Steady State

BY JAMES M. BURIN

Accident categories in 2008 were mostly familiar, including the unwelcome return of the no-flaps takeoff.

A Boeing 737 was destroyed in a runway excursion on takeoff at Denver International Airport.

"Average to below average" is the best way to describe the year 2008 in terms of safety performance for all segments of professional aviation, including commercial and corporate jets and commercial turboprops. The big killers remain, particularly loss of control in commercial jets and controlled flight into terrain (CFIT) in commercial turboprops. Even though there are occasionally new types of accidents — for example, the British Airways Boeing 777 landing accident at London Heathrow — the majority of accidents in 2008 are types we have seen before, including CFIT, runway excursion and no-flap/no-slat takeoff. This raises the question, why are we failing to fully benefit from aviation safety lessons learned? The total fatality count in all commercial jet, commercial turboprop and corporate jet major accidents was 688, down from 763 in 2007 and well under the 903 deaths reported in 2006.

Last year, the commercial jet fleet grew approximately 3 percent over 2007 numbers, while the commercial turboprop fleet stayed virtually unchanged. The corporate jet numbers showed the largest change, with a 9 percent increase. Some 8 percent of the world's commercial jet fleet is Eastern-built, while approximately one-third of the turboprop fleet is Eastern-built.

The active fleets, the aircraft actually in service, are somewhat smaller. Approximately 7 percent of the jet fleet is inactive, while 14 percent of the turboprop fleet is inactive.

Major Accidents, Worldwide Commercial Jets
Jan. 1, 2008–Dec. 31, 2008

Date	Operator	Aircraft	Location	Phase	Fatalities	
Jan. 2, 2008	Iran Air	F-100	Tehran, Iran	Takeoff	0	●
Jan. 17, 2008	British Airways	777	London, England	Landing	0	●
Feb. 1, 2008	LAB	727	Trinidad, Bolivia	En route	0	
Feb. 14, 2008	Belavia	CRJ-100	Yerevan, Armenia	Takeoff	0	●
April 15, 2008	Hewa Bora Airways	DC-9	Goma, Democratic Republic of Congo	Takeoff	3	●
May 25, 2008	Kalitta Air	747	Brussels, Belgium	Takeoff	0	●
May 30, 2008	TACA	A320	Tegucigalpa, Honduras	Landing	3	● ●
June 10, 2008	Sudan Airways	A310	Khartoum, Sudan	Landing	29	● ●
June 30, 2008	Ababeel Aviation	Il-76	Khartoum, Sudan	Takeoff	4	
July 6, 2008	USA Jet Airlines	DC-9	Saltillo, Mexico	Approach	1	● ●
July 7, 2008	Kalitta Air	747	Bogotá, Colombia	Takeoff	0	
Aug. 20, 2008	Spanair	MD-82	Madrid, Spain	Takeoff	154	●
Aug. 24, 2008	Itek-Air	737	Vishkek, Kyrgyzstan	Approach	65	● ●
Aug. 30, 2008	Conviasa	737	Toacaso, Ecuador	En route	3	●
Sept. 14, 2008	Aeroflot Nord	737	Perm, Russia	Approach	88	● ●
Sept. 22, 2008	ICARO	F-28	Quito, Ecuador	Takeoff	0	●
Nov. 10, 2008	Ryanair	737	Rome, Italy	Approach	0	●
Nov. 27, 2008	XL Airways Germany	A320	Perpignan, France	Approach	7	● ●
Dec. 20, 2008	Continental Airlines	737	Denver, Colorado, U.S.	Takeoff	0	●

● Loss of control accident ● Controlled flight into terrain accident ● Approach and landing accident
● Runway excursion

Source: Ascend, Aviation Safety Network

Table 1

Reviewing 2007 data for commercial jet major accidents in all scheduled and unscheduled passenger and cargo operations for Western- and Eastern-built commercial jet aircraft, there were 17 major accidents, 16 involving Western-built aircraft, killing 583 people. Of the 17 accidents, 12 were approach and landing accidents, two were CFIT accidents and four were loss of control accidents.

In 2008, there were 19 major accidents, one of which was an Eastern-built jet; fatality totals declined to 357 (Table 1). Only eight of the 2008 accidents were approach and landing accidents, and two were CFIT accidents. Six of the 19 major accidents were runway excursions, four occurring on takeoff. There were six commercial jet loss of control accidents in 2008, nearly one of every three accidents.

The major accident rate for Western-built commercial jet aircraft in losses per million departures for the last 10 years had been decreasing but now has leveled (Figure 1, p. 20). The rate is only for Western-built aircraft because, even though we know the number of major accidents for Eastern-built aircraft, we do not have reliable worldwide exposure data to calculate rates for them.

