHT Threatened

A somewhat unexpected benefit from airlines forming globe-circling business alliances has been the creation of a new layer of safety oversight as alliance partners check on each other and provide assistance.

Strangely enough, the competition-driven quasi-consolidation of the alliance movement provides a more profound safety improvement through cooperation than airlines achieved back in the pre-deregulation era, when they were encouraged not only to cooperate on economic matters but also were required to maintain a high degree of commercial coordination in international operations. Sure, there was mutual back-scratching on maintenance issues, and even the formation of maintenance consortia in which medium-sized carriers pooled resources to approach large airline economies of scale in overhaul facility operations, but airlines were not much attuned to checking up on each other's operations. I suspect that, given the pride most airlines had in their unique operating protocols, such checking would not have been tolerated.

Now, however, as Croatian Airlines' Tomislav Gradisar pointed out at the Foundation's recent European Aviation Safety Seminar in Nicosia, Cyprus, the evolved inter-airline safety system has "adequate finances, adequate human resources and unlimited scope," not constrained to the limits of regulation, able to reach beyond those limits when more should or could be achieved. But there is a weakness in this system: "They want to make it work."

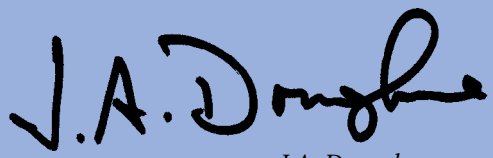
I take his intended point, that an intra-alliance oversight might be tainted by a need to make the audits show good results. However, his words also can be taken in another way: Oversight conducted on the straight and narrow has the power to achieve the end goal, as well.

Thus it has been that collaborations crafted largely for commercial motives have had a safety payoff, not only because of the requirements put on these alliances by governments as part of the price for approval but also from pilot groups from diverse alliance carriers coming together to share their information in a new kind of organization that crosses borders and hemispheres.

Now, however, there is a regressive tide of thought sweeping through the U. S. House of Representatives that runs counter to the past three decades-plus of convincing governments to treat airlines as they treat nearly every other form of business enterprise. The proposed legislation would increase the burden on airlines trying to maintain an alliance. Not all alliances are wildly successful, and should U.S.-imposed rules prove to be the stick that breaks the camel's back, that extra layer of oversight would be lost.

In addition, the House's wrong-headed attack on airlines also would require the Federal Aviation Administration (FAA) to inspect non-U.S. maintenance facilities used by U.S. carriers twice a year, a move that would be a direct violation of last year's U.S.-European Union (EU) agreement to allow reciprocal treatment of maintenance and repair facilities. Ultimately, the proposed requirement also would mean that the European Aviation Safety Agency (EASA) would have to inspect U.S. shops used by EU airlines, as well. It is doubtful that either the FAA or the EASA has the resources to conduct such inspections, and this would create severe service disruptions.

There are no safety benefits to be derived from either proposal. In fact, the opposite would be the result.



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

We can't wait for rule changes to counter fatigue

The March *ASW* ["Easing Fatigue," p. 22] did a great job discussing the challenges and solutions related to flight crew fatigue. Your editorial [p. 5] was "right on" as you characterized the reality of all parties having a lack of will to address a serious safety hazard. You rest responsibility on labor and on the company for accepting the status quo in lieu of the safety and scientific evidence. You are being kind not to include government, who also must influence the situation.

Perhaps, by design, you kept the focus on flight crews and air traffic control. Of course, all aviation workers have similar alertness challenges. From the ramp, to maintenance, to the cabin crews, all workers are fatigued by their work schedules and then by today's challenges of life away from work. A multitude of U.S. National Aeronautics and Space Administration Aviation Safety Reporting System reports demonstrate the situation with quotes like this one from a maintenance worker: "Fatigue played a role as I had not slept prior to this event for a period approaching 22 hours."

In lieu of immediate rule changes, U.S. Federal Aviation Administration (FAA) Flight Standards is working with the FAA Civil Aerospace Medical Institute (CAMI) on fatigue-related applied research and development, both for cabin and maintenance workers. The long-term solution may be appropriate rule making; however, immediate action is necessary.

For the maintenance research, CAMI has formed a working group of scientists, labor representatives and managers to identify and implement short-term solutions. Those could include increasing the use of scientific scheduling; controlled application of fatigue testing and monitoring devices; and distribution of attractive promotional materials that highlight the personal injury, flight safety and financial issues associated with working while fatigued. Most important, all parties must wake up and address the fatigue challenge.

It took a long time for governments and the public to address the issue of alcohol-impaired driving. The issue of fatigue-impaired driving and working must involve that same scientific, regulatory and public recognition and action. Sooner would be better than later.

Dr. Bill Johnson
Chief Scientific and Technical Advisor
Human Factors in Maintenance
U.S. Federal Aviation Administration

Getting out of sleep debt

Besides the risk management on how we manage our schedules and use science and technique to stay awake, the root cause of fatigue is the individual being unable to get to sleep to reduce the sleep deficit. One aspect that you do mention is to get a good rest and ease the fatigue and sleep debt. However, how many of us never get to REM sleep [in which dreams occur].

I came to the realization that I was restless at night and missing that "dream period." The catch-22 was a medical condition we call sleep apnea. Once I visited the doctor to have a sleep test and, diagnosed with sleep apnea, I lost my ticket. For me, I knew it was the right thing to do. I realized the risk I was incurring on my own health, family, friends, co-workers and customers.

I made the turnaround in record time and got my special issuance from the FAA. For three years now, I have slept with the "dream machine," worked hard at other factors to reduce my known cause for fatigue and incorporated some of the techniques mentioned to manage my risk during my time of wakefulness.

I'm a fairly young guy and want you to know that if you are not dreaming, keep yawning during the day, have circles under your eyes, have microsleep episodes or your friends tell you "what you look like" — go visit your doctor. The catch-22 of being diagnosed with sleep apnea can be overcome to enjoy a great day. However, the root cause of a fatigue incident or accident is not getting your "dreams," and that is unacceptable in our business.

Name withheld by request

MAY 3–7 ➤ Annual Scientific Meeting. Aerospace Medical Association. Los Angeles. Dr. Russell B. Rayman, <rrayman@asma.org>, <www.asma.org/meeting/index.php>, +1 703.739.2240, ext. 103.

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 4–7 ➤ Aging Aircraft 2009. Universal Technology Corp. Kansas City, Missouri, U.S. Jill Jennewine, <jjennewine@utcdayton.com>, <www.agingaircraft2009.com/index.html>, +1 937.426.2808.

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 6–7 ➤ Bird Strike Prevention Forum. Aviation Week Management Forums. Chicago. Helen Kang, <helen_kang@aviationweek.com>, <www.aviationnow.com/forums/birdmain.htm>, +1 212.904.6305.

MAY 11 ➤ Fatigue in the Air and on the Road Symposium. Stress Research Institute, SAS, Swedish Airline Pilots Association. Stockholm, Sweden. Louise Nordenskiöld, <louise.nordenskiold@stressforskning.su.se>, +468 5337.8918.

MAY 11–12 ➤ Risk Management Course. ScandiAvia. Stockholm. Morten Kjellesvig, <morten@scandiavia.net>, <www.scandiavia.net/index.php/web/artikkel_kurs/risk_management_course/>, +47 91.18.41.82.

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 18–19 ➤ A Practical Approach to Safety Management Systems Course. Curt Lewis and Beyond Risk Management. Denver. Brendan Kapuscinski, <info@beyondriskmgmt.com>, <fsinfo.org/docs/SMS_Beyond_ad.pdf>, +1 403.804.9745.

MAY 21–22 ➤ Waypoint AirMed and Rescue. *Waypoint*. Oxford, England. <info@airmedandrescue.com>, <www.airmedandrescue.com>, +44 (0)117 922 66 00, ext. 2.

MAY 26 ➤ Management Responsibilities Within EASA 145 Course. Baines Simmons Americas. Jerry Allen, <jerry@bainessimmonsamericas.com>, <www.bainessimmonsamericas.net>, 888.326.5070, +1 770.298.9025.

MAY 27–29 ➤ Wildlife Management Workshop. Embry-Riddle Aeronautical University. Dallas-Fort Worth International Airport. <training@erau.edu>, <worldwide.erau.edu/professional/wildlife-hazard-management.html>, 866.574.9125, +1 386.226.7694.

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 2–4 ➤ 2009 Europe/U.S. International Aviation Safety Conference. European Aviation Safety Agency and Hellenic Civil Aviation Authority. Athens, Greece. Ross Inwood, <athens2009@easa.europa.eu>, <www.easa.europa.eu/conf2009>, +49 221 89990 2041.

JUNE 3–4 ➤ Flight Simulation Conference: Towards the Edge of the Envelope. Royal Aeronautical Society. London. <conference@aerosociety.com>,<www.aerosociety.com/conference/indexconf.html>, +44 (0)20.7670.4345.

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.

JUNE 9–11 ➤ CAE Flightscape Users Conference. CAE Flightscape. Ottawa. <info@flightscape.com>, <www.flightscape.com/about/conferences.php>, +1 613.225.0070.

JUNE 15–21 ➤ International Paris Air Show. Gifas (Groupement des Industries Françaises Aéronautiques et Spatiales). Paris Le Bourget. <siae@salon-du-bourget.fr>, <www.paris-air-show.com>, +33 (0)826.465.265.

JUNE 15–18 ➤ Human Factors Initial and Train-the-Trainer Courses. The Aviation Consulting Group. Phoenix. Bob Baron, <tacg@scccoast.net>, <www.tacgworldwide.com/humanfactorstraining.htm>, 800.294.0872, +1 954.803.5807.

JUNE 22–23 ➤ Safety Awareness Course. AviAssist Foundation and Zambia Air Services Training Institute. Lusaka, Zambia. Tom Kok, <tom.kok@aviassist.org>, <www.aviassist.org>, +260 (0)955 711205.

JUNE 25–27 ➤ 14th Annual Flight Attendants Conference. National Business Aviation Association. New Orleans. Jay Evans, <jevans@nbaa.org>, <web.nbaa.org/events/fac/2009>, +1 202.783.9353.

JULY 7–9 ➤ Deicing Conference. Airports Council International–North America and Air Transport Association of American. Cincinnati. <meetings@aci-na.org>, <www.aci-na.org/conferences/detail?eventId=142>, +1 202.293.8500.

JULY 13–17 ➤ Safety Management System Principles Course. MITRE Aviation Institute. McLean, Virginia, U.S. Mary Page McCanless, <mpthomps@mitre.org>, <mai.mitrecaasd.org>, +1 703.983.6799.

JULY 13–22 ➤ Safety Management System Theory and Application Course. MITRE Aviation Institute. McLean, Virginia, U.S. Mary Page McCanless, <mpthomps@mitre.org>, <mai.mitrecaasd.org>, +1 703.983.6799.

JULY 16–17 ➤ Implementing LOSA and TEM Into Your Organization Course. Morning Star Aviation Consulting. Denver. David Bair, <DLBair@comcast.net>, <www.regonline.com/builder/site/Default.aspx?eventid=127619>, +1 720.981.1802.

AUG. 3–6 ➤ Air Safety and Security Week. Air Line Pilots Association, International. Washington. <crewroom.alpa.org/safety/?tabid=2427>, +1 703.689.2270.

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.

Safety News

Helicopter Crash Analysis

A preliminary analysis of 186 helicopter accidents in Europe between 2000 and 2005 has found that about one-third — and about 68 percent of the fatal accidents studied — occurred during the en route phase of flight.

The preliminary analysis by the European Helicopter Safety Team (EHEST) was based on final investigation reports on accidents that occurred within member states of the European Aviation Safety Agency (EASA). These accidents included an estimated 58 percent of all accident reports available for that time frame and about 25 percent of the total helicopter accidents that occurred during the period. The accident analysis is being conducted as part of an overall effort to reduce the helicopter accident rate by 80 percent by 2016, in line with objectives of the International Helicopter Safety Team.

© Christian Sager/Wikimedia

Human factors issues were cited in 76 percent of the accidents, and the analysis, which is designed to identify safety issues and intervention recommendations, singled out three areas most frequently identified as "standard problem statements" associated with accidents: "pilot judgment and actions," "safety culture/management" and "pilot situation awareness."

Of the 186 accident reports analyzed, 72 involved general aviation, 66 involved aerial work, 40 involved commercial air transport and eight were state flights. Data showed that in 33 percent of the 186 accidents, the pilot had less than 1,000 flight hours in helicopters.

New Push for Performance-Based Navigation

Major stakeholders in the aviation industry have endorsed a declaration promoting the speedy adoption of performance-based navigation (PBN) to enhance safety and efficiency in the air transport system worldwide.

"Our collective mission has always been to provide the citizens of the world with the safest and most efficient air transport system possible," said Roberto Kobeh González, president of the Council of the International Civil Aviation Organization (ICAO). "Performance-based navigation is vital to helping us fulfill our mission today and in the future."

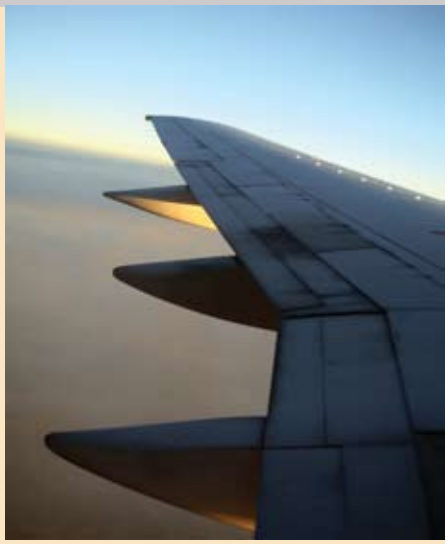
Under PBN, performance requirements shift from conventional ground-based navigation aids and related procedures to satellite-based navigation aids and area navigation procedures, which provide for greater accuracy, more direct routes and more efficient takeoffs and landings.

As an example, ICAO cited the implementation of the first phase of an agreement between Qantas and AirServices Australia to develop PBN arrival procedures at Australian airports. Phase 1 included development of approaches to be flown by Qantas Boeing 737s into Brisbane.

"In the first year, Qantas flew 1,612 PBN approaches to Brisbane in low-visibility conditions, which reduced normal distance flown by 17,300 nm [32,040 km]," ICAO said. PBN also reduces the number of diversions resulting from low visibility and improves access to "weather-challenged destinations," ICAO said.

The 10 signers of the declaration agreed to support ICAO's timetable for implementation of PBN and to "assist states, regions and other stakeholders in their development and execution of a complete PBN implementation plan."

The organizations represented by the signers included ICAO, the International Air Transport Association, the Civil Air Navigation Services Organisation, the International Federation of Air Traffic Controllers' Associations, the International Federation of Air Line Pilots' Associations, the International Business Aviation Council and the International Coordinating Council of Aerospace Industries Associations.



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Others were the Airports Council International, the International Federation of Helicopter Associations and Flight Safety Foundation.

Fire Prompts Safety Recommendations

All Boeing 777s should be equipped with trays to contain hot debris that might drip onto insulation blankets in case of a failure of power contactors in the airplane's main equipment center, which contains electric and avionics equipment, the U.K. Air Accidents Investigation Branch (AAIB) says.

In addition, the AAIB said that the European Aviation Safety Agency (EASA) and the U.S. Federal Aviation Administration (FAA) should require all 777s to be equipped as soon as possible with "a software update that will generate a caution message to alert flight crew of the presence of smoke in the main equipment center."

The recommendations were included in the AAIB's final report on a Feb. 26, 2007, accident involving a United Airlines 777-200 at London Heathrow Airport. None of the 205 people in the airplane was injured in the accident, which resulted in extensive heat and fire damage to a power panel near the nose gear wheel well, the report said.

The report said that the accident occurred during engine start, when an electrical failure occurred in the right main bus as the right generator came on line. The crew detected a burning odor, observed indications of the bus failure and, in response, shut down the right engine and taxied the airplane to a nearby stand. When fire fighters arrived, they found smoke but no fire.

© Adrian Pingstone/Wikimedia

"The heat generated during the failure resulted in the contactor casings becoming compromised, causing molten metal droplets to fall down onto the insulation blankets below," the report said. "The insulation blankets ignited, and a fire spread underneath a floor panel to the opposite electrical panel, causing heat and fire damage to structure, cooling ducts and wiring."

Boeing said that it already has begun a review of "system architecture, smoke detection, flight deck indications and flight crew procedures across all of our production models to ensure a consistent approach to fireworthiness and flight crew indication, and identify safety enhancements that may be warranted."

North Sea Task Force

A group representing the oil and gas industry in the United Kingdom has established a task force to address issues stemming from the fatal April 1 crash of a Eurocopter AS 332L2 Super Puma in the North Sea.

The Helicopter Accident Issues Task Group, established by Oil and Gas U.K., is made up of senior industry managers and is designed to help define policies and practices that may be implemented throughout the industry in the wake of the crash, which killed all 12 passengers and both pilots.

The British Air Line Pilots' Association (BALPA) said the industry's response should be accompanied by an independent safety summit on North Sea operations involving political leaders, aviation safety experts and North Sea pilots.

In a preliminary accident report, the U.K. Air Accidents Investigation Branch (AAIB) said the pilots had made a routine transmission on a company radio frequency at 1254 local time, followed 12 seconds later by the first of two calls declaring an emergency. Witnesses saw the helicopter descend rapidly and strike the water.

The AAIB said that preliminary indications are that the accident followed the catastrophic failure of the main rotor gearbox. The investigation is continuing.

Preliminary findings resulted in several AAIB safety recommendations, including calls for additional inspections of the main rotor gearbox epicyclic module and improvements in monitoring and warning systems. Eurocopter has issued corresponding service bulletins.

© Eurocopter

ASAP Returns

Aviation Safety Action Programs (ASAPs) have been reinstated at three major U.S. airlines where they had been abandoned during disputes between labor and management.

The voluntary, confidential safety-reporting programs were restored in late March at US Airways and American Airlines. A similar program at Delta Air Lines had been reinstated in late January.

"We are relieved to see the last big program come back online," Flight Safety Foundation President and CEO William R. Voss said.

"The importance of these self-reporting programs cannot be overstated. … When we can identify the little errors during a normal flight, it can lead to a change in operations that may eliminate the threat of a future major accident."

Cabin Crew Review

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As part of a review of requirements for the number of cabin crewmembers on an Australian commercial aircraft, the Australian Civil Aviation Safety Authority (CASA) has authorized some airlines to operate with a lower cabin crew-to-passenger ratio than prescribed by law.

Australian law requires one cabin attendant for every 36 passengers in airplanes that carry between 36 and 216 passengers. Worldwide, best practices have been identified as requiring one flight attendant for every 50 passengers, and under the review, "after carefully evaluating the safety implications of each change," some airlines have been permitted to operate with one cabin attendant for every 50 passengers, CASA said. "This has included comprehensive and detailed reviews of the application and practical demonstrations by operators, taking into account evacuation efficiency and crewmember redundancy issues."

Before a decision is made to propose changing the current requirements, the review will examine "aircraft certification requirements, the carriage of children, crew numbers per floor-level exit and the need for safety cases to move to the 1-to-50 ratio," CASA said.

CIS Safety Plans

The Interstate Aviation Committee (IAC) of the Commonwealth of Independent States (CIS) and the International Air Transport Association (IATA) have agreed on a plan to improve aviation safety throughout Russia and other nations that are part of the CIS.

The agreement calls for improvements in the civil aviation infrastructure, including implementation of the International Civil Aviation Organization's (ICAO's) standards for reduced vertical separation minimums and performance-based navigation, and emphasizes IATA's operational safety audits (IOSA), safety audits for ground operations (ISAGO) and integrated airline management system (IAMS).

"Safety is our top priority, and the performance of the CIS is far below the global average," said Giovanni Bisignani, IATA director general and CEO.

IATA said the new agreement expands on a 1994 pact between the IAC and IATA to promote "safe, secure and reliable air transport."

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Bisignani added, "Russia's vast geography makes aviation a critical link domestically and internationally. Russia's location puts it at the crossroads of North America, Asia, Europe and the Middle East. Russia's seat on the ICAO Council makes it an important player in international aviation policy. IATA's goal is to work with the Russian government to ensure that this great aviation nation is fully integrated into the global aviation system. … The result will be a safe and efficient air transport industry delivering enormous economic benefits."

In Other News …

The International Federation of Air Line Pilots' Associations has asked the European Commission and European national aviation authorities to work toward speedy development of **flight time limitations** based on a scientific study that called for strict new duty-time limits (*ASW*, 3/09, p. 22). … The U.S. Federal Aviation Administration has extended until Aug. 10 the deadline for public comment on a proposal to enhance **training programs** for air carrier flight crews. The changes that would be required under the proposal include increased use of full flight simulators and special hazard training on loss of control and controlled flight into terrain (*ASW*, 4/09, p. 39). … The European Commercial Aviation Safety Team (ECAST) has issued guidelines to aid in implementing **safety management systems**. The guidance materials include reviews of reference materials, hazards identification and risk assessment methods.

Compiled and edited by Linda Werfelman.

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SYSTEMIC ILLS

BY LINDA WERFELMAN

A risk profile points to latent structural issues behind the HEMS industry's safety problems.

Helicopter emergency medical services (HEMS) in the United States are plagued by a range of systemic risks — many of them embedded in the industry's structure or oversight framework — that have led to divergent standards and interruptions in the level of health care and operational safety they provide, according to a report released by Flight Safety Foundation.

Risks associated with the absence of a well-defined national EMS structure are among the most serious of 26 specific risks identified in the *Industry Risk Profile (IRP)*, developed by Aerosafe Risk Management, which has developed similar profiles for many segments of the aviation industry. The report is available on the Internet at <www.flightsafety.org/pdf/HEMS_Industry_Risk_Profile.pdf>.

