Disappointing LEVEL-OFF

The decade just ended averaged 0.57 major accidents per million departures of Western-built commercial jets.

BY JAMES M. BURIN

"Average" is the best that can be said about the 2009 overall safety performance of the largest segments of professional civil aviation, the operation of commercial and corporate jets, and commercial turboprop airplanes. The year started poorly for operators of commercial jets, and by mid-year, it looked like their rate of major accidents might regress to the level seen 10 to 15 years ago (see "Accident Classification," p. 17).

However, the second half of the year was much safer than the first half, as measured by number of accidents; the rate for the entire year was 0.52 major accidents per million departures of Western-built commercial jets. This was about the average of the previous five years and below average for the decade just ended. The total fatalities for major accidents in all three industry segments was 745 in 2009, up from 688 in 2008 and 763 in 2007, but lower than 903 in 2006.

The corporate jet fleet, which normally averages about 10 major accidents a year, had a significantly better year with six major accidents and 12 fatalities, compared with higher numbers

A Boeing 737 was destroyed in a loss of control accident during approach to Amsterdam Airport Schiphol.

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in the rest of the decade. The commercial turboprop fleet's year was a bit better than average, as measured by the number of major accidents, but controlled flight into terrain (CFIT) accidents remained prominent in this segment's accident and fatality numbers.

Last year, the commercial jet fleet grew approximately 1 percent from its 2008 size. By year's end, there were more than 21,000 commercial jets in the world, 7 percent Eastern-built. The commercial turboprop fleet decreased approximately 3 percent from 2008 with more than 6,000 commercial turboprops registered, one quarter of which were Eastern-built.

The corporate jet fleet grew approximately 6 percent to almost 16,000 aircraft. However, the active fleets, the aircraft actually in service, are smaller than the total fleets. About 10 percent of the total commercial jet fleet was inactive, a growing percentage. About 13 percent of the total turboprop fleet was inactive. For the first time, there were inactive corporate jets, approximately 3 percent of the total fleet.

Major accidents involving commercial jets totaled 17, killing 609 people, in the data for major accidents in all scheduled and unscheduled passenger and cargo operations for Western-built and Eastern-built types (Table 1), and 14 involved Western-built aircraft.

Nine of the 17 were approach and landing accidents,

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A Boeing 737 overran the runway landing at Kingston, Jamaica.

Major Accidents, Worldwide Commercial Jets
January 1, 2009–December 31, 2009

Date	Operator	Aircraft	Location	Phase	Fatalities
Jan. 15, 2009	US Airways	A320	New York, USA	Climb	0
Feb. 25, 2009	Turkish Airlines	737	Amsterdam, Netherlands	Approach	9
March 9, 2009	Aerolift	IL-76	Entebbe, Uganda	Climb	11
March 9, 2009	Lion Air	737	Jakarta, Indonesia	Landing	0
March 23, 2009	FedEx Express	MD-11	Tokyo, Japan	Landing	2
April 9, 2009	Aviastar Mandiri	BAE-146	Wamena, Indonesia	Approach	6
April 29, 2009	Bako Air	737	Massamba, DRC	En route	7
May 31, 2009	Air France	A330	Atlantic Ocean	En route	228
June 6, 2009	Myanma Airways	F-28	Sittwe, Myanmar	Landing	0
June 30, 2009	Yemenia	A310	Comoros	Approach	152
July 15, 2009	Caspian Airlines	TU-154	Qazvin, Iran	Climb	168
July 24, 2009	Aria Air	IL-62	Mashhad, Iran	Landing	16
Oct. 21, 2009	Azza Transport	707	Sharjah, UAE	Takeoff	6
Nov. 12, 2009	RwandAir	CRJ-100	Kigali, Rwanda	Taxi	1
Nov. 19, 2009	Compagnie Africaine d'Aviation	MD-82	Goma, DRC	Landing	0
Nov. 28, 2009	Avient Aviation	MD-11	Shanghai, China	Takeoff	3
Dec. 22, 2009	American Airlines	737	Kingston, Jamaica	Landing	0

Loss of control accident
Possible loss of control accident
CFIT accident
Approach and landing accident
Runway excursion

Source: Ascend, Aviation Safety Network

Table 1

and one was a CFIT accident. There were only two confirmed loss of control (LOC) accidents, although three others could receive this classification, pending final accident reports. Six of the 17 commercial jet major accidents were runway excursions.

The major-accident rates for commercial jets since 2000 and the five-year running average both have virtually leveled off (Figure 1). The accident rate is only for Western-built aircraft because even though the number of major accidents for Eastern-built aircraft is known, the industry does not have reliable worldwide exposure data to calculate the rate of accidents.