There were 12 major accidents involving corporate jet aircraft in 2008, killing 39 people (Table 2, p. 21). Reliable worldwide exposure data is not available to calculate rates for corporate jets, but assuming that exposure has been increasing along with the annual increases in aircraft in the corporate jet fleet and their number of departures, the accident rate is estimated to be decreasing slightly. There also were 12 corporate jet accidents in 2007; 21 people died as a result.

In 2008, there were 29 major accidents involving Western- and Eastern-built turboprop aircraft with more than 14 seats, causing 292 deaths, compared to 24 accidents in 2007 that killed 159 (Table 3, p. 22). Eight of this year's 29 major turboprop accidents were CFIT accidents, more than one of every four.

Focusing on specific high-risk accident categories shows that CFIT, loss of control, and

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A Fokker F-28 ran off the runway during takeoff at Quito, Ecuador.

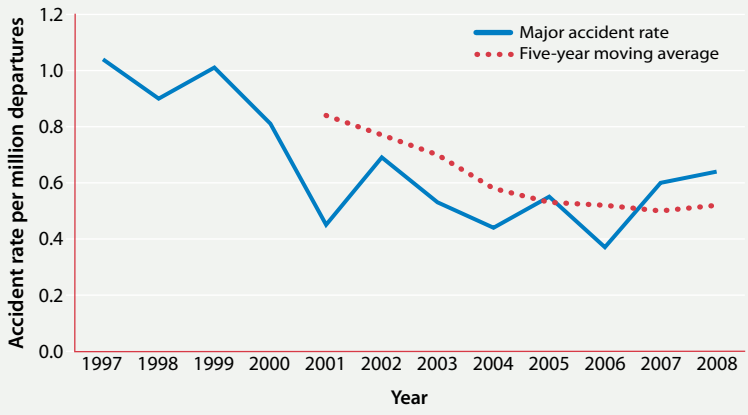
approach and landing accidents continue to claim the majority of the aircraft and account for the majority of the commercial aircraft fatalities. There were two commercial jet CFIT accidents in 2008. The CFIT accident record over the years shows the difficulty the industry has encountered in eliminating CFIT as an accident class.

Although fewer than 10 percent of commercial jets in the world during the past four years did not have a terrain awareness and warning system (TAWS) installed, we still suffered 10 CFIT accidents during that period. There has never been a CFIT accident involving an aircraft equipped with a functional TAWS.

Last year was the first in recent memory that fewer than half of the commercial jet and corporate jet accidents occurred during approach or landing. Flight Safety Foundation and its CFIT and Approach and Landing Action Group (CAAG) team started their worldwide approach and landing accident reduction (ALAR) campaign in 2001. There are now more than 40,000 FSF *ALAR Tool Kits* distributed, and the CAAG team has conducted 30 ALAR workshops around the world — four in 2008, including one in Tripoli, Libya. It is hoped that some of the success we are now seeing in reducing the incidence of approach and landing accidents is the result of the CAAG team's efforts. The Foundation is updating its ALAR data, and an updated *ALAR Tool Kit*, to include a module on reducing the risk of runway excursions, will be available in 2009.

The loss of control accident category, however, has taken over from CFIT as the leading killer in commercial jets (Figure 2, p. 23). The term "loss of control" is somewhat misleading, since many times in this type of accident the flight crew has full control of the aircraft. The

Western-Built Commercial Jet Major Accident Rates, 1997–2008



Note: Total departure data are not available for Eastern-built aircraft.

Source: Ascend

Figure 1

FSF definition for a loss of control accident is "an accident in which an aircraft is unintentionally flown into a position from which the crew is unable to recover due to either aircrew, aircraft, environment or a combination of these factors."

There are basically two types of loss of control accidents. First, there is the type in which upset recovery training will reduce the risk and if possible prevent the accident. In most of these cases the crew has full control of the aircraft at all times, such as the Adam Air and Flash Air accidents. The second type of loss of control accident is one in which no amount of upset recovery training will help — for example, taking off with ice on the wings, or taking off with retracted flaps and slats. As the data show, we are not making much progress in reducing the risk of these high-fatality accident types.

To help reduce risk, there are many challenges that need to be addressed. One of these is safety culture. Safety culture is a very popular topic these days, and rightfully so. It is a critical element in reducing risk. There are multiple