"The current regime was not purposefully designed and has evolved over the past 20 years … in the absence of a framework," said the *IRP*.

The *IRP* blamed the lack of a defined structure for the development of standards that differ from state to state, as well as an increased likelihood of conflicting practices in HEMS operations nationwide.

This specific risk is associated with 17 other effects on the HEMS industry, including industry confusion about accepted practices, "no publicly visible accountability structure for the industry," varying standards for professionals employed in the field and "lack of confidence by the stakeholders that effective health care can be effectively delivered," the *IRP* said.

The document identified 26 sets of actions for responding to each of the 26 identified risks. Recommended responses to risks stemming from the absence of a defined structure included convening a task force representing industry and regulatory groups to "collaboratively review the national EMS definition, framework and arrangements for their suitability and effectiveness." After that work has been reviewed and accepted, plans should be adopted for redesigning the EMS framework "to cater for the national, state and local needs of the health care community," the *IRP* said.

Other related recommendations were to "confirm the political position upon whether access to air medical transportation is considered an essential service" and to appoint an appropriate agency to be accountable for implementation of efforts to improve the national EMS framework. That framework should include performance-based requirements for states to use in designing and implementing a statewide EMS system consistent with a state framework, the *IRP* said. Before the national EMS framework is implemented, another recommendation calls for development of options to resolve "the question of federal versus state oversight of the medical component of HEMS operations," the *IRP* said.

Most Deadly Year

Issuance of the *IRP* followed an increase in HEMS accidents in recent years, concluding with 13 crashes in 2008, the most deadly year in HEMS history. These 13 crashes killed 29 people, according to data from the U.S. National Transportation Safety Board (NTSB), which conducted a four-day hearing earlier this year to identify possible safety improvements.

Two years earlier, the NTSB had issued a report analyzing 55 EMS accidents — including 41 HEMS accidents, of which 16 were fatal, and 15 airplane EMS accidents, of which five were fatal[1] — and concluding that many of them could have been prevented with what the *IRP* characterized as "simple corrective actions, including oversight, flight risk evaluations, improved dispatch procedures and the incorporation of available technologies."

The safety recommendations that accompanied the 2006 NTSB report have been discussed in various forums, including meetings of HEMS industry leaders, and some have been the subject of voluntary compliance measures by the U.S. Federal Aviation Administration (FAA) and legislation pending before Congress (see "FAA Plans HEMS Rule-Making Effort," p. 14).

"Risk management takes place at multiple levels," the *IRP* said.

Kimberley Turner, CEO of Aerosafe Risk Management, added, "When we started this job, we knew that industry had already been working to address the risks it faces at the operational and organizational levels. The *IRP* highlights … key systemic risks, many of which are at the structural and oversight levels of the industry. The broader context of the *IRP* digs deep and provides a common rallying point for all of the HEMS industry to move forward."

The *IRP*'s stated purpose is to identify "latent and systemic issues" that had not been addressed in other forums.

"It was realized that a 'different' approach was needed and there was great value in an industrywide risk assessment that would provide a platform for the coordination of nationwide initiatives to aggressively reduce the risk profile and the associated negative trend in safety," the *IRP* said.

The *IRP* timeline calls for copies of the document to be distributed throughout the HEMS industry to enable HEMS stakeholders to develop

FAA Plans HEMS Rule-Making Effort

The U.S. Federal Aviation Administration (FAA) plans to propose new rules, perhaps by late 2009, to impose stricter safety standards on the helicopter emergency medical services (HEMS) industry.

In a joint statement, Christa Fornarotto, acting assistant transportation secretary for aviation and international affairs, and John M. Allen, director of the FAA Flight Standards Service, told a congressional subcommittee that the agency has begun a formal rule-making project to "address many of the HEMS initiatives and best practices that have been put forth in the advisory circulars, orders and notices issued over the last several years, as well as the most recent revisions to the OPSPEC [operations specification for HEMS operations]." Plans call for the notice of proposed rule making to be published in late 2009 or early 2010.

Fornarotto and Allen told a hearing of the aviation subcommittee of the House Committee on Transportation and Infrastructure that the OPSPEC initiatives have included raising ceiling and visibility requirements for HEMS operations, requiring specific flight planning for visual flight rules (VFR) operations and providing for increased instrument flight rules (IFR) operations by allowing the use of weather-reporting sources located as far as 15 nm (28 km) from the landing location. All HEMS operators now operate according to the OPSPEC, they said.

Other FAA recommendations call for establishing operational control/dispatch systems for all operators and creating operational risk assessment programs. In addition, the FAA appointed a committee to develop standards for the use of helicopter terrain awareness and warning systems (HTAWS), and has urged creation of a stronger safety culture in the industry.

An FAA survey found that more than 80 percent of HEMS operators have adopted training programs and operational control center practices recommended by the FAA, nearly 90 percent have installed radio altimeters in their helicopters, and more than 40 percent have installed HTAWS in at least some of their aircraft, Fornarotto and Allen said. The percentage of operators using HTAWS is expected to increase with publication of an HTAWS technical standard order, they said.

"We recognize that relying on voluntary compliance alone is not enough to ensure safe flight operations," they said, noting that the rule-making

process will mandate many of the practices that now are voluntary.

They discouraged passage of two legislative proposals dealing with safety provisions and state regulatory issues.

One bill would write into law requirements for several of the voluntary compliance measures, including conducting flights under the commuter and on-demand standards of U.S. Federal Aviation Regulations Part 135, developing consistent flight-dispatch procedures and a risk evaluation program, and requiring flight data recorders and cockpit voice recorders in EMS aircraft.

The other measure would expand the states' authority to regulate medical aspects of HEMS operations such as the medical training of the aircraft crew and the medical equipment to be carried in the aircraft. Supporters say it clarifies the authority of states to oversee EMS operations just as they currently oversee ground ambulances.

"The FAA does not believe that new safety legislation is needed at this time," Fornarotto and Allen said, citing "current regulations that govern emergency medical services flights, the voluntary safety measures already being implemented by the industry, as well as the rule-making efforts underway."

They were especially critical of the legislative effort to give the states more authority to regulate medical aspects of EMS operations.

"We are concerned that 50 separate state regimes addressing the economic regulation of air ambulances could unnecessarily complicate the industry and hinder interstate operations," they said. "We also believe that state regulation of the economic issues could serve to limit market entry and could ultimately have a negative effect on available services."

Robert L. Sumwalt III, a member of the U.S. National Transportation Safety Board (NTSB), praised the FAA's plans for formal rule making, adding that, in the past, the FAA "has not taken sufficient action on [NTSB] recommendations" to overhaul HEMS operations.

Sumwalt cited the "lack of timely and appropriate action" on four recent NTSB safety recommendations that asked the FAA to require EMS operators to comply with Part 135 operations specifications — specifically for weather minimums and pilot flight and duty time limits — during flights with medical personnel in the aircraft, to implement flight risk evaluation programs, to adopt formalized dispatch and flight-following procedures and to install HTAWS in their aircraft.

The NTSB is drafting additional recommendations involving HEMS oversight, equipment and training, he said.

Rep. James L. Oberstar, the Minnesota Democrat who chairs the Transportation and Infrastructure Committee, said that the FAA's voluntary guidance to HEMS operators and the stricter requirements for weather and visibility operating requirements are "steps in the right direction" but that additional action is required.

"While some progress has been made by the FAA regarding HEMS safety issues, FAA must commit to long-term action to ensure that patients and flight medical crew aboard HEMS flights reach their destinations safely," Oberstar said.

Matthew Zuccaro, president of the Helicopter Association International, whose members include 93 U.S. air medical service operators, told the subcommittee that the FAA's rule-making process is "unacceptable in terms of the length of time it takes to effect a rule change." Congress should direct the FAA to revise those procedures to "expedite implementation of beneficial safety initiatives, when appropriate," he said.

Sandy Kinkade, president of the Association of Air Medical Services, encouraged allocation of more federal funds and research for expanding the low-altitude aviation infrastructure, including "private-use hospital helipads, regional airports and other routinely utilized locations"; expanding low-altitude, off-airport weather reporting; and expanding "FAA … capabilities surrounding the certification and approval of NVGs [night vision goggles] or similar enhanced-vision systems."

— LW

a response by July 15. One authorized representative from each stakeholder group will be invited to a risk reduction planning conference in August, when strategies will be approved and combined into an overall risk reduction action plan to be presented to the industry.

After that, designated representatives will provide status reports every six months on progress in implementing risk reduction plans, and at some yet-to-be-determined point, the plans will be updated.

"As the context of the industry changes, appropriate triggers for a full update or overhaul of the HEMS *IRP* will be determined," the *IRP* said. "These triggers may include significant progress in completion of the risk reduction measures, emergence of significant new risks … or the accident profile of the industry is not visibly decreased.

"The industry [is] to continue on the six-monthly cycles for the formal management of risk until an acceptable risk profile is achieved."

'Very High' Risks

Of the 26 distinct risks identified in the report, eight were classified as "very high" — including three that were placed at the uppermost level in that category — and the remaining 18 were classified as "high."

Those at the uppermost level, in addition to the risks associated with the absence of a well-defined national EMS structure, were:

- "The risk that the current medical reimbursement model (primary payer model) is no longer adequate to provide the appropriate level of financial coverage for either the current operating costs of the service or the impending upgrade of capability required through the addition of technology"; and,
- "The risks associated with the complexity, non-alignment and lack of clarity around the roles and scope of federal, state and county agencies involved in oversight of the HEMS industry."

Medical Reimbursement

The *IRP* identified 13 effects on the HEMS industry of the medical reimbursement risk, including inconsistencies from one state to another in the primary payer model and pricing pressure on HEMS operators. Pricing pressures may mean that some safety-related training practices, including simulator training, will be considered expendable luxuries.

In addition, reimbursement from Medicare,[2] without additional commercial insurance reimbursements, "will not allow HEMS transport programs to meet operational expenses and maintain financial viability," the report said. Also among the risks are that more advanced helicopters with safer equipment — such as twin-engine aircraft equipped for instrument flight rules (IFR) flight, helicopter terrain awareness

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and warning systems (HTAWS), and night vision goggles (NVGs) — and better-trained flight crews may not be affordable.

The formula for Medicare reimbursement "fosters the proliferation of new programs that operate in rural areas and that incur the lowest operational overhead," the *IRP* said. "The higher reimbursement from Medicare for transports from rural areas, which pays only for 'loaded miles,' inadvertently penalizes transport programs operating in urban and suburban areas." ("Loaded miles" refer to the distance flown when a patient is aboard the helicopter.)

"Conflicting regulatory priorities may place operators in a position where they make decisions that are not optimal for either the aviation or medical areas."

The suggested three-part risk treatment strategy calls for the development of a plan to evaluate and, if necessary, to re-develop, the medical reimbursement model to ensure that related risks have been minimized; the implementation of a medical reimbursement or revenue model to cover operating costs as well as investment in "future capability improvements"; and the recognition that competition among HEMS operators should occur on a regional or state level rather than on a "task-by-task basis" in which those in need of HEMS service call several competing operators — a situation that sometimes results in one operator accepting a flight after others have declined because of instrument meteorological conditions (IMC) weather or other factors.

Complexities of Oversight

The *IRP* said that the complexities surrounding the roles of agencies involved in HEMS oversight can lead to inconsistency with criteria and protocols that determine how HEMS assets will be used and to challenges for the industry in identifying requirements.

Other effects of the risk on the industry include the fact that "no single regulatory body has responsibility for [overseeing] the EMS system as a whole," that "conflicting regulatory priorities may place operators in a position where they make decisions that are not optimal for either the aviation or medical areas" of the industry and that regulators may make independent decisions in one of those areas that would be less than optimal in the other area, the *IRP* said.

The eight points in the risk treatment strategy include analyzing all U.S. bodies that have "some level of accountability or responsibility" for HEMS regulation and producing a centralized stakeholder database; establishing a group to develop an integrated oversight model; and developing options to clarify areas that are within both federal and state oversight.

Operating Environment

Among the other risks, the *IRP* said, is that the operating environment, infrastructure and standard industry practices for both interfacility flights and "scene flights" (conducted to and from accident sites and other off-airport and off-helipad locations) is "not sufficiently designed at the HEMS system level, leading to the increased variance and application of flight profiles, safety standards and safety risk exposure to patient, aircraft … and the public."

Resulting issues for inter-facility transfer flights involve flights that are conducted under visual flight rules (VFR) when IFR operations might be possible, increased potential for controlled flight into terrain or loss of control because of inadvertent encounters with IMC and potential for traffic conflicts near busy hospital helipads.

Issues for scene flights involve the heavy reliance on VFR procedures, even when weather conditions are marginal. As a result, flights often are conducted at low altitudes, with less margin for error; night flights may involve reduced visibility and increased risks for VFR operations; and flights may include inadvertent entry into IMC.

The risk treatment strategy called for implementing task briefing and debriefing processes industrywide, implementing a low-altitude IFR route structure as part of the National Airspace System and adopting "necessary infrastructure to allow the IFR inter-facility flights to be conducted in a more controlled 'standard flight profile' similar to that of a routine aviation operation that flies from known point to known point."

In addition, the strategy recommended that HEMS aircraft be equipped to enable pilots to safely return to visual flight conditions in case of an inadvertent IMC encounter, and that they be equipped with technology such as NVGs, HTAWS and ADS-B (automatic dependent surveillance–broadcast) to assist pilots during VFR flights at low altitudes.

Blurred Responsibilities

The *IRP* also challenged the blurred lines of responsibility that have arisen between flight personnel and medical personnel, especially with the increased involvement of medical crewmembers in NVG operations, passenger briefings, aircraft loading and unloading, and operational risk management.

This results in confusion "for both pilots and medical crew about specific roles in promoting aviation safety and how to apply and use the education they have each received in air medical resource management," the document said.

The recommended risk treatment strategy called for "regulatory clarification of the status of on-board medical personnel," followed by action to ensure that the requirements are enforced.

Note

1. NTSB. *Special Investigation Report: Emergency Medical Services (EMS) Operations*, SIR-06/01. Jan. 25, 2006.
2. Medicare is U.S. government health insurance for people age 65 or older, and for younger people with specific disabilities.

Further Reading From FSF Publications

Werfelman, Linda. "Closing the Loop." *AeroSafety World* Volume 4 (March 2009): 14–18.

Werfelman, Linda. "Critical Care." *AeroSafety World* Volume 3 (September 2008): 12–17.

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BY HAROLD O. DEMUREN

International audits stimulate Nigerian airline development and public-private partnerships to continue rehabilitating infrastructure.

Early Signs of Turnaround

When people look at the skies over Nigeria today, they see a very different environment compared with what we had just a few years ago. New Nigerian airlines with modern aircraft are supplementing strong established carriers that are rapidly renewing their fleets. Many more aircraft coming into the country are providing increased flight frequencies to an ever-expanding number of domestic, regional and international destinations.

The dramatic turnaround (Table 1, p. 20) is the result of a deliberate policy of

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Murtala Muhammed Airport Two at Lagos symbolizes aspirations for more public-private partnerships.

Nigerian Civil Aviation Authority

the federal government of Nigeria that followed the demise of Nigeria Airways in 2003 and came in the aftermath of tragic accidents in the country (*ASW,* 10/06, p. 29). In November 2006, a new Civil Aviation Act became law, establishing the Nigerian Civil Aviation Authority (NCAA) as an autonomous safety regulator. Autonomy for the NCAA effectively protects it from political interference, enabling it to act without fear or favor, and provides for effective safety oversight of the aviation industry in Nigeria.

The Civil Aviation Act incorporates into domestic law provisions specified by the International Civil Aviation Organization (ICAO). The Nigerian state declarations were filed in March 2007 with the International Institute for the Unification of Private Law in Rome, and entered in July 2007 into the International Registry in Dublin, Ireland.

This law mandates that the NCAA provide safety oversight for airlines; oversight of service providers such as the Nigerian Airspace Management Agency (NAMA), the Federal Airports Authority of Nigeria, the Nigerian College of Aviation Technology in Zaria, the AEROMET Project[1] of the Nigerian Meteorological Agency, Nigerian Aviation Handling Co. and Skypower Aviation Handling Co.; economic regulation of the industry; and consumer protection. The law also establishes the Accident Investigation Bureau (AIB) of Nigeria as an autonomous agency. The AIB is now an independent accident investigator in compliance with ICAO Annex 13, *Aircraft Accident and Incident Investigation.*

The importance to Nigeria of autonomy for the NCAA and ratification of the ICAO Convention on International Interests in Mobile Equipment — also known as the Cape Town Convention — cannot be overstated.[2] Because of this autonomy, Nigerian airlines and investors now have confidence that they will compete on a level playing field — with unscrupulous operators prevented from entering the market. Nigerian aviation has new regulations, and the NCAA has the political will and independence necessary to enforce strict compliance.

The Cape Town Convention ratification has given confidence to banks and financial institutions to make investments, and this has enabled Nigerian air carriers to replace their aging fleets and make other improvements. New Boeing 737NGs, Bombardier CRJ900s and Dash 8s and Embraer types are now coming into the country, and the old aircraft are leaving.

As of February 2009, Boeing, Airbus, Bombardier and Embraer had responded to one operator's requests for proposals for 22 new aircraft (Table 2, p. 21), for example. In general aviation, new business jets are being

Civil Aviation Economic Indicators in Nigeria

Activity	Amount
Domestic passengers boarded, 2008	3.5 million
Domestic passenger growth, 2007–2008	17%
International passengers boarded, 2008	3.5 million
International passenger growth, 2007–2008	21%
Aircraft movements growth, 2007–2008	11%

Note: Amounts were estimated in early 2009.

Source: Nigerian Civil Aviation Authority

Table 1

added — such as two new Raytheon Hawker Series 900 aircraft so far in 2009 — with more, including Hawker Series 1000 aircraft, on order. The NCAA also has been registering new Bombardier Challenger, Learjet, Cessna Citation and Embraer Legacy types. Some of the country's large operators have ordered new aircraft, and they envision adding airplanes such as the Airbus A340, Boeing 747-800 and 787 to fleets in the coming months and years.

Four Nigerian airlines — Aero, Arik Air, Bellview Airlines and Virgin Nigeria Airways — in 2008 operated on regional routes, and Bellview and Virgin Nigeria provided service to the United Kingdom. [Virgin Nigeria announced in January a temporary suspension of long-haul flights to London and Johannesburg, South Africa.]

New routes are still opening up, creating opportunities for national companies to compete with British Airways, Emirates, Air France, KLM, Lufthansa and Virgin Atlantic. Start-up airlines such as Afrijet Airlines and Dana Air complement the established scheduled domestic carriers such as Chanchangi Airlines, IRS Airlines and Overland Airways.

Infrastructure Challenges

The federal government of Nigeria, meanwhile, remains committed to improving the nation's decayed aviation infrastructure — the major challenge apart from high fuel prices — to provide a safer environment for the operation of existing fleets and the new aircraft. Beyond initial expenditures on this infrastructure, there had not been any significant investment for 20 years.

Tangible signs of change have appeared since a massive government-funded program in 2006 launched work on runway resurfacing, airport security fences, airfield lighting and rehabilitation of control towers and radar. We now have a new runway at Port Harcourt International Airport open to traffic, and the rehabilitation of the second runway at Murtala Muhammed International Airport at Lagos is complete. A new domestic terminal — known as Murtala Muhammed Airport Two (MMA2), built under a private-public partnership arrangement with Bi-Courtney Limited — recently has celebrated its first year of full-scale operations.

NAMA, the air navigation service provider, has not been neglected during the nation's aviation renaissance. The air traffic control towers at three of our major airports — Lagos, Abuja and Port

More new Nigerian-registered airliners on aprons in Lagos reflect the federal government commitments to law enforcement and safety oversight, which pave the way for fleet updates.

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Harcourt — have been upgraded with state-of-the-art equipment, with major improvements to a fourth control tower at Kano soon to come.

Total air traffic control (ATC) radar coverage for Nigeria's airspace will soon be a reality as the country rolls out new installations of Thales EUROCAT C, a high-performance modular ATC system that is a first for Africa. The NCAA also is gearing up to embrace flight operations with required navigation performance in which European Geostationary Navigation Overlay Service (EGNOS) and global positioning system (GPS) satellite navigation aids replace the present terrestrial navigation aids. Performance-based navigation will mean improved reliability, time and fuel savings to the airlines, and important benefits to the environment.

Much more work lies ahead, however. Apart from the MMA2 and the federal government–owned terminal building at Nnamdi Azikiwe International Airport in the capital city of Abuja, all other airports are 1970s architecture, requiring not just a facelift but development of modern functional buildings with state-of-the-art technology.

On the whole, critical safety support services like aircraft rescue and fire fighting are stretched to the limit at the airports yet to be rehabilitated. Their associated water supply and power supply services typically are outdated, and most of their apron spaces remain congested or grossly inadequate. On the airside, most of their runways have outlived their design life, with deteriorating pavement causing some undulating runways, taxiways and aprons. The NCAA continues to pursue the completion of ongoing airport rehabilitation projects, however, and funding to address the remaining infrastructure problems.

Nigerian air navigation services — comprising the entire communication-navigation-surveillance and air traffic management (CNS-ATM) functions — pose even more challenges. Replacement of obsolete communications equipment, improvement of the navigational equipment and the completion of the NCAA's Total Radar Project with an automatic dependent surveillance–broadcast (ADS-B) component are safety-critical. A related problem is providing adequate numbers of experienced, highly skilled air traffic controllers, CNS engineers and other professionals to maintain these services.