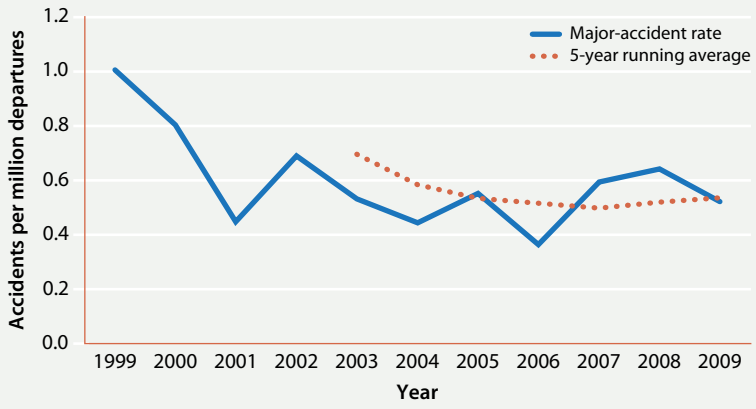
Even though 2008 and 2009 have been roughly average years for commercial jet major accidents, the accident rate for the decade, as noted above, was impressive, although there was both good news and bad news. The good news is that in the decade ending in 2009, the commercial aviation industry basically halved the rate from the previous decade — an outstanding accomplishment. The bad news is that most of the improvement was in the first half of the decade, the second half of the decade failing to continue the decade's early trend.

There were six major accidents involving corporate jet aircraft in 2009 (Table 2), killing 12 people, the lowest number of corporate jet major accidents since 2000 (Figure 2). The numbers highlight the fact that operators of corporate jets had an outstandingly safe year. Although reliable worldwide exposure data are not available for corporate jets, the number of aircraft and the number of departures increased steadily throughout the decade, so the corresponding accident rates with confidence can be assumed to be decreasing.

The 2009 data include 21 major accidents involving Western- and Eastern-built commercial turboprop aircraft with more than 14 seats (Table 3, p. 16). These accidents caused 124 deaths, compared with 29 accidents and 292 deaths in 2008, the lowest number of the decade and less than the decade's annual average of approximately 28 major accidents.

The most significant safety challenge for commercial turboprops remains the prevention of CFIT accidents. Although progress has been made in reducing the risk of CFIT for commercial jets, as illustrated by the fact that one CFIT accident

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



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

Source: Ascend

Figure 1

Major Accidents, Worldwide Corporate Jets
January 1, 2009–December 31, 2009

Date	Operator	Aircraft	Location	Phase	Fatalities	
Jan. 3, 2009	Aero Jet Services	Lear 45	Telluride, Colorado, U.S.	Landing	0	●
Feb. 7, 2009	Air One Executive	Citation III	Trigoria, Italy	Climb	2	●
Feb. 12, 2009	Laret Aviation	Falcon 100	St. Moritz, Switzerland	Landing	2	●
Oct. 26, 2009	S-Air	Hawker 125	Minsk, Belarus	Approach	6	●
Nov. 19, 2009	Pel-Air	IAI Westwind	Norfolk Island, Australia	Approach	0	
Dec. 17, 2009	FL Aviation Group	Falcon 20	Great Inagua Island, Bahamas	En route	2	

● Loss of control accident ● CFIT accident ● Runway excursion

Source: Ascend, Aviation Safety Network

Table 2

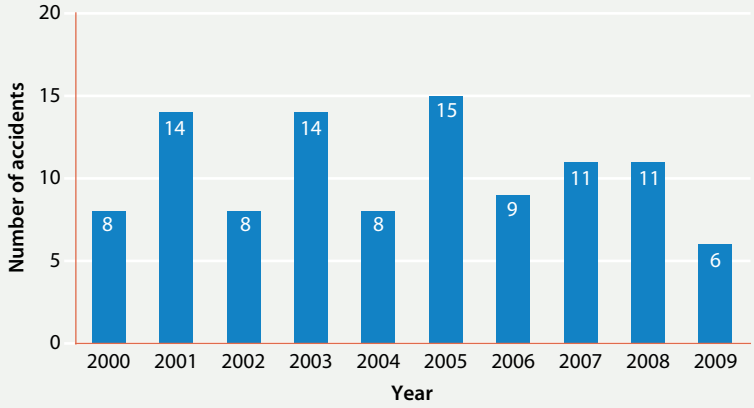
occurred in 2009, it is not the same positive story for turboprops. In 2008, seven of the 29 turboprop major accidents were CFIT, almost one of every four. In 2009, seven of the 21 turboprop major accidents were CFIT, one in every three.

As has been the case for the past 20 years, CFIT, approach and landing, and loss of control classifications continued to represent the majority of accidents and to cause the majority of fatalities in all three industry segments. Trends in the number of CFIT accidents involving commercial jet aircraft since 1997 show the slow, but positive, progress the industry has made in reducing this risk.