Major Accidents, Worldwide Corporate Jets, Jan. 1, 2008–Dec. 31, 2008

Date	Operator	Aircraft	Location	Phase	Fatalities	
Feb. 1, 2008	Symons Living Trust	Citation I	Augusta, Maine, U.S.	Climb	2	●
Feb. 18, 2008	Avion Sales	Citation III	Venezuela	En route	3	
March 4, 2008	Southwest Sports Clinic	Citation I	Oklahoma City, Oklahoma, U.S.	Takeoff	5	
March 4, 2008	Confort Vuela	HS125-800	Monterrey, Mexico	Landing	0	
March 30, 2008	Relton Muse Aviation	Citation I	London, England	Climb	5	
June 12, 2008	FAI Rent-a-Jet	Lear 35	Kisangani, Democratic Republic of Congo	Takeoff	0	●
July 30, 2008	My Aviation	Eclipse 500	West Chester, Pennsylvania, U.S.	Takeoff	0	●
July 31, 2008	East Coast Jets	Hawker 800	Owatonna, Minnesota, U.S.	Approach	8	●
Aug. 18, 2008	Corus Hardware Corp.	Citation I	Santo Domingo, Dominican Republic	Climb	1	●
Sept. 19, 2008	Inter Travel and Services	Lear 60	Columbia, South Carolina, U.S.	Takeoff	4	
Nov. 4, 2008	Mexican Government	Lear 45	Mexico City, Mexico	Approach	9	
Dec. 7, 2008	Tlaxcala State Government	Lear 23	Tlaxcala, Mexico	Approach	2	

● Loss of control accident ● Controlled flight into terrain accident ● Runway excursion

Source: Ascend, Aviation Safety Network

Table 2

A Boeing 777 landed short after power was lost in both engines on final approach to London Heathrow Airport.

definitions of safety culture, such as "the shared values, beliefs, assumptions and norms that govern decision making that may affect individual and group attitudes about risk, safety and the proper conduct of hazardous operations"; or "the way we do things around here"; or even "what you do when nobody is looking." Many people stress the need for a safety culture, or express the desire to establish a safety culture in their organization. Those sorts of discussions are misguided.

Every organization has a safety culture — it is impossible not to have a safety culture. What is needed is a positive safety culture. Likewise, a strong safety culture is not necessarily desirable. An organization can have a very strong safety culture, and it can be all negative. What we want to do to reduce risk is to create and maintain a positive safety culture.

A positive safety culture is unique in many ways, and here are two. First, it cannot be purchased. No matter how much money your chief executive officer (CEO) is willing to spend, you cannot buy a positive safety culture. It must be created. Second, a positive safety culture is the single most important element of a successful safety program. You cannot have a successful flight operational quality assurance program, an aviation safety action program or establish a just culture without the cornerstone of a positive safety culture.

Major Accidents, Worldwide Commercial Turboprops
Jan. 1, 2008–Dec. 31, 2008

Date	Operator	Aircraft	Location	Phase	Fatalities	
Jan 4, 2008	Transaven	LET-410	Caracas, Venezuela	Descent	0	
Jan. 14, 2008	Alpine Aviation	Beech 1900	Lihue, Hawaii, U.S.	Landing	1	
Jan. 25, 2008	Aero Servis	AN-12	Point Noire, Congo	Landing	0	●
Jan. 26, 2008	Dirgantara Air Services	CASA 212	Indonesia	En route	3	●
Feb. 21, 2008	Santa Barbara Airlines	ATR-42	Venezuela	Climb	46	●
March 6, 2008	Manunggai Air	Transal C-160	Vamena, Indonesia	Landing	0	
March 15, 2008	Wings Aviation	Beech 1900	Nigeria	En route	3	
March 19. 2008	Cirrus Airlines	DO-328	Mannheim, Germany	Landing	0	●
April 3, 2008	Blue Wing Airlines	AN-28	Benzdrop, Suriname	Approach	19	●
April 9, 2008	Avtex Aviation	Metroliner III	Bundeema, Australia	Climb	7	
April 11, 2008	Kata Air Transport	AN-32	Chisinau, Moldova	Landing	8	●
April 21, 2008	RICO Linhas Aéreas	Bandeirante	Coari, Brazil	En route	0	●
May 2, 2008	Flex Air	Beech 1900	Rumbek, Sudan	En route	21	
May 23, 2008	Alpine Aviation	Beech 1900	Billings, Montana, U.S.	Takeoff	1	
May 26, 2008	Moskovia Aviation	AN-12	Chelyabinsk, Russia	Climb	9	
May 26, 2008	Great Lakes	AN-32	Goma, DRC	Landing	0	●
June 15, 2008	China Flying Dragon	Y-12	Chifeng, China	En route	3	●
June 18, 2008	Wiggins Airways	DHC-6	Hyannis, Massachusetts, U.S.	Takeoff	9	●
June 27, 2008	Juba Air Cargo	AN-12	Malakai, Sudan	En route	7	
July 10, 2008	Aerocord	Beech 99	Puerto Montt, Chile	Takeoff	9	
July 14, 2008	Maldivian Air Taxi	DHC-6	Maldives	Landing	0	
July 16, 2008	North-Wright Airways	DHC-6	Hook Lake, Canada	Approach	0	●
Aug. 13, 2008	Fly540	F-27	Mogadishu, Somalia	Approach	3	●
Sept. 1, 2008	AirServ International	Beech 1900	Bukavu, Democratic Republic of Congo	Approach	17	●
Sept. 1, 2008	Air Tahoma	CV-580	Columbus, Ohio, U.S.	Approach	3	
Sept. 13, 2008	MAS Wings	DHC-6	Ba Kelalan, Malaysia	Approach	0	
Oct. 8, 2008	Yeti Airlines	DHC-6	Lukla, Nepal	Approach	18	●
Nov. 6, 2008	Xpressair	DO-328	Fak Fak, Indonesia	Approach	0	
Nov. 13, 2008	British Gulf International Airways	AN-12	Falluja, Iraq	Climb	7	