Finally, weather has been a recurring factor in accidents in Nigeria, underscoring efforts to ensure that all flight crews have real-time, accurate forecasts for their departure, en route and destination airports. The NCAA recognizes that acquisition of modern weather observation and forecasting technology and the

Domestic and International Air Carriers Based in Nigeria

Company	Current Fleet	Daily Flights	Aircraft Ordered/Plans
Aero	2 737-300, 2 737-400, 2 737-500, 2 Bombardier Q300 and 2 Eurocopter EC 225 (28 helicopters total)	>50 scheduled airline >100 helicopter	5 737-500 and Bombardier Dash 8
Afrijet Airlines	1 McDonnell Douglas MD-83	NA	NA
Arik Air	6 737-700NG, 2 737-300, 4 Bombardier CRJ 900, 3 Q300 and 1 Fokker 50	54–92	3 A340-500, 16 737-800NG, 8 737-900NG, 5 777-300ER, 7 787-900, 4 Bombardier Q400 and 3 Bombardier CRJ 900NG
Bellview Airlines	737-300 and 767-200	NA	Responses to request for proposal received for up to 22 new airplanes
Chanchangi Airlines Nigeria	2 737-300	24	3 737-300, 737-400 and 757
Dana Air	3 MD-83	10	1 MD-83
IRS Airlines	2 Fokker F100, 3 Dornier 328 and 1 Embraer 145	18	2 F100 and 2 Embraer 145
Overland Airways	2 ATR 42, 2 Beech 1900D and 1 Saab 340	10	3 ATR 42 and 737-700NG
Virgin Nigeria Airways	5 737, 2 767 and 2 Embraer 190	39	24 Embraer 170 and 190

NA = Data not available or not operating scheduled service

Note: Data reflect early 2009 reports and estimates.

Source: Nigerian Civil Aviation Authority; airline Web sites

Table 2

IOSA Registry Adds Two Nigerian Airlines

The registry of the International Air Transport Association (IATA) Operational Safety Audit Program (IOSA) currently includes two Nigerian operators, Bellview Airlines and Virgin Nigeria Airways. Their successful voluntary compliance with the more than 900 IOSA standards was a first in the country. The achievement also coincides with an April 2009 milestone for the association itself: For the first time since the audits began in 2003, all 224 IATA member airlines — which represent 93 percent of scheduled international air traffic — are on the IOSA registry.

"IATA membership is now synonymous with best practice in airline safety," said Giovanni Bisignani, IATA's director general and CEO. "This is a great achievement and an important mark of quality for all IATA airlines … a reassurance for travelers everywhere of aviation's serious commitment to safety. We are now working with those airlines not able to make the [Dec. 31, 2008] deadline to bring them up to the high IOSA standard as soon as possible."

Several of Nigeria's air carriers pursued IOSA registration when the Nigerian Civil Aviation Authority (NCAA) in 2006 encouraged every airline that operated, or intended to operate, on international routes to adopt these industry best practices in all areas of operational safety "as if the audit were compulsory," said Harold Demuren, director general of NCAA. IATA provided the free standards and IOSA training courses for NCAA staff, and conducted gap analyses for individual Nigerian airlines to help them prepare for an audit.

Overall, IATA has invested $3 million in its Partnership for Safety program to help 180 airlines worldwide to participate in these training courses and to prepare for IOSA audits through a gap analysis, Bisignani said. Worldwide, 308 airlines have been added to the registry; registration is valid for two years from the date the audit commenced.

— Wayne Rosenkrans

training of personnel must have high priority for all the country's air carrier airports.

Public-Private Partnership

Aviation is an extremely capital-intensive business with huge amounts of money required for infrastructure development. The key to realizing the much-needed investment — particularly in Nigeria's airport terminal facilities, maintenance hangars, catering facilities, hotels and car parks — is private-public partnerships.

The private sector must be given the opportunity to participate and must be encouraged with clear and consistent government policies. Equal opportunity, free-enterprise competitive markets also must be developed with care taken to ensure that government monopolies are not replaced with private monopolies.

What ultimately makes a country's aviation system safe, functional, affordable and sustainable is the people employed by the airlines, the regulator and the service providers. Facing up to the global challenge of a shortage of skilled manpower as the workforce ages, Nigeria is investing heavily in its people.

Constant training and re-training has been a theme embraced across the industry and in the government sectors alike. While Nigerians are sent to some of the best training facilities around the world, the country also is working to revitalize the Nigerian College of Aviation Technology and the college is rapidly regaining its reputation as one of the best aviation training facilities on the African continent. The country must still find ways to provide sponsorship for ab-initio training at the college for pilots and maintenance engineers, however. Special training programs for air traffic controllers and CNS system engineers also are needed.

Public-private partnerships have worked in many areas. During the past six years, for example, Boeing Commercial Airplanes assisted the NCAA in helping to grow the Nigerian aviation sector by addressing issues of aviation safety; national aviation law; ratification of the Cape Town Convention; symposiums and workshops on operations and maintenance; finance; and fleet renewal. Airbus has provided similar programs.

International Participation

For the last few years, with the support of ICAO, Nigeria has hosted and participated in the Cooperative Development of Operational Safety and Continuing Airworthiness Program (COSCAP) Banjul Accord Group[3] Aviation

Safety Oversight Organization, which focuses on the West and Central African sub-region. In such venues, we also strongly support the initiatives prioritized in the Global Aviation Safety Roadmap.

The outcomes of the ICAO Universal Safety Oversight Audit Program audit in 2006 and the ICAO Universal Security Audit Program audit in 2008 — and work under way to sustain the corrective action plans implemented in 2007 and 2008 — have provided ample evidence of Nigeria's commitment to compliance with ICAO standards for aviation safety and security.

Like other non-European-registered air carriers seeking to operate routes to Europe, Nigerian airlines are subject to that region's Safety Assessment of Foreign Airlines Program. On the industry side, two Nigerian airlines successfully have completed assessments under the International Air Transport Association (IATA) Operational Safety Audit (IOSA) program (see "IOSA Adds First Two Nigerian Carriers," p. 22), and others continue to work toward IOSA registration.

Nigerian operators in 2008 complied with IATA's worldwide requirement for e-ticketing and elimination of paper tickets. The corresponding billing settlement plan has been adopted in Nigeria, and the IATA office in Nigeria now serves the West Africa sub-region.

At present, no Nigerian airlines are able to fly to the United States. A prerequisite is that the U.S. Federal Aviation Administration (FAA) assess the country as meeting Category 1 performance criteria [that is, "State does comply with ICAO standards"] under its International Aviation Safety Assessments (IASA) Program. Three Nigerian airlines have been designated to operate routes to the United States in the future: Arik, Bellview and Virgin Nigeria. Once Nigeria has IASA Category 1 and meets performance standards of a U.S. Transportation Security Administration audit, these carriers will be able to commence flights using Nigerian-registered aircraft.

There will be many other benefits to Nigeria upon achieving Category 1: further evidence of a commercial air transport industry that meets the highest international aviation safety standards and has strong incentives to maintain them as ICAO and the FAA continue to monitor the country's safety oversight; enhanced opportunities to develop tourism to Nigeria; the potential to develop export markets for fresh produce (fruit, vegetables, flowers, seafood, etc.); a greater sense of national pride as Nigerians fly directly to and from the United States on their own country's airlines; competition on the routes leading to lower fares and better services; an enhanced position as an airline hub for West Africa; and reduced outflow of revenue from Nigeria to foreign airlines.

All African nations need safe, secure, efficient and reliable airlines that also are profitable. That requires recognition that the biggest asset of an airline, not written on its balance sheet, is the routes that it operates and that airlines need an environment of government encouragement, and market access.

Ultimately, the NCAA's long-term objectives can be condensed simply as "Fly safe for zero accidents" — the safety culture component; "Fly smart for zero losses" — the profitable airlines component; and "Fly green for zero carbon emissions" — the environmentally friendly component.

Harold O. Demuren, Sc.D., is director general of the Nigerian Civil Aviation Authority.

What ultimately makes a country's aviation system safe, functional, affordable and sustainable is the people.

Notes

1. The AEROMET Project, one of several meteorological initiatives funded by the European Union in Nigeria, transmits real-time aviation weather data from the Nigerian Meteorological Agency to airport control towers at Abuja, Lagos and Port Harcourt.
2. This treaty, a legal instrument on financing and leasing of aircraft, was adopted in 2001. It set rules for transactions; established a global registry of international security rights in airplanes, aircraft engines and helicopters; and required national enforcement of lenders' security rights — all to reduce the risks of foreign lending and transaction costs for airlines.
3. The Banjul Accord Group comprises Cape Verde, Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone.

Promoting sensible and stable attitudes toward regulation is part of risk management.

Lessons from the Financial 'Accident'

BY MALCOLM K. SPARROW

Many of us learn by analogy. This journal was not the first to ask me what useful lessons for risk-control professionals might be extracted from the global financial wreck.

Some aspects of the financial meltdown are peculiarly *financial*, and probably not of much interest to other fields, like the failure to recognize that the risks associated with credit default swaps (insurance policies against defaults on commercial loans) would turn out to be highly correlated in strained economic conditions — a factor which undermines the general presumption of insurance market integrity and famously brought AIG to the brink of disaster.

But several aspects of the meltdown appear to have analogues in the aviation safety business. Let me propose four here.

Catastrophic Novelty

In mature regulatory environments, all catastrophic failures are novel. "Didn't we learn *anything*," people ask, "from the savings and loan crisis?" Yes, we did. We learned how to prevent another *savings and loan* crisis! The forensic debriefing of that particular disaster — just like the investigation that follows any major airplane crash — taught us everything necessary to prevent that particular catastrophe from happening again. Such disasters are studied assiduously, lessons learned and disseminated, controls enhanced. But just how *different* does the next disaster need to be, for the lessons learned last time to appear too narrow, too particular and not sufficiently generalized?

As regulatory regimes mature, they reach the limits of forensic debriefing and control feedback loops. All "major causes" of accidents have been identified and eliminated. Residual risks are novel, hard to imagine and often the result of complex interactions among multiple systems. At this point, any further advances in risk reduction rest on analysis and navigation of the early stages in the unfolding — among the precursor events, and precursors to the precursor events, at greater and greater distances from the eventual confluence of factors that would constitute the next disaster.

This is conceptually and intellectually demanding work, and requires systematic and extensive exercise of the imagination. The development of safety management systems seems to be

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civil aviation's vehicle for grappling with precisely this challenge. But this type of work is much easier to name than it is to organize, or to measure, or to master.

The Fickle Public

The public is fickle about regulatory protections, displaying a split personality. If there *was* a disaster yesterday (e.g., a meltdown, an epidemic or a crash), the fault must obviously be the result of "regulatory failure." Or, if there *hasn't* been a disaster within recent memory, "regulation is suffocating the nation." The result? An oscillating, binary, all-or-nothing support for essential regulatory protections. Public fickleness echoes at the political level, and oversight bodies — which should be better anchored in reality — end up slapping regulators around, first one way (for being overbearing and intrusive) and then the other (for being ineffective in controlling risks).

My point is not to blame the public, but to identify an important job for safety professionals and regulators. Particularly with respect to these once-in-a-blue-moon but high-consequence events (like plane crashes or financial market collapses), the experts need to prevent public opinion from lurching from one ridiculous extreme to the other — from *no tolerance* for controls one day, to screaming "regulatory failure" the next.

Society needs a more rational, stable and sustainable middle-ground commitment to regulatory protections. The challenge for government and industry leaders is to figure out how, on a continuous basis and in the absence of catastrophe, they can stimulate the public imagination about what *could* go wrong, and extend their memories about what *has* gone wrong before. We need appropriate levels of vigilance, with sustained public and political support, more durable in the face of the twists and turns of fate.

Too Big to Fail?

It is an ugly dilemma for government when major institutions teeter on the brink of collapse. Either you let them fail, with potentially disastrous consequences for the markets; or you bail them out, committing billions of taxpayer dollars. How much better to consider the question *earlier*, long before failure becomes a looming prospect.

As financial regulators around the world set about designing their new regimes, perhaps they'd consider some deliberate steps backward, restoring a degree of industry segmentation, and reconnecting with the notion *small is beautiful*. No bank should be too big to fail, if errors of judgment lead it that way. Financial institutions should not be in so many different financial businesses that trouble in one area ripples through the whole system. We design ships with flood doors and flood compartments, so we can lose a few, if necessary, without sinking the whole ship. Over the last 15 years, the global financial system seems to have lost all its flood compartments.

New regulatory regimes might usefully embrace the principle that companies should never be allowed to grow so large or so dominant in the market that they are deemed too big to fail. Nor should they become so powerful that officials can no longer call them to account in the public interest, or take effective enforcement action against them, or put them out of business if necessary. Maybe small *is* beautiful, and we need to ensure a reasonable degree of segmentation in our vital industries.

Beware of 'Low Salience'

Political scientists tell us that the policy-making process is different for issues of high or low *salience*. "High salience" issues are commonplace, visible, frequently in the public and media spotlight. Obvious examples include abortion policy, education quality, local crime control. For these, the debates are public and frequent, and the policy process highly political.

Issues of "low salience" are not so much in the public mind. These concern risks that seldom materialize, and which are often complex and technical. Before the financial crisis unfolded, the public never debated or discussed the liquidity of the credit markets, or the risks associated with credit default swaps or complex derivatives.

The real danger with issues of low salience is that the regulators themselves may not understand them, consider them sufficiently or discuss them much. The more highly technical the issue, the more regulators depend on experts to assess risks. But the experts on emerging technologies generally work for the private sector, and are closely associated with those new technologies. As corporate employees, their primary obligations involve fiduciary responsibility to the shareholders, not broad protections for the public. And as champions of the new technologies and systems, these experts naturally emphasize their upside potential.

So, who should we trust to imagine the worst and to warn us about possibly disastrous effects or interactions? That has to be the regulators, because this task aligns poorly with industry's natural incentives. Hence the lesson: Regulators beware! When the issue is complex and technical, and out of the public view, it is exceedingly dangerous for regulators to rely on the advice and assurances they get from industry experts. The financial crisis has just shown us where that approach leads.

Risky Business

A U.K. CAA report says crash data illustrate the need for new safety measures to target business jet operations.

BY LINDA WERFELMAN

Business jets worldwide are involved in a disproportionate number of crashes, according to a U.K. Civil Aviation Authority (CAA) study that cited comments from U.K. pilots and operators who recommended improvements in pilot training, pilot communications with regulators and air traffic controllers, and fatigue-fighting efforts.[1]

Data showed 59 fatal business jet accidents from 2000 through 2007 and a fatal accident rate of 1.68 per million flight hours (Table 1, and Figure 1, **p. 28**) — considered "statistically significantly higher" than the fatal accident rate for large Western-built jets and turboprops.[2] The business jet category includes all civil usage: corporate/executive and ferry/positioning flights, emergency services, commercial training and private flights, in addition to passenger and cargo flights.

In comparison, the fatal accident rate was 0.17 per million flight hours for Western-built jets and 0.83 per million flight hours for Western-built turboprops. These categories include passenger and cargo flights only.

The CAA cited previous reports that have discussed a wide variation in fatal accident rates among different types of business jet operations, ranging from a low of 0.24 per million flight hours for corporate business jets to a high of 3.49 per million flight hours for commercial air taxi operations (Figure 2, **p. 28**).

Of the 59 fatal accidents recorded in the eight-year period, more than one-third involved ferry or positioning flights (Table 2, **p. 29**), and more than half occurred during approach and landing, said the study.

The study identified the most frequent primary causal factor in the 59 fatal accidents as the crew's "flight handling," cited in 16 accidents, or 27 percent. "Lack of positional awareness — in air" was cited in 11 accidents, or 19 percent.

"A primary causal factor from the flight crew–related group was allocated in 78 percent of the fatal accidents," the study said. "It is recognized that flight crew errors may arise for many reasons and should not necessarily imply that the pilot was to blame. Most fatal accidents were the result of a combination of causal and circumstantial factors, which often involved more than one party."

The most frequent causal factor was identified as the flight crew's "omission of action/inappropriate action," cited in 25 accidents, or 42 percent.

The primary circumstantial factor was "poor visibility or lack of external visual reference," cited in 21 accidents (36 percent), the study said. Other frequently cited circumstantial factors were "non-fitment of presently available safety equipment," cited in 19 accidents (32 percent) and "failure in CRM[3] (cross-check/coordinate)," cited in 16 accidents

Fatal Accidents and Hours Flown, Worldwide

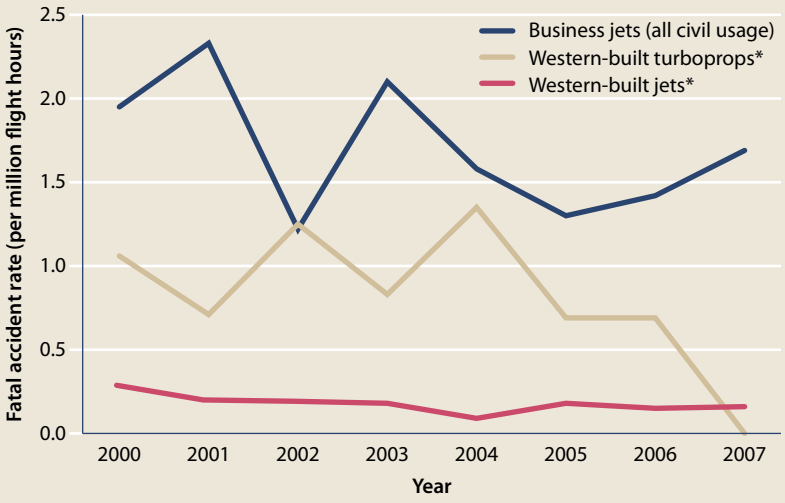
	Western-Built Jets*		Western-Built Turboprops*		Business Jets (All Civil Usage)	
Year	Number of Fatal Accidents	Number of Flight Hours	Number of Fatal Accidents	Number of Flight Hours	Number of Fatal Accidents	Number of Flight Hours
2000	9	37,413,247	8	7,570,609	7	3,594,460
2001	8	37,671,792	5	7,087,417	9	3,857,120
2002	8	37,820,727	8	6,413,272	5	4,113,305
2003	7	38,884,717	5	5,997,777	9	4,283,100
2004	4	43,368,069	8	5,922,736	7	4,433,485
2005	8	45,509,142	4	5,793,290	6	4,614,613
2006	7	47,814,025	4	5,780,481	7	4,922,866
2007	8	50,974,343	0	5,939,240	9	5,324,713
Total	**59**	**339,456,062**	**42**	**50,504,822**	**59**	**35,143,662**

*** Passenger and cargo flights only.**

Source: U.K. Civil Aviation Authority

Table 1

Fatal Accident Rates, Worldwide

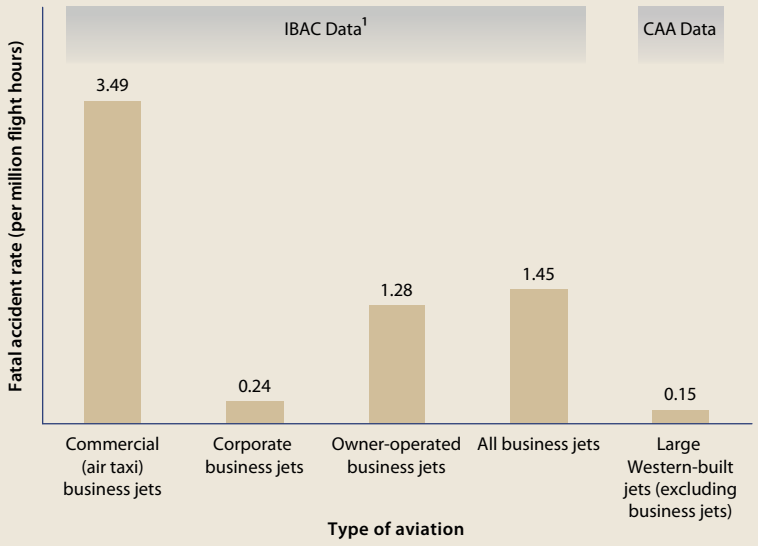


*** Passenger and cargo flights only.**

Source: U.K. Civil Aviation Authority

Figure 1

Fatal Business Aviation Accident Rates, Worldwide, 2003–2007



[1] Data in these categories were obtained from the International Business Aviation Council (IBAC) and Robert Breiling and Associates. CAA = U.K. Civil Aviation Authority

Source: U.K. Civil Aviation Authority, International Business Aviation Council

Figure 2

(27 percent). The most frequently cited consequence was "post-crash fire," which occurred in 33 of the 59 accidents (56 percent), followed by "loss of control in flight," 30 accidents (51 percent), and "controlled flight into terrain," 15 accidents (25 percent).

U.K. Fatal Accidents

Of the 59 fatal accidents, one occurred in the United Kingdom and another involved a U.K.-registered business jet being operated outside the country, the study said.[4]

The fatal accident rate for all U.K.-registered business jets from 2000 through 2007 was 3.3 per million flight hours, and the rate for the subset of public transport business jets was 7.97 per million flight hours, the study said. Fatal accident rates were calculated at 0.10 for large public transport airplanes — those weighing more than 5,700 kg (12,566 lb) — and 3.21 for small public transport airplanes — weighing 5,700 kg or less.

However, the study noted that the fatal accident rates for business jets and small public transport airplanes should be "treated with caution due to the relatively low amount of utilization accumulated and the low number of fatal accidents." The rates might not be representative of the safety of those segments of the industry, the study said.

Thirteen serious events — defined as fatal accidents, non-fatal reportable accidents, serious-injury accidents and serious events that must be reported under the Mandatory Occurrence Reporting Scheme (MORS) — were recorded involving all U.K.-registered business jets from 2000 through 2007, and seven were recorded involving public transport business jets.

The serious event rate was 43 per million flight hours, compared with 19 per million flight hours for large public transport airplanes — and 80 per million flight hours for small public transport airplanes.

During the same period, low-level MORS events were reported involving 570 registered business jets and 123 public transport business jets.

The study cited the ratio between low-level and serious events as an indication of an operator's reporting culture. "The larger the ratio, the better the perceived reporting culture," the study said, noting that many low-level events may go unreported "because of the perceived lack of importance or

reluctance of the crew/operator to submit the necessary paperwork."

The largest ratio was 91:1 for large public transport airplanes. In the other three categories, the ratios were 21:1 for small public transport airplanes, 44:1 for all registered business jets and 18:1 for public transport business jets.

Questions and Answers

In addition to the review of accident data, the study included an evaluation of responses by pilots and operators of bases in the United Kingdom to two questionnaires. Although the number of responses — 11 from operators and 39 from pilots — was small, it was "sufficient to draw useful conclusions," the study said.

Sixty-five percent of the responses were from pilots of light and medium weight aircraft. Eighty-five percent of the respondents were between the ages of 30 and 50, with an average of 2,800 flight hours in business jets. About half held air transport pilot licenses from the U.K. CAA; the other half held similar licenses from the U.S. Federal Aviation Administration. About 20 percent had flown other types of jet aircraft.

"Findings suggested that pilots might have incomplete understanding or variable ability in areas such as use of auto-flight modes (particularly in relation to vertical guidance), energy management and poor weather operations," the study said. "Limited use of simulation for recurrent training reduces opportunities for practice, lack of pre-course preparatory material reduces training effectiveness, and lack of training in additional duties peculiar to business jet operations may cause such tasks to distract pilots from primary flying tasks."

In addition, the study said, "There was concern regarding the limited ability of pilots to conduct safe flight without a serviceable FMS [flight management system]."

When questioned about their greatest concerns, about half of the pilots cited flight crew fatigue; other frequently cited concerns were operations in poor weather conditions, the reliability of ground deicing service, "inability to cope without FMS" and commercial pressure.

Operators said that they were most concerned about operations in ice and snow, the inability of pilots to cope without FMS, landing accidents and overruns, and flight crew fatigue.

Business Jet Fatal Accidents, 2000–2007

Operation Type	Number of Fatal Accidents
Ferry/positioning	21
Private/business	17
Cargo	6
Passenger	5
Air ambulance	4
Training	3
Other	3

Source: U.K. Civil Aviation Authority

Table 2

Training Concerns

The study found that pilot training programs were the greatest concern for both pilots and operators and suggested a re-examination of course content to correct possible deficiencies.

"Of particular concern would appear to be the lack of any training in the area of the pre-/post-flight responsibilities and passenger interaction, and also on awareness of the corporate environment and additional duties of the corporate pilot," the study said.

Although this area might not have a direct effect on safety, "there was a risk that crew attention could be distracted from the flying task by concerns and uncertainty about supplementary duties," the study said.

In addition, the questionnaire responses indicated that current training should be reviewed to improve understanding of auto-flight modes, especially in relation to vertical guidance, the study said. "This was an area that appeared to be causing a disproportionate number of errors, as indicated by the number of level busts being recorded by ATC [air traffic control]," the study added.

The study also found that "limited use of simulation" during recurrent training meant that pilots had little opportunity to practice scenarios that could not be replicated safely during flight. The study recommended improved simulator training and development of a system that would use simulator data to record student pilot performance.

Other recommendations included a call for a review of training principles for automation training in large airplanes to apply those principles to improved training for business jet pilots.

Regulatory Confusion

Operators and pilots complained in questionnaire responses and interviews that they had difficulty identifying appropriate contacts within the CAA and that they were uncertain about the relationships between the CAA, the European Aviation Safety Agency (EASA) and the European Joint Aviation Authorities (JAA), especially about how the responsibilities of those authorities affected business aviation.

The study quoted one pilot as saying, "We now live and operate in the most confusing environment. When I started my career, we were accountable to the CAA and would operate globally according to the law of whichever country

we were in. Nowadays, if you ask most pilots, we do not know where the goalposts are, as they are constantly moving. CAA-JAA-EASA — this is the real issue of safety and who we are accountable to."

Many operators voiced similar concerns, and the study said that some operators "had always felt as if this market was not embraced by the regulatory authority as were the major airlines."

The study recommended that the CAA produce a leaflet for the business jet community, explaining the community's regulatory relationship with the CAA, EASA and JAA, providing contact information and recommending sources of advice on operational issues. The study also called for an improvement in two-way communications between the CAA and business aviation organizations.

Operational Issues

Questionnaire responses from both pilots and operators indicated a shared concern over operational issues such as crew fatigue, runway contamination and aircraft icing and deicing operations, the study said.

"There had been recent high-profile accidents with causal factors being apportioned to ice contamination, and further investigation was recommended into the promotion of pilot awareness in this area," perhaps in the form of safety communications directed specifically to the business jet community.

"Recommended areas of attention included performance of smooth-wing aircraft in icing conditions, freezing residues on non-powered flight controls, runway contamination, ground deicing procedures, visual inspection and judging the severity of weather conditions," the study said.

"Whilst there had been many communications covering the above topics, nothing to date had been specifically aimed at business jet operations."

Other operational recommendations included helping increase awareness of flight crew fatigue issues by making the System for Aircrew Fatigue Evaluation (SAFE) software model available to business jet operators and informing operators of Internet-based training material.

Controller Education

In many instances, the study found, air traffic controllers and business jet pilots knew little about key aspects of each other's responsibilities.

"It would be beneficial to raise ATCO [air traffic control officer] awareness of business jet issues, with particular regard to aircraft performance such as requests for high rates of descent with low speed; last-minute changes to flight plans/SIDs [standard instrument departures], particularly at times of high workload/single-pilot operations; waypoint identification, etc.," the study said. "Business jet pilots appeared, in some cases, to be unaware of ATC expectations, for example, when a continuous descent was requested. If high rates of climb and descent were made, far in excess of other types of civilian air traffic (as many of these aircraft were capable of), multiple vertical levels would need to be allocated to this single aircraft, thus further increasing the ATCO's workload."

Pilot workloads may be increased with late changes in departure clearances, especially when accompanied by an "unnecessarily high number of radio transmissions" during critical stages of flight, and especially during operations from unfamiliar airports, the study said, noting, "This was of particular concern in single-pilot operations."

The study also cited the multiple altitude restrictions and frequency changes included in SIDs.

"Coupled with any commercial pressure to depart on time and not enabling crews sufficient time to properly brief, these scenarios compounded potential human errors that may lead to an incident," the study said.

NATS, the U.K. air navigation service provider, and the business aviation community currently are addressing some of these issues, the study said, recommending a joint CAA-NATS forum on business jet safety.

Other recommendations included a call for joint efforts to promote ATC awareness of business jet operational concerns so that controllers minimize radio transmissions and frequency changes during critical stages of flight, and recognize the effects of controller instructions — such as last-minute clearance changes — on single-pilot operations.

The study said that all of the researchers' recommendations were intended to "specifically target both the causal factors that were apparent in the fatal accident statistics, and the concerns that had been highlighted by this study."

Some findings support ongoing safety initiatives, the study said.

This article is based on CAA Paper 2009/03, "Business Jet Safety Research: A Statistical Review and Questionnaire Study of Safety Issues Connected With Business Jets in the U.K." March 29, 2009.

Notes

1. Primary findings of the study were endorsed by the Business Aviation Safety Partnership, which was established in 2007 as a partnership between the CAA, NATS and the business aviation community to identify safety issues and develop solutions.
2. After completion of the study, nine fatal accidents involving business jets occurred in 2008.
3. Crew resource management.
4. In 2008, after completion of the study, another fatal crash occurred in the United Kingdom.

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New Regional Base in Australia

Flight Safety Foundation (FSF) has absorbed the Aviation Safety Foundation Australasia (ASFA) into its organizational structure to expand the FSF presence in the Pacific region with the establishment of a regional base in Melbourne, Australia. Consolidating these two groups will bring significant benefits to the aviation industry in the region, including increased access to the Foundation's substantial range of technical programs and expertise.

The Foundation expects to increase its activities within the region, including the establishment of a series of national advisory boards that will feed into an Asia Pacific Advisory Committee. This will provide the industry in the region with direct input into the Foundation's global information gathering network on air safety.

Announcing the arrangement at the Australian International Airshow 2009, FSF President and CEO William R. Voss said, "Our new office in Melbourne is an important part of our mission to spread aviation safety information as widely as possible. It not only puts us in a strong position to spread our safety message to the entire region, but we also can help the Australian aviation community to spread their innovations to their aviation peers around the world.

"This is a part of the world that is growing quickly and we need to have a presence. I'm very pleased that the ASFA board saw this opportunity and realized it would be a win-win for Australia and the rest of the aviation community."

The initial geographical focus of the U.S.-based Foundation's first regional office will be Australia, New Zealand and the South Pacific. Longer term, the move is seen as a stepping stone to providing support to the industry in the broader Asia Pacific region.

Coordinating the new FSF regional team will be the former executive director of ASFA, Paul Fox. "As the industry comes under increasing financial pressure, it becomes even more important that safety remains uppermost in people's minds," Fox said. "In Australia, the government's recent Aviation Policy Green Paper is to be commended for setting an example in the region by reinforcing safety as the number one priority for the industry. Today's announcement by Flight Safety Foundation creates a stronger independent voice on all matters of aviation safety in the region."

Recent figures from the International Air Transport Association (IATA), which represents 230 airlines comprising 93 percent of scheduled international air traffic, reported the total number of fatalities from aviation accidents dropped from 692 in 2007 to 502 in 2008. However, the number of accidents increased from 200 in 2007, to 209 in 2008, with fatal accidents up from 20 in 2007, to 23 in 2008.

The Asia Pacific region continues to be the fastest growing passenger market in the world, with the top five quickest growing freight markets having destinations in the region. The Asia Pacific region safety performance last year was better than the global average, where there was one accident per 1.2 million flights. The region's airlines recorded one accident per 1.7 million flights.

Paul Fox

ICAO Looks to AFRICA

BY TOM KOK

© AviAssist Foundation

The most recent ICAO meeting on air navigation in Africa included a focus on safety for the first time.

The November 2008 International Civil Aviation Organization (ICAO) Africa-Indian Ocean (AFI) Regional Air Navigation (RAN) meeting in Durban, South Africa, was exceptional in how it dealt with safety as much as its approach to efficiency.[1] This meeting takes place on average once every 10 years, and in the most recent event Flight Safety Foundation and the AviAssist Foundation participated in the safety committee of the AFI RAN meeting.[1]

Under ICAO's Universal Safety Oversight Audit Program, audits to determine the implementation of ICAO critical elements of a safety oversight system were conducted in 36 African countries as of Oct. 31, 2008 (Figure 1, page 34).

From these, 25 African civil aviation authorities were referred to the ICAO Audit Results Review Board. Nineteen of them still have unresolved issues stemming from their safety audits. And of the six countries identified on the ICAO Flight Safety Information Exchange Web site as having significant safety concerns, five are in Africa. At the same time, the latest medium-term traffic forecast from ICAO calls for Africa to post the highest growth rate of any world region by 2010, with an 8.5 percent increase in passenger kilometers expected. In the long term, African airlines are expected to grow faster than the global rate.

The AFI RAN meeting offered a new opportunity to strengthen regional commitment to improving safety and efficiency. It attempted to resolve deficiencies and address critical issues through development of a comprehensive set of work programs with associated performance metrics. The inclusion of safety metrics was introduced in 2006 to the world aviation community by the Global Aviation Safety Roadmap (GASR).

Careful Move to Regional Solutions

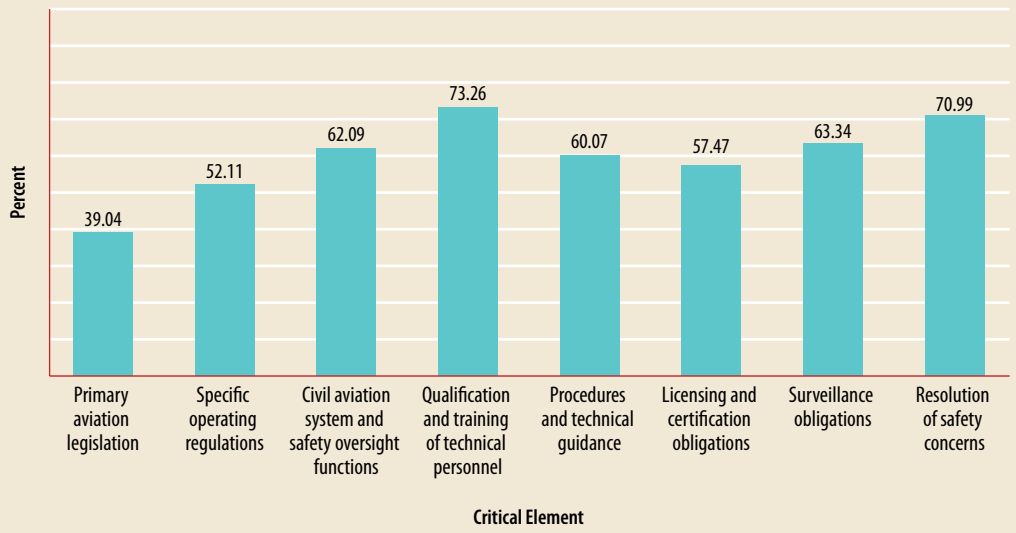
One paper presented at the AFI RAN analyzed results of the audits performed during the present cycle of ICAO safety oversight audits using the comprehensive systems approach. The study looked at a possible relationship between the rate of non-compliance with the eight critical elements of state safety oversight systems and accident rates. Each critical element was tested independently for a linear relationship using a statistical model.

Many African countries may initially focus attention on issues such as renewal of primary aviation legislation. However, the 2007 ICAO study that forms the basis for the paper presented at the AFI RAN points out that among the critical elements, resolution of safety concerns has a strong relationship with accident rates, whereas another, primary aviation legislation, has a weak relationship with rates (Table 1).

African states and safety support providers such as the U.S. Federal Aviation Administration (FAA), the European Aviation Safety Agency (EASA) and the AviAssist Foundation can use this study to help further prioritize their activities.[2]

The AFI RAN meeting seemed to indicate that a trend toward regional solutions is gaining genuine support. Such support may be easiest to mobilize for regional solutions related to technical developments (e.g., air traffic management). However, the meeting also discussed regional cooperation in flight procedure development, accident investigation, and search and rescue.

Implementation of ICAO Critical Elements of a Safety Oversight System, Selected States, AFI Region



ICAO = International Civil Aviation Organization; AFI = Africa-Indian Ocean Region

Note: Figure represents 36 states, 68 percent of AFI.

Source: International Civil Aviation Organization

Figure 1

Realistically, the level of aviation activity in many African countries is too low to generate the funds necessary to support effective and sustainable national safety oversight systems. Regional organizations offer the most economically efficient way to pool resources for effective oversight, but there seems to be little progress in oversight cooperation where the AviAssist Foundation is active, in East and Southern Africa. The only progress on regional safety oversight is being made by the five states of the East African Community (EAC). Burundi, Kenya, Rwanda, Tanzania and Uganda have come together under the Civil Aviation Safety and Security Oversight Agency (CASSOA). CASSOA builds on an EAC organization that started just after independence of the three founding member states — Kenya, Tanzania and Uganda — in 1967. The EAC collapsed in 1977 but was successfully revived in 2000.

For future meetings such as AFI RAN, ICAO might have to encourage more African member states and the industry to present papers on their ideas for topical safety solutions. This meeting saw a majority of presentations made by the ICAO secretariat.

The AFI RAN meeting also underlined the importance of continuing the work of the GASR, in particular concerning programs in which industry and government interests are balanced. An approach in which neither industry nor government interests dominate efforts at improvement has been central to the success of other safety initiatives. A number of presentations at the AFI RAN meeting, made by the industry, were not perceived as presentations by peers in aviation safety but almost as presentations of safety competitors.

The AviAssist Foundation is assisting EASA and the African Civil Aviation Commission (AFCAC), a specialized agency of the African Union, in organizing a symposium on regional aviation safety authorities. It will take place in July 2009 in Livingstone, Zambia, and should enable the sub-Saharan African national stakeholders to better understand today's regional success stories in Africa, and particularly those in other parts of the world.

ICAO Critical Elements of a Safety Oversight System and Their Relationship to Accident Rates

Critical Element	Relationship to Accident Rates
8 (Resolution of safety concerns)	Very strong
6 (Licensing and certification)	Very strong
3 (State civil aviation system and oversight functions)	Very strong
7 (Surveillance obligations)	Very strong
2 (Specific operating regulations)	Medium
5 (Procedures and technical guidance)	Medium
4 (Qualifications and training of technical personnel)	Medium
1 (Primary aviation legislation)	Weak

ICAO = International Civil Aviation Organization

Source: International Civil Aviation Organization

Table 1

Mozambique Roadmap Workshop

The fourth regional GASR workshop took place in Maputo, Mozambique, immediately after the AFI RAN meeting. Flight Safety Foundation and AviAssist Foundation facilitated the working group on focus area 11 of the GASR that aims to tackle the "Insufficient Number of Qualified Personnel."

The meeting attracted more than a hundred participants, but some three-quarters were from Mozambique. Unfortunately, this participation did not fulfil the group's hope to have wider participation from the 15 states of the Southern African Development Community (SADC) at which the workshop was aimed.

SADC seems to have difficulty creating momentum for joint action on aviation safety oversight, perhaps because it is too large. Most other successful regional safety oversight initiatives are made up of fewer states. In such smaller groupings, it may be easier to find natural coherence. The low attendance from all 15 SADC states at the Maputo workshop might show insufficient marketing of the event by the organizing committee, insufficient interest and coherence in SADC, or a combination of factors.

In addition to the disappointing industry participation from outside Mozambique and

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South Africa, limited industry participation was also a problem with some of the other GASR workshops in the AFI region. Perhaps it was because the region lacks a widespread tradition of cooperation between governments and industry, or perhaps the regular channels of invitations for these meetings may not reach intended industry participants. The vast majority of operators in Africa are not International Air Traffic Association (IATA) members and are not automatically included in IATA communication efforts.

Against that background, the AviAssist Foundation has suggested including national aircraft owners' and operators' associations that exist in some countries, and associations such as the Airline Association of Southern African (AASA), in regular communication from the Industry Safety Strategy Group (ISSG), which produced the GASR. The low level of industry participation also underlines the need to train more national champions on the use of the GASR process to reach more operators and maintenance organizations. The ISSG is now working on a generic article that can be used to sensitize staff members of those non-IATA operators through alternative means of communication, such as African aviation magazines.

In all, the GASR Mozambique workshop participants learned the GASR process, including the gap analysis procedures and the process of prioritization on the basis of the impact a change can have and the relative ease with which a change can be implemented, the impact-changeability prioritization. The workshop led to recommendations for the four focus areas of the GASR that were handled during breakaway sessions.

The aviation markets of both the EU and Africa are undergoing significant economic and regulatory changes aimed at making market access easier and providing safe air traffic in a fast-growing environment.

EU-Africa Aviation Conference

Over the past few years, the European Union (EU) has held aviation summits in important aviation markets throughout the world — EU-India, EU-China, EU-Latin America and other summits and seminars. Most focused on bringing EU relationships with those markets into the 21st century. Africa was the only region not addressed before 2009.

With airline capacity on EU-Africa routes steadily growing over the past decade, this meeting was long overdue. The aviation markets of both the EU and Africa are undergoing significant economic and regulatory changes aimed at making market access easier and providing safe air traffic in a fast-growing environment. European Commission Vice President Antonio Tajani and Commissioner Louis Michel recently launched an initiative with Elham Ibrahim, African Union commissioner for infrastructure and energy.

The result of these calls was a two-day EU-Africa aviation conference in Windhoek, Namibia, on April 2–3, 2009. At the meeting, the European Commission and the African Union Commission agreed on an ambitious common strategic framework to develop safer and more sustainable air transport by fostering continuing policy. Its goal was to define a roadmap for further cooperation. Several initiatives were discussed in safety, economic regulation, air traffic management, navigation aids, environment and security.

"Improved safety standards and more choice are the basis of our new dialogue," Tajani said. "There are a number of actions which can easily contribute to change the picture of air transport in Africa." The two parties will establish arrangements for a permanent strategic dialogue in aviation matters, aiming at, among other things, improving safety and security. And, in that process, the European Commission could provide increased technical assistance.

The regions also looked at developing further cooperation in air traffic management (ATM) and the related Single European Sky ATM Research (SESAR) program, particularly to identify changes required to optimize the flow of traffic. They may include extending the European Geostationary Navigation Overlay Service (EGNOS) satellite navigation system to provide the same services to civil aviation over Africa as over Europe.

The EU-Africa aviation meeting also provided an important opportunity to discuss the European blacklist, which includes numerous African airlines and states. This discussion led to calls for a strengthened constructive EU-Africa partnership in civil aviation.

Implementing Shared Solutions

As noted last year *(ASW*, 7/08, p. 18), the African aviation scene has to move from meetings that share challenges to meetings that share practicable solutions. The challenge for aviation experts all over the world is to put the knowledge obtained at a workshop or conference into practice. But with aviation safety in Africa requiring a bigger improvement than in some other regions, that hill is even steeper for African aviation safety experts.