● Loss of control accident ● Controlled flight into terrain accident ● Runway excursion

Source: Ascend

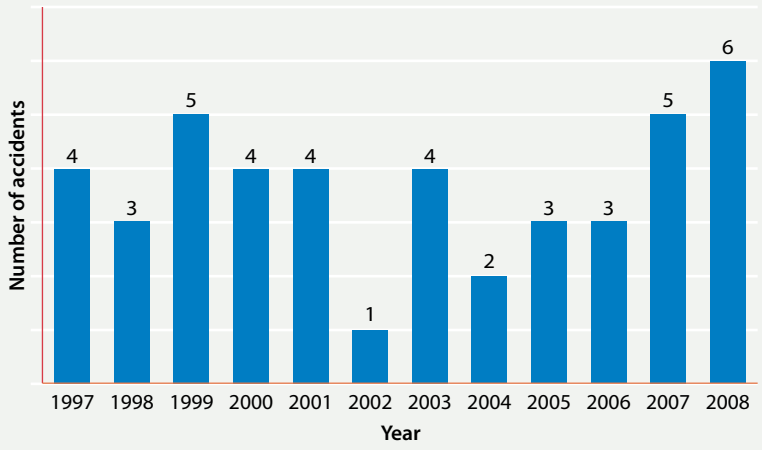
Table 3

You can institute a safety management system (SMS) without a positive safety culture, but don't expect it to be successful. Your SMS may influence your safety culture. Your safety culture will influence your SMS.

A positive safety culture must be fully supported by the top of the organization. If it is not supported there, it will not last. Changing the safety culture in an organization is an evolutionary process, not a revolutionary process. In other words, the change takes a while — any existing corporate culture, regardless whether it is positive or negative, has a lot of momentum to overcome. No matter how many statements the CEO has signed or how many of the right words he uses, you cannot fake a positive safety culture. If the organization from top to bottom does not practice the words they publish, the safety culture will be bad.

Today, several aviation organizations, particularly in the military, are measuring their safety culture, or their safety climate. Climate is an important indicator of the underlying safety culture and refers to the perception of the members of the organization that their leaders are committed to safety.

Loss of Control Major Accidents, Commercial Jets, 1997–2008



Source: Ascend, Boeing

Figure 2

Many organizations do not only measure safety culture or climate, but can compare one organization's safety culture to similar organizations. Even better, they can provide recommendations on how to improve weak areas identified in a safety culture.

The U.S. Navy's cultural assessment program showed that in the 2002–2004 period, 93 percent of the Navy's major accidents happened in organizations without a culture assessment workshop. That is one reason why these assessment workshops are now mandatory for all Naval aviation organizations.

All this information on safety culture and the adoption of a positive safety culture will not reduce anyone's risk to zero. But it will reduce risk.

The Foundation's goal is "to make aviation safer by reducing the risk of an accident." We have achieved great successes advancing toward this goal, but as can be seen from last year's safety record, there are still challenges, such as learning from lessons of the past and ensuring a positive safety culture.

In an industry where risk will never be zero, we face a constant challenge of meeting the public's expectation of perfection as the minimum acceptable standard. However, the aviation industry continues to successfully address that challenge and is constantly working to make aviation safer by reducing the risk of an accident.

James M. Burin is FSF director of technical programs.

Accident Classification

Two years ago, Flight Safety Foundation changed from using "hull loss" as the primary accident criterion to a new standard, "major accident." A major accident is defined as an accident in which any of three conditions is met. The first condition is that the aircraft is destroyed or sustains major damage. Major damage is defined by the Ascend Damage Index (ADI), a measure developed by Paul Hayes of Ascend. The ADI is the ratio of the cost of repairs to the projected value of the aircraft had it been brand new at the time of the accident. If the ADI is over 50 percent, the damage is considered major. The second condition defining a major accident is that there are multiple fatalities. The third condition is that there is one fatality and the aircraft is substantially damaged. The major accident classification criteria ensure that an accident is not determined by an aircraft's age or by its insurance coverage, and it gives a more accurate reflection of the high-risk areas that need to be addressed.

— JB