However, there is also a hidden economic lure to attend meetings as a result of the civil service realities in many African countries. The allowance system in some African civil service systems makes it lucrative for senior staff to attend meetings abroad. Quite often, national and international allowance levels are disproportionately generous compared with the monthly salaries of staff in aviation administrations. Attending a meeting of a few days may bring an extra month's salary.

As a result, senior staff may even wish to spend substantial amounts of their time attending such meetings. While good for meeting attendance, this takes time away from operational responsibilities at their national offices. Given the low levels of salaries in many African civil services, one can hardly blame experts for attending meetings abroad. This is a general civil service problem in those countries that the global aviation community cannot be expected to solve, but it is important to be aware of the reality.

Access to meetings is often limited to management. Yet, to achieve a culture in which people's honest mistakes are protected from being seen as culpable, every member of aviation organizations must be made aware of the role they can play in improving safety in their national aviation system.

Safety training and exposure to hazards are not always related. Often, the people most exposed to hazards, and in a position to create the most damage, tend to be among the least technically qualified or trained. As part of its efforts to address these grassroots safety training needs, the AviAssist Foundation is creating a low-cost safety awareness training package that it aims to roll out from its office in Zambia.

The training will combine easily accessible lectures with scenarios that relate to the actual working environment of the participating staff instead of to generic international examples. The idea is to eventually embed this sort of training in the curricula of the many civil aviation training centers in Africa that often focus only on training in "hard" technical skills. Significant safety benefits can thereby be realized.

At a cost of just under $3,000, these courses enable cost-efficient, simultaneous training of up to 20 participants in organizations that may not have a budget for expensive training abroad. Yet, they are at the "front end" of safety problems. Wide access to, and sponsorship of, such courses will be an important part of genuine immersion of the African aviation community in a positive safety culture.

Tom Kok is director of the AviAssist Foundation.

Notes

1. The full report is available at <www.icao.int/afiran08/docs/AFI_RAN_Report_en.pdf>. Reports on the agenda items relating to safety (4, 5 and 6) are available from the AviAssist Foundation via e-mail to <info@aviassist.org>, as is a summary of most papers presented at the meeting.
2. The study is too large for many African civil service agencies to download, but a summary can be downloaded at <www.icao.int/AFIRAN08/docs/SP-AFI_WP24_en.pdf>.

Short Flight,

BY MARK LACAGNINA

Visibility over Ireland's Galway Bay was poor, and the ceiling was low. The Cessna 208B Grand Caravan was lower than indicated, and the relatively short coastal runway came into sight sooner than the pilot expected. A quick S-turn established the big single-turboprop aircraft on final approach, but during the flare the pilot became aware of a significant tail wind. The intermittent buzz of the stall warning system became continuous as the pilot pushed the propeller and power levers forward for a go-around. Torque effect from the propeller caused the aircraft to roll left toward rising terrain. Wallowing in a high pitch attitude on the back side of the power curve, the aircraft crashed on the side of a hill.

The accident occurred the afternoon of July 5, 2007, during a 9-nm (17-km) flight from Inis Meáin, an island off the west coast of Ireland, to Connemara Airport in Inverin. The pilot and the passenger seated behind him were killed; the other seven passengers were seriously injured.

In its final report, the Irish Air Accident Investigation Unit (AAIU) said that the accident was caused by the pilot's attempt to land downwind in marginal weather conditions. "This resulted in a late go-around, during which control was lost due to inadequate airspeed," the report said.

Among the findings of the investigation were that the pilot did not establish radio communication with airport personnel before landing and thus was not aware of a substantial change of wind direction and velocity since an earlier departure from the airport.

Demo Flight

The aircraft was manufactured in 2005 and had accumulated 320 airframe hours and 275 cycles. It was registered as N208EC in the United States and was operated privately in Ireland under U.S. general operating and flight rules. Wells Fargo Bank Northwest of Salt Lake City was the registered owner or "trustee" of the aircraft, and Lancton Taverns of Dublin was the "beneficial owner" or "trustor," according to the report, which noted that such arrangements are "widespread practice."

The aircraft services intermediary who managed the aircraft's maintenance records and flight schedule told investigators that, due to the complexity of the Caravan, an air operator certificate likely would be required to operate the aircraft under European

Joint Aviation Requirements. "He said that it would therefore be more expensive to operate the aircraft under Irish registry," the report said.

The report said that the "owner" of the Caravan had accepted a request made through the aircraft services intermediary to loan the aircraft and its pilot to conduct a demonstration flight for a group of investors and associates involved in the proposed development of an airport in Clifden, about 25 nm (46 nm) northwest of Inverin.

The intermediary also asked an aircraft maintenance specialist and former lightplane pilot to take part in the demonstration flight and provide an audiovisual presentation about the Caravan to the group, who also were considering the purchase of a light utility aircraft.

The pilot, 59, an Irish national, held a U.S. commercial pilot certificate and had 9,001 flight hours, including 476 hours in type. The pilot and the maintenance specialist departed from Dublin at 0920 local time and landed at Inverin about an hour later. The flight was conducted under instrument flight rules.

The pilot had flown to Connemara Airport seven times during the preceding 12 months. The maintenance specialist recalled that the flight was normal but that weather conditions deteriorated as they neared the airport. "As far as he could remember, they approached from over land and landed on Runway 23," the report said. "He remembered the pilot commenting that he preferred to land from the other direction, from over the sea, due to the terrain and that he was not happy with approaching from the land direction."

Permission Required

The runway at Connemara Airport is 609 m (1,998 ft) long and 18 m (59 ft) wide. There are no navigational aids at the airport, which is uncontrolled and open only during the operating hours of Aer Arran Islands, which conducts commercial flights to the islands in Galway Bay with Britten-Norman Islanders.

Prior permission is required to land, and landing is prohibited if the pilot is unable to establish radio communication with airport personnel on 123.0 MHz. "However, the frequency is not usually manned unless a flight is expected," the report said.

After a brief discussion with airport ground staff, the pilot and the maintenance specialist conducted a visual flight rules (VFR) familiarization flight to Inis Meáin — the pilot's first trip to the island — and then returned to Connemara Airport to await the passengers. "This time they approached from over the sea and landed on Runway 05," the report said.

When the Clifden airport group arrived, the pilot found that there were too many people to accommodate with one flight. He decided to make two flights to transport them to the island. The pilot departed with the first load of passengers at about 1130. The maintenance specialist occupied a rear seat during this VFR flight.

"A passenger who had previously piloted both fixed-wing and helicopter aircraft occupied the copilot's seat on the flight out," the report said. "He commented that the pilot appeared quite professional and diligently completed cockpit checks prior to departure. There was a significant crosswind during takeoff."

The pilot was surprised to see the runway pop into view, but he went for it, not knowing that the wind had shifted.

Long Odds

The passenger said that the pilot flew a complete approach pattern before landing at Inis Meáin. "The passenger commented that runway alignment for landing was accurate and the landing was good," the report said. "The weather was poor, and there were two tall cranes close to the extended centerline of the runway, associated with constructing a harbor on the island. He believed that the pilot was unhappy with such significant obstacles in the vicinity of [the airport] in conditions of poor visibility."

Cessna 208B Grand Caravan

Production of the Cessna 208 Caravan 1 — a fixed-gear utility airplane with a single Pratt & Whitney PT6A-114 engine rated at 600 shp (447 kW) — began in 1984. A cargo version, the 208A, with no cabin windows and a belly pod, was introduced in 1985. A stretched version of this model, the 208B, appeared in 1986 with a 4.0-ft (1.2-m) fuselage plug aft of the wing and a PT6A-114A engine rated at 675 shp (503 kW).

The Grand Caravan, a passenger version of the 208B, has accommodations for a pilot and as many as 13 passengers. Maximum weights include 8,750 lb (3,969 kg) for takeoff and 8,500 lb (3,856 kg) for landing. Minimum runway distances are 1,100 ft (335 m) for takeoff and 745 ft (227 m) for landing. Maximum rate of climb is 1,234 fpm. Maximum cruise speed is 184 kt, and maximum range is 1,026 nm (1,900 km).

The current version is the Caravan 675, which has the 208/208A's shorter fuselage and the 208B's engine.

Source: *Jane's All the World's Aircraft*

Not Comfortable

The maintenance specialist said that there were low clouds over the bay. "He said the pilot decided that, because the weather conditions were very gusty and blustery, he was not prepared to return to [Connemara Airport] to collect the rest of the group," the report said. An Aer Arran Islander was chartered to fly the remaining seven passengers to Inis Meáin. The passengers were weighed and received a safety briefing before departure.

The Islander pilot had accumulated 4,000 hours of experience in flying Islanders in the area. He said that after landing, he heard one of the passengers comment to the Caravan pilot that the Islander had made the trip, "so why couldn't you?" The Islander pilot told investigators he believed that "this went down very badly with the [Caravan] pilot."

After lunch at a local hotel, the group received the presentation about Caravan performance and cost factors. The pilot helped the maintenance specialist answer questions about operating the aircraft. "During the meeting, the pilot indicated that he was not comfortable in the area and specifically mentioned cranes on the island and the poor weather," the report said. "One passenger stated that the pilot commented over lunch that he did not like flying in the area, as there were no radio aids." Another passenger said the pilot also commented that he would "not be pressured when it comes to safety."

Two members of the group left during the presentation to attend a meeting on the mainland; they were flown to Inverin by the Islander pilot, who then flew back to the island to assist in returning the remainder of the group to Connemara Airport.

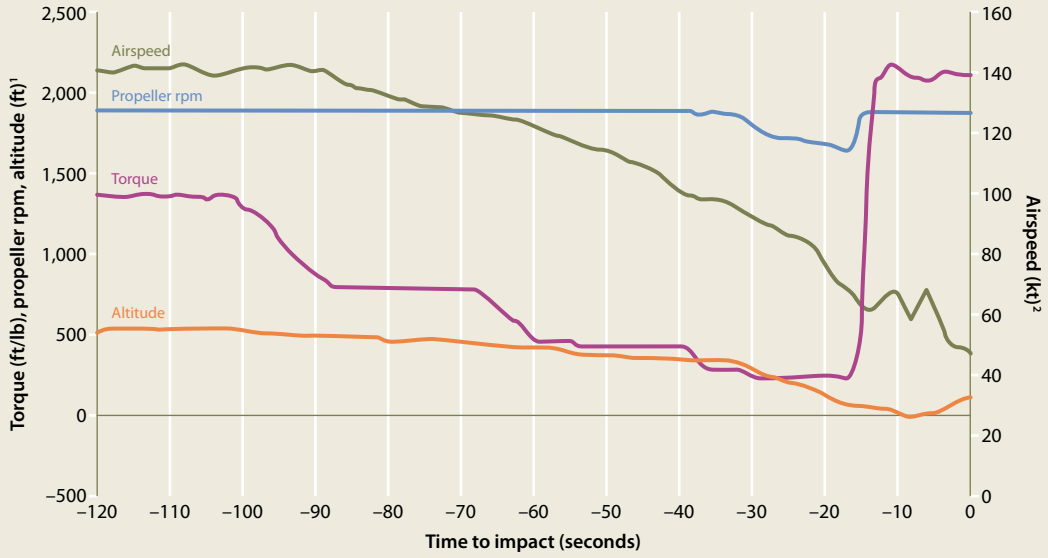
'Quite Low'

After the presentation was concluded, the seven passengers who had been flown to Inis Meáin in the Islander were invited to return to Inverin in the Caravan. The aircraft departed VFR at 1335. The maintenance specialist again occupied a rear seat so that he could talk with

the passengers during the flight. "He believed they did not enter cloud during the flight, but the windows had misted over," the report said. "He could see the surface of the sea and that they were quite low."

The passenger in the right-front seat, who was not a pilot, said that it was wet and damp, and that the aircraft entered clouds during departure. "He believed the autopilot was engaged, because when the pilot selected 1,000 ft the aircraft climbed up to it," the report said. About four minutes later, he heard the pilot make a radio call before setting the altitude selector to 800 ft.

The Final Seconds



Notes:
1 Error: ± 75 ft
2. Error: ± 5 kt

Source: Irish Air Accident Investigation Unit

Figure 1

The passenger said that when the aircraft broke out of the clouds, he saw the shoreline about 2 km (1 nm) ahead and the airport at least 500 m (1,640 ft) left of track. "He said the pilot expressed surprise that they were so close to the runway," the report said. "He could see the ocean and thought they were going very fast. The pilot, manually flying the aircraft, turned left — to a right base leg for Runway 05 — and started to lose height. He then 'swerved right' to line up with the airstrip."

The passenger perceived that the aircraft was still traveling rapidly as it neared the runway and saw the pilot move two levers forward and pull back on the control wheel. He said that the aircraft made a steep left turn, did not appear able to climb, then "stopped and started to fall." Several passengers recalled a beeping sound that became continuous during the attempted go-around.

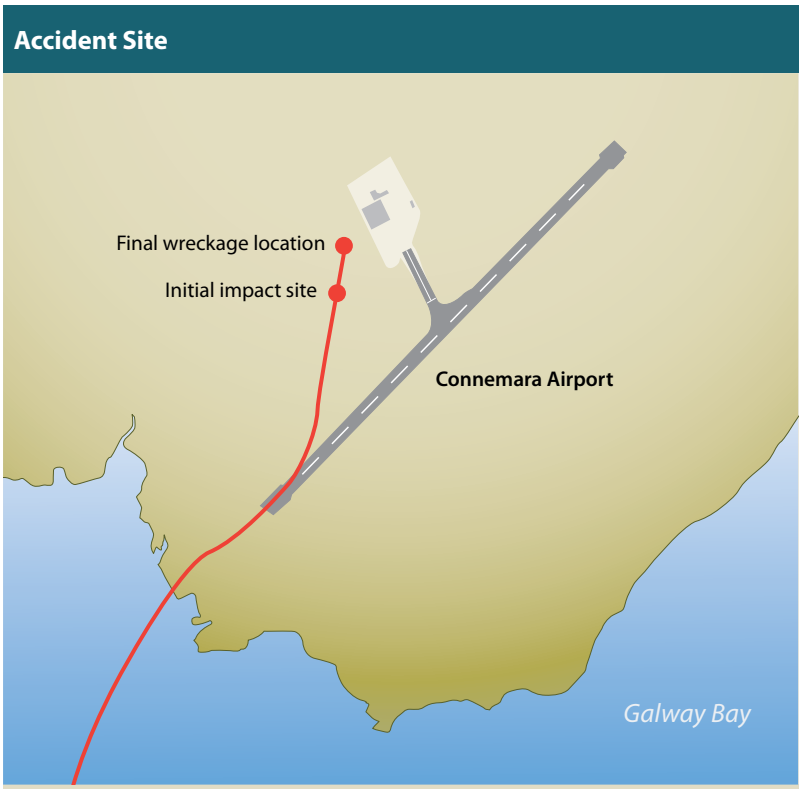
Torque Roll

The report said that the pilot likely initiated a go-around when he realized that he would not be able to stop the aircraft on the runway. His rapid application of power caused torque to increase within two seconds from 376 ft/lb to 2,060 ft/lb, exceeding the limit by 13 percent (Figure 1).

There was a clearway off the end of Runway 05 and terrain sloping down to the sea to the right, but torque effect caused the aircraft to roll left in the direction of terrain that sloped up toward the airport buildings (Figure 2, page 42).

The Caravan's nose-up pitch attitude was abnormally high, and airspeed was about 46 kt on impact. The report said that this is "symptomatic of an aircraft hovering at the back of the drag curve, where the power output of the engine was incapable of accelerating the aircraft out of the high drag regime."

An airport operations staff member told investigators that he was on the ramp when he heard "engine noise really revving up and then a bang."



Source: Irish Air Accident Investigation Unit

Figure 2

He went behind a hangar, saw that the aircraft had crashed and activated the airport fire alarm.

The Caravan was destroyed in the accident, which occurred at 1449. Fuel leaked from the wing tanks, but there was no fire. Aircraft rescue and fire fighting personnel arrived soon after the crash. "They did not lay a foam blanket as there was no fire or smoke, and they thought it might affect the casualties on board and hinder the rescue effort," the report said. "The airport emergency plan was put into operation with medical, fire and ambulance services being notified, and they endeavored to evacuate as many casualties as they could without endangering them.

"Several casualties could not be extracted because of their injuries. [County] fire tenders arrived later, bringing heavy cutting equipment, which assisted in the casualty evacuation."

Low and Over Gross

An aftercast prepared by Met Éireann, the Irish meteorological service, indicated that the weather conditions in the Inverin area at the time of the accident likely included surface winds from 220 degrees at 15 to 20 kt with occasional gusts of 25 to 30 kt, visibility ranging from 2,000 to 5,000 m (1 1/4 to 3 mi) in light rain, and ceilings from 500 to 1,000 ft with occasional scattered clouds at 200 ft.

Atmospheric pressure had fallen rapidly during the day; however, the Caravan pilot had not reset the altimeters after his first landing at Connemara Airport. "Because this was not done, the altimeters misread the height by 224 ft," the report said. "Therefore, while the pilot was flying an indicated altitude of 800 ft, he was in fact much lower, less than 600 ft."

A load and trim sheet for the accident flight was not found. Based in part on the passenger weights recorded by Aer Arran for the Islander flight to Inis Meáin, investigators estimated that the Caravan was 293 lb (133 kg) over maximum landing weight and that the center of gravity was near the aft limit when the accident occurred.

"The investigation is of the opinion that the heavy landing weight of the aircraft, with slow deceleration during the attempted landing and a subsequent slow acceleration during the go-around due to inertia, was a contributory factor in the accident," the report said.

The Islander had departed from Inis Meáin several minutes after the Caravan. The Islander pilot tried unsuccessfully to establish radio communication with the Caravan pilot on 123.0 MHz but heard a helicopter pilot report on the frequency that he was transiting the area south of the airport.

The Islander pilot reported his position and altitude, and advised the helicopter pilot that the Caravan also was inbound to the airport. The helicopter pilot told investigators that he did not recall hearing any radio transmissions by the Caravan pilot. The Islander pilot returned to Inis Meáin after airport personnel told him about the accident.

"The [Caravan] pilot, though he may have attempted to do so, did not communicate his imminent arrival to [airport] staff and so lost the opportunity of being informed of the changed wind direction," the report said.

This article is based on AAIU Formal Report No. 2009-003, published Jan. 20, 2009.

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Special Delivery

Flight attendants team with medical advisers to aid passengers during in-flight labor and childbirth.

BY WAYNE ROSENKRANS

Airline crew responses to rare pre-term labor and childbirth during flight have been difficult for the industry to assess quantitatively compared with much more frequent types of in-flight medical events (IFMEs).[1,2] Either situation may occur because a pregnant passenger fails to comply with an airline's policy for travel (Table 1, p. 46) or, more likely, because an unknown health factor or natural process disrupts her careful plans for the ideal full-term childbirth. In an aircraft cabin, both are serious, exposing the baby to high risk of injury, death or possibly health problems later in life even with timely emergency medical transport after landing to a neonatal intensive care unit.

Medical and cabin safety specialists — relatively comfortable with airline guidelines and readiness to deal with leading IFMEs such as heart attacks — today have sketchier information when it comes to pre-term labor and childbirth aboard a large commercial jet. As a result, researchers in several countries have called on governments and the airline industry to collect better data about these events to help them pursue more robust, evidence-based recommendations.[3]

For flight attendants, the practical effect is that what they study in first aid or medical training materials reflects the professional judgments of specialists based on a fairly limited number of events. Accounts of how aircraft crews have responded successfully to a pregnant patient's crisis without compromising overall cabin safety or flight safety therefore have taken on added importance. Potentially valuable insights or lessons for understanding unexpected operational risk factors also can be found in brief narratives that flight attendants and pilots have submitted to publicly available confidential reporting systems.

Fresh Insights

MedAire's MedLink Global Response Center, located within the emergency department at Banner Good Samaritan Hospital in Phoenix, had a total of 27 cases of in-flight labor in calendar years 2006, 2007 and 2008. Two cases involved in-flight births — one to a 20-year-old airline passenger and one to a 25-year-old airline passenger — and the circumstances of the 20-year-old passenger's labor led to a medical diversion. The age of passengers in labor ranged from 16 to 43, and the average was 27, MedAire said. One baby was stillborn during pre-term labor that had begun during flight and continued at a hospital after landing; no other maternal or infant deaths occurred. These cases were among approximately 55,000 IFMEs in which MedLink provided ground-based medical advice.

The 20-year-old passenger was eight months pregnant, and she unexpectedly went into labor five hours into a 10-hour flight. "Two doctors and two nurses traveling aboard the flight voluntarily stepped forward to assist, with surprisingly little time to spare before delivery," MedAire said. "A healthy baby girl made her entrance into the world at Flight Level 330 (approximately 33,000 ft) over Kazakhstan."

Immediately after this delivery, a crewmember contacted the response center, and an emergency medicine physician — following MedLink protocols — collaborated with the medical volunteers, cabin crew and flight crew and provided them detailed guidance on post-delivery care; monitoring of the mother's and baby's medical conditions; and guidance on use of appropriate medications from the enhanced emergency medical kit. Other specialists concurrently suggested suitable medical diversion airports along the route, consulting their database and making arrangements for emergency medical transport upon landing at the airport selected by the captain.

The data also showed that licensed medical professionals — such as physicians, nurses, midwives and emergency medical technicians — aboard these 27 flights had volunteered to assist in 18 cases (67 percent); the captain diverted the flight in eight cases (30 percent); and average time into the flight varied by flight length, with 37 percent of planned flight time elapsed when the short-haul aircraft crews learned of the labor, 59 percent elapsed on long-haul flights and 62 percent elapsed on medium-haul flights.

"None of our 27 total cases could be said to be a full-term labor," said Paulo Alves, M.D., vice president, aviation and maritime health. "The numbers may be low, but the potential for complications is really high. No passenger with a full-term pregnancy had been allowed on board. We don't have precise information about the gestational maturity aspect to make any further inference, but the fact that no babies had major initial complications suggests a good level of average maturity."

Occasionally, in-flight labor escapes notice by the pregnant passenger and the cabin crew by masquerading as a cramp or back pain, or because the passenger is unaware of the pregnancy or psychologically is in denial. Other times the situation is complicated because the pregnant woman has not declared her late stage of pregnancy to the airline, and her health condition has not been discovered by airline ground personnel during passenger screening at the ticket counter or boarding gate.

"In some of our scenarios, it's possible that the mom was intending to travel without revealing her condition; otherwise, she would not have been traveling," Alves said. "She may intend to deliver somewhere closer to family, for example. To travel at the last minute, she could try to disguise the condition, but then when she asks the cabin crew for help after the beginning of the labor, often her labor already is advanced."

Not Like TV

Numbers alone can't capture what the flight attendants, medical volunteers, pregnant passengers and newborn babies experienced in these cases, said Heidi Giles MacFarlane, vice president of strategic development at MedAire. "We think of childbirth in an aircraft today as a low-resource situation involving health risks comparable to the increased mortality that a mother and child may experience in the underdeveloped world," she said. "The issues also have much to do with passenger responsibility — the woman taking all necessary precautions, everything possible, to ensure that she is not going to deliver her baby on that airplane."

About the only time that visibly pregnant women induce a little anxiety in a cabin crew during boarding, however, is on an ultra-long-range flight of more than 16 hours, Giles MacFarlane said. The cabin crew realizes that unless the aircraft is just leaving or arriving, an in-flight birth almost always would result in a medical diversion because the cabin crew and medical volunteers cannot be sure of the health status of the newborn, Alves added.

Ideally, establishing a positive relationship early in the flight will encourage each pregnant passenger to reach out immediately for help from a flight attendant at any sign of labor. "When boarding someone who is visibly expecting a baby, a flight attendant often can have a quick conversation, saying 'Congratulations, when are you due? How exciting!' The mother typically will reply, 'I am due on such and such date.' The flight attendant then can add, 'If there is anything that I can do for you, please don't hesitate to let me know.' After building simple rapport, if that person gets into a critical situation, she likely will speak up."

After departure, flight attendants periodically should check on the well-being of these passengers as time permits. Things get interesting quickly in pre-term labor scenarios, requiring cabin crews to recall what they know from training and to disregard what they know from popular culture. "In that situation, initial expectations are largely based on what flight attendants have seen on television shows," Giles MacFarlane said. "Very often they have seen extreme, dramatic cases … lots of complications and problems. As soon as a passenger says 'I think I'm in labor,' they may think the passenger will have the baby in five minutes. In reality, the key to the whole response is to focus on a proper overall assessment of what is actually happening."

More realistically, after labor begins, medical volunteers or flight attendants attending the mother generally will have at least 30 minutes to prepare before the

birth. "Especially for a first-time birth, it will require some time from the initial contractions," Alves said. "The time is not counted in seconds, it is in minutes and sometimes even in hours."

This allows time to notify the flight crew, initiate a call to ground-based medical advisers and make a public address announcement for medical volunteers. In most cases, managing the pre-term labor scenario concludes with landing before delivery and handing off the passenger to emergency medical responders. "As a flight attendant, once the flight diverts, and the passenger in labor has been taken off the airplane, it's not my problem any longer," Giles MacFarlane said. "That's normally a pretty short scenario, but I still would prepare for the situation where the diversion was expected but turned out not to be immediately possible." Even if diversion is warranted from the standpoint of health risk,

Different Airline Rules for Reducing Risk of In-Flight Labor and Childbirth

IATA Recommendation	Examples of Airline Policy Variations
Uncomplicated pregnancy	
A woman who has a single pregnancy should not be accepted to fly beyond the end of the 36th week. A woman who has a multiple pregnancy should not be accepted to fly beyond the end of the 32nd week.	• For travel after 36 weeks on domestic flights only, Qantas Airways accepts without medical clearance a woman who has a single pregnancy and accepts with airline medical clearance a woman who has a multiple pregnancy. • Travel after 36 weeks is allowed by Lufthansa if the woman obtains airline medical clearance and presents a medical certificate from a physician dated within 72 hours of the departure time, stating that an examination has confirmed her physical fitness for flight. • Continental Airlines accepts women in any stage of pregnancy but requires a medical certificate from a physician to allow boarding of a flight within seven days of the estimated date of delivery (EDD). • Aeromexico requires the woman to sign and submit a liability exemption certificate and provide a letter from her physician showing stage of pregnancy and state of health to fly at seven months or later, and prohibits travel within seven days of the EDD. • Air India requires airline medical clearance, an indemnity bond and a physician to accompany a woman to allow boarding a flight at 32 through 35 weeks. • Japan Airlines requires an obstetrician to accompany the passenger as a condition of acceptance for boarding within seven days of EDD on a domestic flight or within 14 days on an international flight.
Complicated pregnancy	
A physician or other medical practitioner should make a case-by-case determination of fitness to fly. A woman should not be accepted to fly if she has active bleeding related to a threatened or completed miscarriage; the airline's passenger medical clearance unit should clear her for flight after she has been medically stable without any bleeding or pain for 24 hours.	• Regardless of the EDD, Qantas, Air France, and Lufthansa require clearance by the airline medical clearance unit if any complications have been identified. • South African Airways requires every pregnant woman to present a letter from her gynecologist stating the EDD and "whether it is a high-risk pregnancy and any possible complications at the time of travel."
Certificate/letter from physician	
For uncomplicated single and multiple pregnancies, clearance by an airline's passenger medical clearance unit should not be required to fly, but a physician certificate should be required from the passenger after 28 weeks of pregnancy.	• Japan Airlines expects a pregnant woman to carry a letter from her physician — stating the EDD and that the pregnancy is uncomplicated — if traveling within 28 days of the EDD. • Emirates advises that boarding may be denied in some circumstances if a pregnant ticket holder has declined to carry a medical certificate or letter from a physician.
Physical signs of labor	
Not mentioned.	• Continental Airlines explicitly advises pregnant women that boarding will be denied if physical signs of labor are present on the day of travel.
Airline-specific travel prohibitions	
Not mentioned.	• American Airlines advises women that boarding will be denied for travel within seven days of the EDD or within 30 days for trans-Atlantic flights, trans-Pacific flights and flights to/from Central America or South America.

IATA = International Air Transport Association

Source: *IATA Medical Manual;* Web sites of individual airlines

Table 1

the captain may decide that, in the big picture, this action would not be safe for the flight.

If medical volunteers, a remote adviser or the pregnant passenger say in-flight childbirth is imminent, customary cabin crew teamwork in marshalling resources and dividing tasks has proven to be a key factor in successful outcomes whether a medical volunteer or flight attendant attends the delivery. "When they agree immediately on who is going to do what — similar to the model used to train for in-flight fire fighting — coordination can happen in seconds," she said.

One of the first cabin safety issues then enters the picture: Where a passenger in labor can be accommodated best in the cabin. Flight attendants may have to weigh the safety risks of temporarily foregoing the maximum protection of passenger seats and a seat belt to position the woman on the floor of a galley, an action best avoided if another solution is workable.

"Sometimes medical volunteers did not make the best decisions just because they were not in their usual 'perfect' environment to make them — or they made decisions that they were not trained to make," Alves said. "The best combination is the remote doctor working with someone who has hands and eyes directly on the pregnant passenger."

Medical oxygen may be helpful to some passengers during pre-term labor but is not essential. "To my knowledge, there is no specific role for oxygen for the mother during labor unless she is in distress or exhausted," Alves said. "Later on, for the baby, there's no doubt oxygen could be required because then he or she will be needing some respiratory support."

Safety Issues

MedAire's IFMEs and reports filed with the U.S. National Aeronautics and Space Administration Aviation Safety Reporting System also serve as a reminder that pre-term labor and childbirth aboard an aircraft generate an unexpectedly high level of distraction and emotional involvement for pilots and flight attendants. "All aircraft crewmembers are trained on how to deal with distraction, but even those who have been trained in the best manner don't necessarily succeed at not becoming distracted — particularly when something as unusual as this occurs," Giles MacFarlane said.

Another often-reported safety issue is flight deck door security protocols that eliminate face-to-face updates between pilots and flight attendants concerning a passenger in labor or a childbirth, and complete reliance on spoken interaction via interphone. In real situations, message relay via the flight crew also has been extremely cumbersome with the possibility of delaying, if not miscommunicating, critical information, she said.

Another problem has occurred after flight attendants agreed to cover for another crewmember's safety duties but subsequent distractions caused them to omit critical safety duties for some phase of flight, Giles MacFarlane said. Preparing the cabin for landing involves a relatively high workload level, for example.

"If even one cabin crewmember has been dedicated to caring for a passenger in labor, all other crewmembers have to communicate to ensure that that person's duties are covered," she said. "It is then very possible that a duty could be overlooked. If a childbirth is occurring during the landing phase, sterile cockpit procedures [limiting flight deck–cabin communication to messages immediately critical to safety of flight] also will mean that the cabin crew will hesitate to communicate with the flight crew."

A recurrent issue in MedAire's cases has been agreeing to complete another person's major duties but missing some key details. "It is easy to check the cabin to be sure that luggage is properly stowed and that every passenger is secured," Giles MacFarlane said. "It's the smaller things — for example, verifying in a particular section that all of the galley carts were secured or that all the bins were double-latched — that others might overlook because those simply were not part of their group of duties. On landing, a cart that has not been double-latched very easily could be set loose, a cart compartment could come open, and containers could come flying into the cabin."

To read an enhanced version of this story, go to <www.flightsafety.org/asw/may09/childbirth.html>.

Notes

1. Estimated date of delivery (EDD) is calculated from the current date, first day of the last menstrual period, ultrasound date and gestational age by ultrasound. Pre-term refers to delivery before completion of 37 weeks of gestation.
2. If a passenger has complied with airline rules derived from International Air Transport Association recommendations for travel while pregnant, her in-flight labor by definition will be pre-term — that is, at least four weeks before the EDD for a single uncomplicated pregnancy and eight weeks before the EDD for an uncomplicated multiple pregnancy. Delivery at term means during a normal range of 37 to 42 complete weeks.
3. Sand, Michael; Bechara, Falk-Georges; Sand, Daniel; Mann, Benno. "Surgical and Medical Emergencies On Board European Aircraft: A Retrospective Study of 10,189 Cases." *Critical Care* Volume 13 (2009), 13.

MembershipUPDATE

Welcome to new Flight Safety Foundation members in 2009! We thank you for your support.

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Accidents in On-Demand Operations Cloud 2008 U.S. Safety Data

The accident rate for scheduled Part 121 flights continued to improve.

BY RICK DARBY

For the second year in succession, U.S. air carriers operating under Federal Aviation Regulations (FARs) Part 121 had no fatal accidents in 2008, and their accident rate decreased from 2007. But U.S. carriers operating under FARs Part 135 as on-demand — air taxi — flights had more fatal accidents and a higher fatal accident rate in 2008 compared with 2007, according to preliminary statistics from the U.S. National Transportation Safety Board (NTSB).[1]

The accident rate for scheduled Part 121 carriers was 0.189 per 100,000 departures for 2008, with a total of 20 accidents (Table 1). That compared with a rate of 1.205 per 100,000 departures for Part 135 scheduled service — commuter operations — which was 6.4 times higher.

In all Part 121 operations, there were three accidents in 2008 classified as "major" by the NTSB, following a year with none (Table 2).[2] For the previous nine years, the average number of major accidents was 2.3.

Accidents, Fatalities and Rates, U.S. Civil Aviation, 2008

	Accidents		Fatalities		Accidents per 100,000 Flight Hours		Accidents per 100,000 Departures	
	All	Fatal	Total	Aboard	All	Fatal	All	Fatal
U.S. air carriers operating under FARs Part 121								
Scheduled	20	0	0	0	0.107	—	0.189	—
Nonscheduled	8	2	3	1	1.288	0.322	4.211	1.053
U.S. air carriers operating under FARs Part 135								
Commuter	7	0	0	0	2.410	—	1.205	—
On-demand	56	19	66	66	1.52	0.52	—	—
U.S. civil aviation	1,649	296	564	553	—	—	—	—
Non-U.S.-registered aircraft	6	4	7	7	—	—	—	—

FARs = U.S. Federal Aviation Regulations

Notes: All data are preliminary. Departure information for on-demand Part 135 operations is not available. Air carriers operating under Part 135 were formerly called scheduled and nonscheduled services. They are currently called commuter operations and on-demand operations, respectively. On-demand Part 135 operations encompass charters, air taxis, air tours or medical services when a patient is aboard.

Source: U.S. National Transportation Safety Board

Table 1

The 2008 rate of major accidents per million flight hours, 0.155, compared with an average of 0.122 for the previous nine years. The number of Part 121 "injury" accidents declined to eight from 14 in 2007, lower than the 1999–2007 average of 16 and one-third of the highest number recorded in the previous nine years.[3]

Part 121 operations resulted in five passenger serious injuries in 2008, compared with an average of 10.8 in the previous nine years.

The accident rate for Part 121 carriers in scheduled service was lower in 2008 than in 2007, whether considered in terms of accidents per 100,000 departures, per 100,000 flight hours or per million miles flown (Table 3). The rate based on departures, 0.189, compared with an average of 0.335 for the previous nine years and was lower than in any of those years. The highest rates by these measures occurred in 2003 — at 0.499, 0.302 and 0.0073, respectively.

In nonscheduled Part 121 operations, the 2008 accident rate rose to 4.211 per 100,000 departures (Table 4), the highest of the 10-year period. There were eight accidents, two of them involving a combined total of three fatalities.

Part 135 carriers operating scheduled service had no fatal accidents in 2008 for the second year in a row, although the rate of accidents per 100,000 departures rose year-over-year from 0.506 to 1.205 (Table 5, p. 52). The 2008 rate compared with an average of 1.089 for the previous nine years.

It was not the best of times for Part 135 on-demand operations in 2008 (Table 6, page 52), which include air charters, air tours and helicopter emergency medical services. The number of fatal accidents rose from 14 in 2007 to 19, compared with an average of 16.2 for the

Continued on p. 52

Accidents and Accident Rates, by NTSB Classification, FARs Part 121, 1999–2008

	Accidents				Accidents per Million Flight Hours			
Year	Major	Serious	Injury	Damage	Major	Serious	Injury	Damage
1999	2	2	20	27	0.114	0.114	1.139	1.538
2000	3	3	20	20	0.109	0.109	1.093	1.475
2001	5	1	19	21	0.281	0.056	1.067	1.179
2002	1	1	14	25	0.058	0.058	0.810	1.446
2003	2	3	24	25	0.114	0.172	1.374	1.431
2004	4	0	15	11	0.212	0.000	0.794	0.583
2005	2	3	11	24	0.103	0.155	0.567	1.238
2006	2	2	7	22	0.104	0.104	0.363	1.142
2007	0	2	14	12	0.000	0.103	0.720	0.617
2008	3	1	8	16	0.155	0.052	0.413	0.827

FARs = U.S. Federal Aviation Regulations; NTSB = U.S. National Transportation Safety Board

Notes: NTSB classifications are as follows:

Major — An accident in which any of three conditions is met: A Part 121 aircraft was destroyed, or there were multiple fatalities, or there was one fatality and a Part 121 aircraft was substantially damaged. Serious — An accident in which at least one of two conditions is met: There was one fatality without substantial damage to a Part 121 aircraft, or there was at least one serious injury and a Part 121 aircraft was substantially damaged. Injury — A nonfatal accident with at least one serious injury and without substantial damage to a Part 121 aircraft. Damage — An accident in which no person was killed or seriously injured, but in which any aircraft was substantially damaged.

Source: U.S. National Transportation Safety Board

Table 2

Accidents, Fatalities and Rates, FARs Part 121, Scheduled Service, 1999–2008

	Accidents		Fatalities		Accidents per 100,000 Flight Hours		Accidents per 1,000,000 Miles Flown		Accidents per 100,000 Departures	
Year	All	Fatal	Total	Aboard	All	Fatal	All	Fatal	All	Fatal
1999	40	2	12	11	0.240	0.012	0.0060	0.0003	0.368	0.018
2000	49	2	89	89	0.280	0.011	0.0069	0.0003	0.443	0.018
2001	41	6	531	525	0.216	0.012	0.0053	0.0003	0.348	0.019
2002	34	0	0	0	0.203	—	0.0049	—	0.331	—
2003	51	2	22	21	0.302	0.012	0.0073	0.0003	0.499	0.020
2004	23	1	13	13	0.126	0.005	0.0030	0.0001	0.213	0.009
2005	34	3	22	20	0.182	0.016	0.0043	0.0004	0.312	0.027
2006	27	2	50	49	0.145	0.011	0.0034	0.0003	0.254	0.019
2007	26	0	0	0	0.138	—	0.0033	—	0.245	—
2008	20	0	0	0	0.107	—	0.0025	—	0.189	—

FARs = U.S. Federal Aviation Regulations

Notes: 2008 data are preliminary. Aircraft with 10 or more seats used in scheduled passenger service are operated under Part 121. Other than the persons aboard aircraft who were killed, fatalities resulting from the Sept. 11, 2001, terrorist act are excluded.

Source: U.S. National Transportation Safety Board

Table 3

Accidents, Fatalities and Rates, FARs Part 121, Nonscheduled Service, 1999–2008

	Accidents		Fatalities		Accidents per 100,000 Flight Hours		Accidents per 1,000,000 Miles Flown		Accidents per 100,000 Departures	
Year	All	Fatal	Total	Aboard	All	Fatal	All	Fatal	All	Fatal
1999	11	0	0	0	1.276	—	0.0267	—	2.435	—
2000	7	1	3	3	0.853	0.122	0.0188	0.0027	1.689	0.241
2001	5	0	0	0	0.762	—	0.0167	—	1.553	—
2002	7	0	0	0	1.225	—	0.0265	—	3.012	—
2003	3	0	0	0	0.517	—	0.0113	—	1.462	—
2004	7	1	1	1	1.002	0.143	0.0215	0.0031	2.915	0.416
2005	6	0	0	0	0.885	—	0.0186	—	2.728	—
2006	6	0	0	0	0.975	—	0.0209	—	3.102	—
2007	2	1	1	1	0.321	0.161	0.0069	0.0034	1.030	0.515
2008	8	2	3	1	1.288	0.322	0.0275	0.0069	4.211	1.053

Notes: 2008 data are preliminary.

Source: U.S. National Transportation Safety Board

Table 4

Accidents, Fatalities and Rates, FARs Part 135, Commuter Operations, 1999–2008

	Accidents		Fatalities		Accidents per 100,000 Flight Hours		Accidents per 1,000,000 Miles Flown		Accidents per 100,000 Departures	
Year	All	Fatal	Total	Aboard	All	Fatal	All	Fatal	All	Fatal
1999	13	5	12	12	3.793	1.459	0.2481	0.0954	1.934	0.744
2000	12	1	5	5	3.247	0.217	0.2670	0.0223	1.988	0.166
2001	7	2	13	13	2.330	0.666	0.1624	0.0464	1.254	0.358
2002	7	0	0	0	2.559	—	0.1681	—	1.363	—
2003	2	1	2	2	0.627	0.313	0.0422	0.0211	0.349	0.175
2004	4	0	0	0	1.324	—	0.0855	—	0.743	—
2005	6	0	0	0	2.002	—	0.1312	—	1.138	—
2006	3	1	2	2	0.995	0.332	0.0645	0.0215	0.528	0.176
2007	3	0	0	0	1.028	—	0.0651	—	0.506	—
2008	7	0	0	0	2.410	—	0.1525	—	1.205	—

Notes: 2008 data are preliminary. Air carriers operating under Part 135 were formerly called scheduled and nonscheduled services. They are currently called commuter operations and on-demand operations, respectively.

Source: U.S. National Transportation Safety Board

Table 5

Accidents, Fatalities and Rates, FARs Part 135, On-Demand Operations, 1999–2008

	Accidents		Fatalities		Accidents per 100,000 Flight Hours	
Year	All	Fatal	Total	Aboard	All	Fatal
1999	74	12	38	38	2.31	0.37
2000	80	22	71	68	2.04	0.56
2001	72	18	60	59	2.40	0.60
2002	60	18	35	35	2.06	0.62
2003	73	18	42	40	2.49	0.61
2004	66	23	64	63	2.04	0.71
2005	65	11	18	16	1.70	0.29
2006	52	10	16	16	1.39	0.27
2007	62	14	43	43	1.54	0.35
2008	56	19	66	66	1.52	0.52

Notes: 2008 data are preliminary. Air carriers operating under Part 135 were formerly called scheduled and nonscheduled services. They are currently called commuter operations and on-demand operations, respectively. On-demand Part 135 operations encompass charters, air taxis, air tours or medical services when a patient is aboard.

Source: U.S. National Transportation Safety Board

Table 6

1999–2007 period. There was little change in the accident rate, but the fatal accident rate of 0.52 per 100,000 flight hours in 2008 was a 48.57 percent increase over the 0.35 in 2007, compared with an average of 0.49 for the nine years before 2008.

Unlike Part 135 commuter operations, the Part 135 on-demand operations rates are based on flight hours estimated by the U.S. Federal Aviation Administration, less precise and which safety professionals regard as perhaps less meaningful than the Part 121 rates based on numbers of departures. On-demand flights are usually of short duration, so accidents have a relatively large effect on rates. But year-to-year comparisons of accidents against flight hours are valid.

Notes

1. The NTSB accident statistics are available via the Internet at <www.ntsb.gov/aviation/Stats.htm>.
2. A major accident is one in which a Part 121 aircraft was destroyed, or there were multiple fatalities, or there was one fatality and a Part 121 aircraft was substantially damaged.
3. An injury accident is a nonfatal accident with at least one serious injury and without substantial damage to a Part 121 aircraft.

Topical Storm Warning

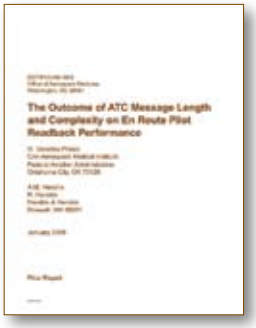
Including too many topics in one ATC clearance encourages readback errors.

REPORTS

Say No More

The Outcome of ATC Message Length and Complexity on En Route Pilot Readback Performance

Prinzo, O. Veronika; Hendrix, A.M.; Hendrix, R. U.S. Federal Aviation Administration (FAA) Office of Aerospace Medicine. DOT/FAA/AM-09/2. Final report. January 2009. 38 pp. Figures, tables, references, appendixes. Available via the Internet at <www.faa.gov/library/reports/medical/oamtechreports/2000s/2009> or from the National Technical Information Service.*



This study finds brevity to be a positive factor in the accuracy of pilot-air traffic control (ATC) communications. But more important than the duration of the message is the number of different items of information, or aviation topics (ATs), in each communication. The complexity of the information, regardless of the number of ATs, also matters.

The researchers analyzed 51 hours of ATC communication from air traffic route control centers. In addition to duration and number of ATs, communications were assigned a "complexity value," based on the number of elements that had to be understood and read back correctly. Each element, it was assumed, added another weight to the memory load. For example, "Contact Minneapolis center one one eight point eight" had a complexity value of six: one for the instruction "contact," one for the name of the facility and four for the frequency — two for the "one one eight," one for the decimal point and one for the number following the decimal.

In response to the total of 4,261 ATC messages, pilots responded to 89 percent with a complete or partial readback. A partial readback might, for example, omit numbers or letters in the aircraft call sign or be a simple acknowledgement rather than a readback of the clearance plus the full call sign. Of the 3,799 readbacks, 28.7 percent were correct, while the remaining 71.3 percent were faulty.

Faulty readbacks were categorized into three types. In errors of omission, part of the information was missing, although what was read back was correct. In readback errors only, the information was read back incorrectly. The third error type was a combination of the two. The majority of errors, 67.4 percent of all readbacks, were errors of omission.

Among the errors of omission, the largest proportion concerned altitude — 34.4 percent — and the next largest concerned radio frequency — 32.24 percent. Of pilot transmissions with readback errors, 2 percent were a combination of transposition of letters or numbers; 19.9 percent were a substitution of an incorrect for the correct letter or number; and 78.1 percent were a combination of transposition and substitution.

"The increase in faulty readback performance was attributed to a steady rise in errors of omission brought on by the added complexity of ATC messages," the report says. "This is not altogether surprising, given the high memory load imposed on the pilot's working memory capacity and the fact that verbatim recall of ATC messages is not a requirement."

Message length affected both errors of omission and readback errors, the report says: "There were more errors of omission as ATC message length increased from short (one aviation topic), to moderate (two aviation topics) and long (three aviation topics). … Readback errors increased once ATC messages included two or more aviation topics. The most common readback errors involved altitude and altitude restrictions, followed by radio frequency, route/position

clearance and altimeter settings. These findings agree with research investigating the capacity limitations of verbal working memory … ."

The report concluded with recommendations:

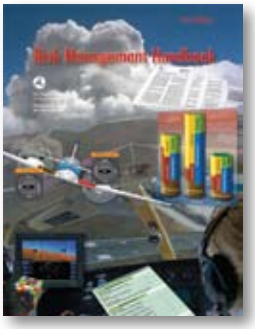
"No more than three aviation topics [should be] present in any ATC transmission.

"If a route clearance is given, it should be given separately as a stand-alone transmission. This is especially important when complex route clearances are transmitted by ATC.

"The names of all fix, waypoint, location, etc., identifiers [should] be repeated, and if necessary, spelled out following their first recitation.

"Slang should not be accepted as part of a pilot readback.

"Reduce excessive words/phrases — on, your, to, is, etc. The phraseology created by the FAA is precise and needs no further embellishment."



Weighing Risk

FAA Risk Management Handbook 2009

U.S. Federal Aviation Administration (FAA) Flight Standards Service. FAA-H-8083-2. 112 pp. Figures, appendixes, glossary, index. Available via the Internet at <www.faa.gov/library/manuals/aviation/media/FAA-H-8083-2.pdf> or from the GPO.**

Many accidents "are the result of the tendency to focus flight training on the physical aspects of flying the aircraft by teaching the student pilot enough aeronautical knowledge and skill to pass the written and practical tests. Risk management is ignored, with sometimes fatal results," the handbook says. It adds, "A key element of risk decision making is determining if the risk is justified."

The handbook begins by defining risk management as "a formalized way of dealing with hazards … the logical process of weighing the potential costs of risks against the possible benefits of allowing those risks to stand uncontrolled."

What this means more specifically is spelled out in subsequent chapters, including "Human Behavior," "Identifying and Mitigating Risk," "Assessing Risk," "Aeronautical Decision Making," "Automation" and "Risk Management Training."

Although the material is clearly aimed at small-airplane general aviation pilots, commercial pilots — particularly those with relatively few flight hours — will find its principles worth reviewing as a refresher.

The handbook is illustrated with full-color figures, many of which have a realistic "three-dimensional" look. An appendix includes the Flight Safety Foundation CFIT Checklist for estimating a flight's vulnerability to controlled flight into terrain.

Stop Right There

Survey Report: Stopbars

International Federation of Air Traffic Controllers' Associations (IFATCA). December 2008, released on the IFATCA Web site, March 4, 2009. 17 pages. Figures, tables, appendix. Available via e-mail to <office@ifatca.org> or the Internet at <www.ifatca.org/docs/stopbar_report.pdf>.

When, where and how are stopbars used? Who owns the stopbars, and who operates the on/off switches? Does air traffic control (ATC) ever instruct pilots and vehicle drivers to cross illuminated stopbars?

What happens if a pilot or driver refuses to cross an illuminated stopbar? Are there contingency plans when a stopbar or switch malfunctions?

These are some of the questions in an IFATCA survey about stopbar usage at major international and regional airports. The survey was conducted by the organization's airport domain team (ADT) and delivered to 39 of IFATCA's global member associations. Twenty-nine of the associations, representing 70 airports, responded to the survey, resulting in data from airports in each of IFATCA's four regions: 51 in Europe, two in Africa and Middle East, seven in Asia and Pacific, and 10 in the Americas region.

The report compiles IFATCA observations and recommendations based on survey responses and its review of existing International Civil Aviation Organization (ICAO) provisions. The report identifies respondents with stopbars and outlines their responses to the questions about activation times (i.e., in low visibility only versus always in use), ownership (airport versus air navigation service provider), on/off switching authority, contingency plans or alternate routing when an illuminated stopbar cannot be switched off, and other issues. Airports without stopbars are also identified.

The report says, "The use of stopbars that are permanently on appears to be more common at the major international airports than at the other international/regional airports." It also says that "the use of stopbars during nighttime appears to be applied by a relatively low number of airports in this survey" — eight of 56.

Nearly all airports reported that stopbars are owned by airport authorities. ATC operates stopbar switches, with a few exceptions. The report says comments on survey forms appear to indicate a mismatch between some stopbar owners and their operators regarding how stopbars should be used, resulting in pilots and vehicle drivers sometimes being expected or instructed to cross active stopbars.

Responses indicated that 35 of 56 airports with stopbars have no contingency procedure for when an aircraft or a vehicle is situated in front of an active stopbar that cannot be switched off. Of those 35 airports, 10 have alternative routes available. Procedures vary at airports with contingency plans. For example, ATC tells the pilot/driver to cross by following a designated vehicle, or ATC uses specific phraseology to instruct pilot/driver to cross the illuminated stopbar or electrical power to the circuit is temporarily switched off.

In its conclusion, the report says, "There is considerable diversity in the application of stopbars and the associated procedures around the world," and notes that differences in procedures could become a safety issue. The organization is concerned that "as long as there are airports where pilots are instructed or expected to cross an active stopbar, the integrity of the protection that stopbars are intended to provide is breached."

Based on the findings, the IFATCA ADT has recommended remedies, including better guidance from ICAO on stopbar-related procedures and improved consistency across various ICAO documents. Stopbar illumination should be switchable at taxiways and intersections where aircraft and vehicles are intended to operate.

"Pilots and vehicle drivers should be trained to never cross an active stopbar, except when under the guidance of a 'follow me' vehicle as part of a contingency measure," the team says, and controllers should not instruct a pilot or driver to violate that rule. Airport and ATC authorities should have or develop contingency plans and apply them uniformly when stopbars are inoperable. "This contingency procedure should comprise the use of a 'follow me' vehicle to guide the aircraft or vehicle over the stopbar," the ADT says.

WEB SITES

Playing Safe With Rotors

National EMS Pilots Association (NEMSPA), <www.nemspa.org>

NEMSPA's Web site contains a large amount of free information for viewing online or downloading — training resources; publications; links to materials on other safety organization Web sites, such as "Guidelines for a Robust Safety Management System" by the International Helicopter Safety Team; presentations (e.g., "Safety and the Safety Officer for Dummies") and the video, "Heliport Safety Training."

This 16-minute video is in color with audio, and was developed by the Illinois (U.S.) Association of Air and Ground Critical Care Transport and the Illinois Department of Transportation, with contributions by several hospitals and helicopter organizations.

The video is designed to benefit hospital staff and medical, security and maintenance personnel. It focuses on hazards and safety precautions of helipad operation with the intent of providing safe air transport of medical patients and protecting patients, pilots, personnel and the public from accidents. Much of the information delivered in the video can be applied to heliports located in environments similar to hospitals where limited space, limited assistance from ground personnel, proximity to adjacent

equipment (especially magnetic and flammable hazards) and ground traffic are all challenges.

Using special effects, the video illustrates rotor wash from main and tail rotors, blade tilt/droop effect and the arc of rotors in motion. Differences in rotor designs are also discussed.

Viewers learn how to safely approach a helicopter, from a front quarter only, and to properly enter and exit the helipad environment. Techniques for transferring patients safely are demonstrated. Viewers are instructed about different door styles and warned not to be "helpful," as inadvertent damage or injury may occur. "Hot spots" and other sensitive areas of the aircraft are identified with warnings to personnel not to touch such areas.

The video discusses foreign object debris awareness, the importance of proper protection including goggles, headphones and vests for personnel working in the vicinity of a heliport, and on-site navigation aids and lighting.

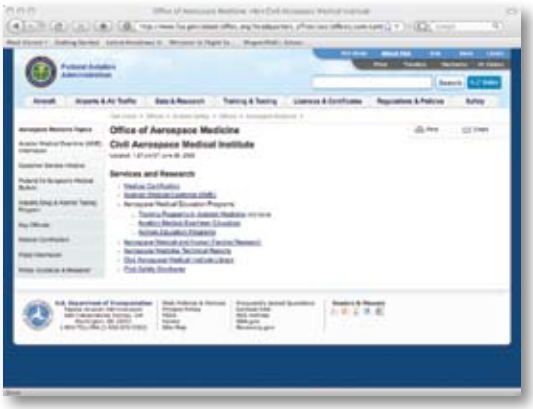
A companion to the video is "Hospital Helipads: Safety, Regulatory and Liability Issues Hospitals Must Know and Consider." The resource is available as 92 PowerPoint slides or a 92-page document in Adobe portable document format. It is heavily illustrated and addresses helipad and adjacent landscape designs, best practices and standard operating procedures, regulatory information, fire protection standards, navigable airspace and navigation aids, proactive safety training, and more.

Aviation Medicine Research Central

Federal Aviation Administration (FAA), Office of Aerospace Medicine, Civil Aerospace Medical Institute, <www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/cami/>

Regular readers of InfoScan will recognize the Civil Aerospace Medical Institute (CAMI), part of the Office of Aerospace Medicine (OAM), as the source of many reports noted here. CAMI, through its divisions, pursues its mission "to ensure civil aerospace safety in the U.S. through excellence in medical certification, aerospace medical education, human factors research, aerospace medical research and occupational health services," says the FAA.

The medical certification division administers the medical certificate program for pilots. Educational and training programs for flight crew and aviation medical examiners are addressed by the medical education division. Field and laboratory performance research are conducted by the human factors and aerospace medical research divisions.



The human factors research division studies organizational and individual human factors in aviation work environments, such as man-machine relationships, human performance under conditions of impairment, training analysis, and the impact of advanced automation on personnel requirements and performance. The Web site says the aerospace medical research division focuses on "enhancing human safety, security and survivability in civilian aerospace operations." It conducts bioaeronautical research to establish injury and death patterns in accidents, determines cause and prevention strategies and makes recommendations for equipment to protect flight and cabin occupants, among other responsibilities.

CAMI publishes its research findings in technical reports that are available in full-text online to read, print or download at no cost. Reports date from 1961 to the present. Chronological, author and subject indexes appear in a separate document. From the OAM/CAMI Web site shown in the header, choose "aerospace medical technical reports," or go directly to the Institute's publications Web page at <www.faa.gov/library/reports/medical/oamtechreports/index.cfm>.

Sources

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

** U.S. Government Printing Office <bookstore.gpo.gov>

— Rick Darby and Patricia Setze

Lost in the Lights

A lightplane was still on the runway when a regional jet was cleared for takeoff.

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

Collision Narrowly Avoided

Bombardier CRJ700, Cessna 172. No damage. No injuries.

An air traffic control (ATC) operational error resulted in a near collision between the CRJ and the 172 at Lehigh Valley International Airport in Allentown, Pennsylvania, U.S., the evening of Sept. 19, 2008, according to the report by the U.S. National Transportation Safety Board (NTSB).

Night visual meteorological conditions (VMC) prevailed. The CRJ had 56 passengers and four crewmembers aboard for a scheduled flight from Allentown to Chicago. The 172 was inbound on a private flight from Caldwell, New Jersey, with the pilot and two passengers aboard.

At 1935 local time, the CRJ flight crew told the airport local traffic controller that they were holding short of Runway 06 and were ready for takeoff. The controller told the crew to continue holding short for traffic landing on Runway 06. About two minutes later, the 172 passed over the approach threshold, and the controller told the CRJ crew to taxi into position and hold on the runway.

The controller then asked the 172 pilot where he would be parking. The pilot said that he would be parking at Hangar 7, which is on the south side of the airport. The controller told him to turn right onto Taxiway A-4 and to remain on the local control radio frequency while taxiing to the hangar. Taxiway A-4 is 1,450 ft (442 m) from the approach end of Runway 06, which is 7,600 ft (2,316 m) long and 150 ft (46 m) wide. The control tower is on the north side of the airport and about 1,400 ft (427 m) from the midpoint of Runway 06. The airport does not have a ground-movement radar system.

The controller, who was hired by the U.S. Federal Aviation Administration (FAA) in September 2007 and was certified on the local control position at the Allentown airport in August 2008, told investigators that he had received very little training on night operations because of insufficient traffic. "Review of his training documentation showed that of his 82 hours' training time on local control, 49 minutes were at night," the report said.

After issuing taxi instructions to the 172 pilot, the controller believed that he saw the 172's landing light begin to move right toward Taxiway A-4. He turned his attention to an airplane in the landing pattern to the northwest. The controller told

'We made an immediate high-speed evasive abort with maximum braking and reverse thrust.'

the pilot of that airplane to extend his downwind leg to accommodate the departing CRJ. "He then turned around and scanned the runway," the report said. "The runway appeared to be clear, [so] he cleared [the CRJ crew] for takeoff. The local controller did not recall actually seeing [the 172] clear of the runway."

About 20 seconds after the CRJ crew was cleared for takeoff, the 172 pilot told the controller that he had missed Taxiway A-4 and requested permission to turn right on Taxiway B, which is about 3,100 ft (945 m) from the approach end of the runway. The controller responded, "No delay, turn immediately." The pilot acknowledged the instruction. "When asked what he meant by that clearance, the local controller stated that he wanted the aircraft to get off the runway even if it had to turn into the grass," the report said.

The controller-in-charge that night was the ground controller, who was hired by the FAA in 2001 and was certified for all positions in the airport control tower. "The ground controller first became aware of the incident when he heard a pilot say something unusual on the local control frequency," the report said. "He did not completely catch what was said, but it did not sound right. Much later, after reviewing the voice tapes, he realized that what he had heard was [the 172 pilot] saying that he had missed the turn at A-4. … After hearing the transmission, he looked up and saw the lights from [the CRJ] at an angle on the runway. … He did not know what had happened."

The 172 pilot was turning the airplane right of the runway centerline and toward Taxiway B at 1938 when he saw the regional jet pass by on the left side of the runway. "The pilot stated that at no time did he hear the jet either being cleared into position and hold or being cleared for takeoff," the report said. "[He] stated that he would have contacted the tower immediately had he heard the takeoff clearance being issued while he was still on the runway."

The CRJ captain said that indicated airspeed was about 110 kt when he heard the 172 pilot radio that he had missed his turnoff. "When we heard that transmission, my first officer noticed a white nav[igation] light off to the right of centerline that appeared to be an aircraft," he said. "He immediately made the callout to 'abort, abort,' and we made an immediate high-speed evasive abort with maximum braking and reverse thrust to the left side of the runway. … We missed the Cessna by 10 ft [3 m] at 40 kt as we passed off his left wing."

The CRJ crew decided to cancel the flight and to taxi the airplane back to the gate for inspection. They notified their airline's safety department about the near collision, and the safety department reported the incident to NTSB.

"Asked what caused the incident, the local controller stated that he just 'lost the Cessna in the lights,'" the report said.

NTSB determined that the probable cause of the near collision was "the failure of both tower controllers to maintain awareness of the position of [the 172] and ensure that the aircraft was clear of the runway before issuing a takeoff clearance to [the CRJ]."

Confused Crew Taxis off Runway End

Boeing 747-400. No damage. No injuries.

The 747 flight crew, inbound from their home base in London with 349 passengers and 17 cabin crewmembers the night of Dec. 26, 2006, conducted an uneventful landing on Runway 30 at Miami International Airport. It was their first night landing on Runway 30, and they intended to make a right turn onto a high-speed taxiway at the end of the runway.

The pilots looked for green lights leading to the taxiway. "The taxiway at the end of the runway did not have taxiway lead-off lights extending to the center of the runway, but the taxiway did have centerline lights beginning at the runway edge, per FAA requirements," the NTSB report said.

After the 747 was inadvertently taxied past the taxiway, the pilots saw a line of red lights about 50 m (164 ft) ahead and, believing that the lights marked the end of the runway, continued to taxi. "The first officer started to turn off the runway using the blue taxiway edge lights as

a guide but immediately stopped the airplane when both he and the captain realized the light pattern was not as expected," the report said.

The 747 had been taxied off the departure end of the runway at less than 10 kt and had struck two approach lights for Runway 12. "The airplane was not damaged and, after being towed from the overrun area, taxied to the gate under its own power," the report said. One of the tires on the center landing gear was changed before the airplane returned to London.

The red lights that the flight crew had observed were obstruction lights mounted on top of an instrument landing system localizer antenna about 500 ft (152 m) beyond the runway threshold. "The actual runway threshold was marked with eight red lights, consisting of four lights extending out from each side of the runway edge," the report said. "FAA advisory material for new runway threshold lighting installations and for reconstruction of existing installations recommends that threshold lights extend from the runway edge inboard toward the center of the runway and not outboard like those on the incident runway; however, existing installations, such as those on the incident runway, were permitted by the FAA."

Although the pilots were confused by the red lights, "they had numerous other indications available to identify their position on the runway," the report said.

Distraction Cited in Runway Excursion

Cessna 510 Citation Mustang. Substantial damage. No injuries.

The pilot was flying a standard terminal arrival route to McClellan–Palomar Airport in Carlsbad, California, U.S., the morning of April 19, 2008, when the primary flight display (PFD) on the right side of the panel began to flicker. The airplane was descending through 28,000 ft about five minutes later when a "PFT" — autopilot preflight test fail — warning appeared on the left PFD.

The NTSB report said that the autopilot self-test, in addition to being performed before flight, "is performed automatically in response to some detected anomalies while in flight, and its failure will result in the autopilot, yaw damper and electric pitch trim becoming inoperative."

The pilot told investigators that, after the PFT warning appeared, "he immediately felt heavy control forces on the control yoke that he had to exert to fly the airplane," the report said. The pilot did not follow the emergency checklist procedures for a PFT warning, which include pulling the autopilot circuit breaker (CB) and waiting five minutes before resetting the CB. The checklist says that if the warning ceases, the autopilot may be re-engaged, but if the warning persists, the CB must be pulled and the airplane hand-flown.

The pilot said that he hand-flew the Mustang for about 45 minutes. "The pilot noted that he was overwhelmed with the electrical failures and fatigued from maneuvering the airplane by hand for such a long duration," the report said.

Nearing the airport, the airplane entered instrument meteorological conditions (IMC) and descended below the overcast at 2,600 ft. The pilot told ATC that he would conduct a visual approach to Runway 24. The airport traffic controller said that the airplane appeared to be "quite high" and that she asked the pilot, "Do you think you can make it?" The pilot replied, "Yes."

The controller said that the airplane appeared to be 'quite high' and that she asked the pilot, 'Do you think you can make it?'

The Mustang was in landing configuration when it crossed the runway threshold, but airspeed was 102 kt — 15 kt above the target landing speed. The pilot said that he was aware of the excessive airspeed but believed that the runway was long enough to accommodate a delayed touchdown. The airplane touched down beyond the midpoint of the 4,897-ft (1,493-m) runway. "The airplane approached the apex of the sloping runway, and the pilot began to clearly distinguish where the runway surface ended, which was sooner than he had anticipated," the report said.

The pilot determined that a go-around was not possible and purposely ground-looped the Mustang, apparently to avoid an overrun. The main landing gear collapsed, and the airplane came to a stop south of the runway. The pilot and his three passengers were not injured.

In its probable-cause statement, NTSB said that the pilot's failure to follow the autopilot PFT emergency procedures and his distraction with the flickering PFD contributed to the accident. Investigators found no relationship between the anomalies: the PFT warning had been generated by a yaw damper servo reset prompted by a load monitor, and a faulty screen had caused the PFD to flicker.

Escape Slide Separates in Flight

Boeing 767-200. Minor damage. No injuries.

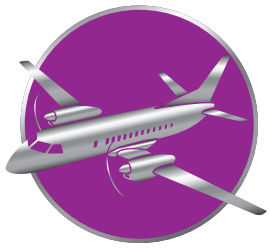
Inbound from Zimbabwe with 206 passengers and 10 crewmembers, the 767 was on final approach to London Gatwick Airport the evening of Aug. 3, 2008, when the flight crew felt an unusual roll motion while extending the flaps 15 degrees. The motion stopped, and the crew landed the airplane without further incident.

"During their post-flight external inspection, the crew noticed that the compartment for the right overwing escape slide was open and the slide itself was missing," said the report by the U.K. Air Accidents Investigation Branch (AAIB). "The actuating mechanism was hanging from the compartment and had caused slight dents and perforations in the adjacent fuselage skin."

A few days later, a deflated escape slide was found on the ground below the approach path to Gatwick. "By that time, the aircraft had been repaired and had flown several subsequent sectors," the report said. "The aircraft had been repaired and dispatched without a detailed inspection to determine the cause of the slide compartment opening."

Boeing records show two broad categories of overwing escape slide detachment. The first involves activation of the inflation system while the slide compartment is closed and latched. "This 'blows' the compartment door open as the slide inflates and leaves telltale evidence." The AAIB determined that the incident at Gatwick fit the second category: "[This] involves, generally, a combination of incomplete latching and, in some instances, an element of misrigging or worn components," the report said.

TURBOPROPS



Violent Encounter Below 'Very Dark Cloud'

Raytheon King Air B300. Substantial damage. No injuries.

VMC prevailed for the positioning flight from Alabaster, Alabama, U.S., to Tuscaloosa, Alabama, the afternoon of April 4, 2008, but there was a squall line in the vicinity of the destination airport. The pilot said that while nearing Tuscaloosa at 3,000 ft, he saw a very dark cloud ahead. The cloud was about 300 ft (91 m) thick and appeared to be precipitating virga.

The pilot said that a "violent and rapid turbulence event" was encountered as the King Air passed about 500 ft below the cloud. "During the turbulence episode, the airplane descended several hundred feet, but the pilot was able to maintain control," the NTSB report said. Neither the pilot nor the copilot was injured.

The airplane was landed without further incident, and the pilots observed no damage during their preflight inspection for the subsequent flight. Four days later, however, maintenance technicians found that the main spar in the left wing had been substantially damaged. A subsequent inspection by a Raytheon field engineer indicated that the airplane had encountered loads in excess of design limits.

"The airplane most likely flew under either a roll cloud or a shelf cloud," the report said. "Severe or extreme turbulence should always be expected in the vicinity of these cloud types."

Weather Deteriorates During VFR Flight

Pacific Aerospace Cresco 08-600. Destroyed. One fatality.

The pilot conducted a ferry flight from Tully, Queensland, Australia, to Ingham — about 100 km (54 nm) south — the morning of Aug. 16, 2007, to have maintenance performed on the single-turboprop aircraft, which was configured to transport parachutists. The maintenance included correction of a reported nosewheel shimmy and a scheduled dynamic propeller balance.

The Cresco departed from Ingham at about 1454 local time for the return flight. "The aircraft did not arrive at Tulley, and the next

day the pilot and aircraft were reported missing," said the report by the Australian Transport Safety Bureau (ATSB), which noted that initiation of search-and-rescue activities was delayed because the pilot had not filed a flight plan.

On Aug. 18, the wreckage was found at 1,280 ft in mountainous terrain 24 km (13 nm) south of Tully. "The circumstances of this occurrence were consistent with controlled flight into terrain resulting from VFR [visual flight rules] flight into IMC," the report said. The aircraft was certified for VFR-only flight in Australia. The private pilot had 397 flight hours, including 25 hours in the Cresco, and did not have an instrument rating.

A maintenance technician told investigators that there were clear skies in the vicinity of Ingham but the weather to the north, toward Tully, was poor when the aircraft departed. An amended forecast issued by the Bureau of Meteorology called for a broken ceiling at 800 ft with tops at 2,000 ft, scattered cumulus with bases at 1,800 ft and tops at 12,000 ft, and occasional visibility of 2,000 m (1 1/4 mi) in rain showers.

Position Awareness Lost During Approach

Embraer Bandeirante. Destroyed. One fatality.

NTSB concluded that the pilot likely misinterpreted the airplane's position during an instrument approach in IMC to Bennington, Vermont, U.S., the morning of Aug. 4, 2006. The pilot was conducting a positioning flight from Binghamton, New York. The Bandeirante was scheduled to have maintenance performed in Bennington.

The airport had calm winds, 10 mi (16 km) visibility, scattered clouds at 500 ft and an overcast at 900 ft. The pilot conducted the VOR (VHF omnidirectional radio) approach to Runway 13 and a missed approach at the missed approach point (MAP), then requested and received clearance from ATC to conduct another VOR approach.

The VOR is the final approach fix (FAF), which has a minimum crossing altitude of 3,400 ft. After crossing the FAF, the procedure calls for a descent to 1,880 ft, the minimum descent altitude. The MAP is 6 nm (11 km) from the VOR and 1.3 nm (2.4 km) from the runway. Field elevation is 827 ft.

"There was no dedicated distance measuring equipment (DME) aboard the airplane," the report said. "Instead, distance was determined by the use of an IFR [instrument flight rules] approved GPS [global positioning system] unit."

Investigators believe that the pilot did not reprogram the GPS receiver after conducting the missed approach. "Unless the pilot reprogrammed the unit, the last waypoint entered would have remained at the airport, rather than the VOR," the report said. "The pilot then most likely mistook the airport position for the VOR position and displaced the beginning of the descent by 6 nm."

The approach controller provided radar vectors to help the pilot rejoin the final approach course, then terminated radar services and approved a change to the airport advisory radio frequency. Recorded radar data showed that the airplane crossed the VOR at 3,500 ft and then remained at that altitude, rather than descending, until reaching the airport. "At the airport, the airplane began a descent," the report said. "The airplane continued to travel outbound from the airport, along the same course, until the last radar contact about 2 nm [4 km] to the southeast at 2,600 ft." The Bandeirante struck rising terrain at 2,100 ft about 6.5 nm (12.0 km) beyond the airport.

Investigators believe that the pilot did not reprogram the GPS receiver after conducting the missed approach.

Sink Rate Not Arrested on Final

Pilatus PC-6/B2-H4. Substantial damage. No injuries.

After conducting one of several parachute drops the afternoon of May 4, 2008, the pilot returned to Clonbullogue (Ireland) Airfield to pick up more parachutists. Surface winds were from 210 degrees at 12 to 15 kt as the Turbo Porter was established on final approach to Runway 27. The aircraft likely encountered turbulence from air flowing over an adjacent hangar, said the report by the Irish Air Accident Investigation Unit.

"On short finals, the aircraft sank below the normal approach profile, and the pilot responded by increasing power," the report said, noting

that the power increase was not sufficient to arrest the sink rate.

The pilot pulled back the control stick in an attempt to clear a hedge that borders the airfield. "The underside of the aircraft fuselage contacted the boundary hedge," the report said. "A low fence post embedded in the hedge caused substantial damage to the underside of the fuselage. The aircraft continued its landing run without further incident."

Control Lost During Takeoff on Snow

Douglas DC-3T. Substantial damage. One minor injury.

During takeoff from McMurdo Station, Antarctica, the night of Dec. 20, 2007, the first officer made a callout when the DC-3, modified with turboprop engines and skis, accelerated through 60 kt. The first officer said that when the captain subsequently moved the control wheel aft to lower the tail and attain a flight attitude, she felt the tail wheel contact the hard-packed snow.

"Just before the airplane became airborne, the right wing lifted and the left wing struck the snow-covered terrain, which pivoted the airplane 90 degrees to the left," the NTSB report said. "Both main landing gear assemblies collapsed, and the airplane came to rest on its belly, sustaining substantial damage to the left wing and fuselage." The first officer's seat belt had opened when the DC-3 pivoted, and her head struck the overhead console. The captain and eight passengers were not injured.

NTSB concluded that the probable cause of the accident was "the captain's decision to lift off before attaining a proper airspeed, resulting in a loss of control during takeoff."

PISTON AIRPLANES

'Options for Maneuvering Were Severely Limited'

De Havilland DHC-2 Beaver. Destroyed. Six fatalities, three serious injuries.

The pilot had landed the float-equipped Beaver on Traitor's Cove, 20 nm (37 km) north of Ketchikan, Alaska, U.S., on Aug. 16, 2007. The winds were light, and the water was calm during the landing. The pilot said that, while waiting for the passengers to return from their ground tour, the wind velocity increased, and choppy waves formed in the cove.

The NTSB report said that after boarding the passengers for the return flight to Ketchikan, the pilot — who had 17,000 flight hours, including 7,000 hours in type — decided to take off toward the shoreline, in the direction of rising terrain, to avoid some of the wind and waves. "The pilot said that he had never taken off in that direction before," the report said.

After lifting off the water and climbing about 400 ft, the pilot began a left turn. "While attempting this turn, the pilot encountered a downdraft, was unable to climb above the terrain and stalled the airplane about 60 ft above the ground," the report said. "The downdraft made it more difficult to avoid descending into the rising terrain." Six passengers were killed by the impact and postaccident fire; the pilot and two passengers were seriously injured.

NTSB said that the probable cause of the accident was "an inadvertent aerodynamic stall resulting from the pilot's poor decision making and inadequate planning and execution when he took off toward nearby rising terrain, in strong winds, under circumstances where his options for maneuvering were severely limited."

Fuel Starvation Leads to Ditching

Piper Cherokee Six. Substantial damage. Two serious injuries.

During departure from Brampton Island, Queensland, Australia, for a charter flight to Mackay on April 3, 2008, the Cherokee's engine lost power at about 400 ft. "The pilot turned the aircraft left approximately 30 degrees to face into the wind and to be parallel with the wave tops on the sea below," the ATSB report said.

Before ditching the aircraft, the pilot declared an emergency and told the passengers to open the cockpit and cabin doors. He also attempted unsuccessfully to restore power by manipulating the throttle and mixture control, and activating the electric fuel pump. He did not reposition the fuel-tank selector valve, however.

The pilot suffered an eye injury and one passenger sustained bone fractures when the Cherokee decelerated rapidly on contact with the water. The aircraft remained afloat about one minute, but all five occupants were able to evacuate before it sank. They donned life vests and were picked up by a rescue helicopter.

The report said that the takeoff likely was conducted with the fuel-selector valve positioned to the right tip tank and that the power loss occurred when the fuel in that tank was exhausted.

Bird Strike Cripples Trainer

Piper Seminole. Destroyed. Two fatalities.

The airplane crashed inverted in a bog in Browerville, Minnesota, U.S., during a night cross-country training flight on Oct. 23, 2007. "Data recovered from the airplane's flight display system indicated that the airplane was in stable flight … at 4,500 ft and 160 kt when it abruptly departed from controlled flight," the NTSB report said.

The airplane rolled and yawed left, and pitched nose-down; it then entered a right roll that continued until it struck the bog about 30 seconds after the upset began. Examination of the wreckage revealed that the left half of the horizontal stabilator was bent upward about 90 degrees, which was not consistent with damage to the rest of the airframe, the report said. Microscopic examination and DNA testing of material found inside a tear on the skin near the left wing tip indicated that the airplane had been struck by at least one Canada goose.

NTSB determined that the bird strike had damaged the stabilator and resulted in the control loss. "Contributing to the accident was the night lighting condition, which precluded any possibility of the flight crew seeing the bird(s) prior to impact," the report said.

HELICOPTERS

Blade Failure Causes Tail Rotor Separation

Sikorsky S-58HT. Substantial damage. One serious injury.

After lifting construction equipment from the top of a 620-ft smokestack in Belmont, West Virginia, U.S., on March 9, 2008, the pilot observed an overtorque indication and felt a high-frequency vibration. The tail rotor assembly separated shortly thereafter, and the helicopter yawed right. After two 360-degree rotations, the pilot released the external load and established an autorotation. The S-58 landed hard on a mound of coal.

NTSB said that the probable cause of the accident was the fatigue failure of one of the four tail rotor blades. "Detailed examination of the separated blade revealed that its skins had cracked due to fatigue and that the blade then separated due to overstress," the report said.

Patrol Flight Encounters Vortex Ring State

Eurocopter AS 350B3. Destroyed. One fatality, one serious injury.

The helicopter was being maneuvered about 150 ft above ground level and at an airspeed between 20 and 30 kt during a border-patrol flight near San Elizario, Texas, U.S., on May 22, 2007, when it began to spin right. The helicopter then descended rapidly to the ground, struck a parked pickup truck and rolled over. The pilot was killed, and the observer was seriously injured. No one on the ground was hurt.

A helicopter maintenance technician who witnessed the accident said that the engine was "screaming" but the rotor system sounded like it was slowing down, "sucking or chopping air."

Noting that density altitude was 5,433 ft, the NTSB report said that the helicopter had entered a vortex ring state from which the pilot had insufficient time or altitude to recover. "A fully developed vortex ring state is characterized by an unstable condition where the helicopter experiences uncommanded pitch and roll oscillations, has little or no cyclic authority and achieves a descent rate [as high as] 6,000 fpm," the report said. "A vortex ring state may be entered during any maneuver that places the main rotor in a condition of high upflow and low forward speed."

Preliminary Reports

Date	Location	Aircraft Type	Aircraft Damage	Injuries
March 2	San Miguel, Venezuela	Beech King Air 100	destroyed	6 fatal
The King Air was on a visual flight rules flight from Caracas when it struck a mountain while approaching Valera in instrument meteorological conditions.				
March 4	Maridi, Sudan	Cessna 208	substantial	5 none
The pilot turned back to the airport after the engine failed on takeoff. The Caravan overran the runway and struck a tree during the emergency landing.				
March 4	Saint Martin, Netherlands Antilles	Bell 206B	substantial	3 none
The pilot landed the helicopter in shallow water near a beach after the engine lost power.				
March 6	Bangalore, India	Hindustan Aeronautics Saras	destroyed	3 fatal
The prototype twin-turboprop pusher airplane crashed during a test flight intended to evaluate engine-out characteristics.				
March 9	Jakarta, Indonesia	McDonnell Douglas MD-90-30	substantial	172 none
Heavy rain and strong winds prevailed when the MD-90 overran the runway on landing.				
March 9	Magombe, Uganda	Ilyushin Il-76T	destroyed	11 fatal
The airplane crashed in Lake Victoria shortly after taking off from Entebbe for a night cargo flight to Mogadishu, Somalia.				
March 10	Aberdeen, South Dakota, U.S.	Cessna 402B	substantial	1 none
Low visibility and strong winds prevailed when the 402 landed hard on Runway 31 during a cargo flight.				
March 11	El Indio, Texas, U.S.	Hughes 269	substantial	2 serious
Heavy rain and gusty winds prevailed when the pilot attempted to land on a trailer. The helicopter rolled over after a skid became entangled beneath the trailer.				
March 12	Atlantic Ocean	Sikorsky S-92A	destroyed	17 fatal, 1 NA
The helicopter was en route to an offshore platform when the pilot declared an emergency and reported a main gearbox oil-pressure problem. The S-92 was found inverted after it was ditched 31 nm (57 km) off the coast of St. John's, Newfoundland, Canada. Rescuers found one survivor.				
March 13	Healy, Alaska, U.S.	Helio Courier	substantial	3 none
The pilot was flying the ski-equipped airplane low over the airfield, creating tracks in the snow in preparation for landing, when the Courier struck high brush and crashed.				
March 14	Buckland, Alaska, U.S.	Piper Chieftain	substantial	1 none
The pilot said that braking action was nil when the cargo airplane overran the runway and struck a snow bank. He had landed on the runway the previous day without incident and said that the sun apparently had melted a layer of snow that had refrozen into a layer of ice.				
March 19	Quito, Ecuador	Beech King Air 200	destroyed	7 fatal, 4 serious
The King Air was on a military training flight when it struck the top of a four-story apartment building during an approach in fog. All five people aboard the airplane and two people on the ground were killed; four others were seriously injured.				
March 20	Melbourne, Australia	Airbus A340-500	substantial	225 none
A tail strike occurred as the A340 was taking off for a night flight to Dubai. The crew dumped fuel and returned to Melbourne for an uneventful landing.				
March 22	Butte, Montana, U.S.	Pilatus PC-12/45	destroyed	14 fatal
After picking up passengers at two airports in California, the pilot was proceeding toward the intended destination, Bozeman, Montana, when he told air traffic control that he was diverting to Butte. He gave no reason for the diversion. Day visual meteorological conditions prevailed at both airports. Witnesses said that the airplane pitched nose-down on approach and descended into a cemetery.				
March 23	Narita, Japan	McDonnell Douglas MD-11F	destroyed	2 fatal
Winds were from 310 degrees at 26 kt, gusting to 40 kt, when the cargo airplane bounced while landing on Runway 34L, touched down on its nosegear and rolled left. A fire erupted when the left wing separated, and the freighter crashed inverted on the runway.				

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.

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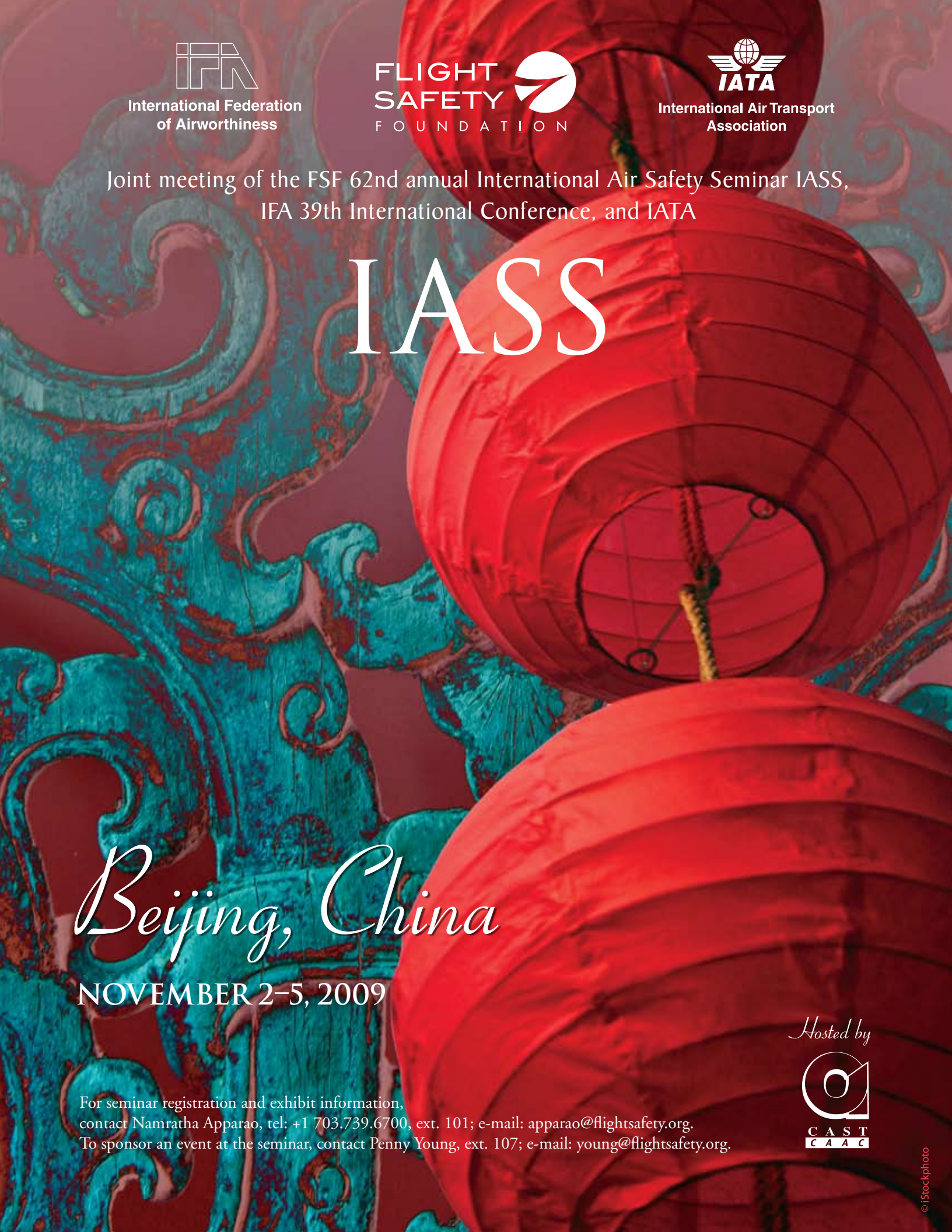
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