In the most recent five-year period, more than 90 percent of the aircraft in the commercial jet fleet had terrain awareness and warning system (TAWS) equipment installed. The commercial jet segment in this period experienced 11 CFIT accidents; none involved an airplane with a functional TAWS.

In contrast, as noted, a substantial proportion of turboprop major accidents continued to be CFIT accidents, and none of those aircraft had a TAWS installed, according to preliminary information. This calls into question why some countries have yet to implement the International Civil Aviation Organization (ICAO) standard for states to require operators to install TAWS in turbine-engine airplanes with maximum certificated takeoff weight greater than 5,700 kg /12,500 lb or authorized to carry more than nine passengers.

Major Accidents, Business Jets, 2000–2009



Source: Ascend

Figure 2

By 2008, LOC accidents had surpassed CFIT as the leading killer among commercial jet accidents. In 2009, there were only two confirmed LOC accidents, although three others — an

A Bombardier Q400 crashed during approach to Buffalo, New York, U.S.

Ilyushin Il-76 accident at Entebbe, Uganda; an Airbus A330 accident over the Atlantic Ocean; and a Tupolev Tu-154 accident in Iran — may be classifiable as LOC accidents. The aviation community awaits the final accident reports to confirm the accident class.

Eleven years ago, Flight Safety Foundation released, in a special issue of *Flight Safety Digest,* the report "Killers in Aviation," which focused on solutions to the global challenge of approach and landing accidents, including those involving CFIT.

It has been eight years since the Foundation released its original safety product for approach and landing accident reduction (ALAR) — the *ALAR Tool Kit.* More than 40,000 copies of the *ALAR Tool Kit* have been distributed as of January 2010, and since 2000, the Foundation's CFIT and Approach and Landing Action Group (CAAG) has conducted 32 ALAR workshops around the world.

The Foundation is completing an update of the original *ALAR Tool Kit,* which had been based on an international task force study of fatal approach and landing accidents from 1985 to 1996. The upcoming new *ALAR Tool Kit,* a more comprehensive product compared with the original, provides data from 1995 through 2007 and looks at *all* approach and landing accidents, not just fatal accidents.

The new data show improvement in areas such as installation of safety equipment and reduction of nonprecision approaches. The data also show that the major causal factors in approach and landing accidents identified in the original ALAR study are still present (e.g., omission of action, poor professional judgment/airmanship and inadequate crew resource management [CRM]). The best news from the latest

Major Accidents, Worldwide Commercial Turboprops
January 1, 2009–December 31, 2009

Date	Operator	Aircraft	Location	Phase	Fatalities	
Jan. 11, 2009	Zest Airways	MA60	Caticlan, Philippines	Landing	0	
Jan. 27, 2009	FedEx Express	ATR-42	Lubbock, Texas, U.S.	Landing	0	
Feb. 7, 2009	Manaus Aerotáxi	EMB-110	Santo Antônio, Brazil	Landing	24	
Feb. 12, 2009	Colgan Air	Q400	Buffalo, New York, U.S.	Approach	49	●
Feb. 20, 2009	Aerolift	AN-12	Luxor, Egypt	Takeoff	5	●
April 1, 2009	Aberdair	EMB-110	Locbokh, Ethiopia	Takeoff	0	
May 26, 2009	Service Air	AN-26	Isiro-Matari, DRC	Approach	3	●
June 2, 2009	Maldivian Air Taxi	DHC-6	Halavelhi, Maldives	Landing	0	●
June 26, 2009	TAC Transporte Aéreo de Colombia	LET-410	Capurganá, Colombia	Landing	0	●
June 29, 2009	Aviastar Mandiri	DHC-6	Wamena, Indonesia	En route	3	●
July 6, 2009	El Magal Aviation	AN-28	Saraf Omra, Sudan	Landing	0	
Aug. 2, 2009	Merpati Nusantara Airlines	DHC-6	Oksibil, Indonesia	En route	15	●
Aug. 4, 2009	Bangkok Airways	ATR-72	Koh Samui, Thailand	Landing	1	●
Aug. 11, 2009	Airlines PNG	DHC-6	Kokoda, Papua New Guinea	Approach	13	●
Aug. 14, 2009	Skydive Portugal	Beech 99	Évora, Portugal	Landing	2	
Aug. 26, 2009	Aero Fret Business	AN-12	Brazzaville, DRC	Approach	6	●
Sept. 24, 2009	SA Airlink	Jetstream 41	Durban, South Africa	Takeoff	1	
Oct. 15, 2009	Blue Wing Airlines	AN-28	Kwamalasamutu Airfield, Suriname	Landing	0	●
Nov. 9, 2009	Blue Bird Aviation	Beech 1900	Nairobi, Kenya	Approach	2	●
Nov. 10, 2009	Kingfisher Airlines	ATR-72	Mumbai, India	Landing	0	●
Nov. 19, 2009	Win Win Services	DHC-8	Tarakigne, Mali	Landing	0	

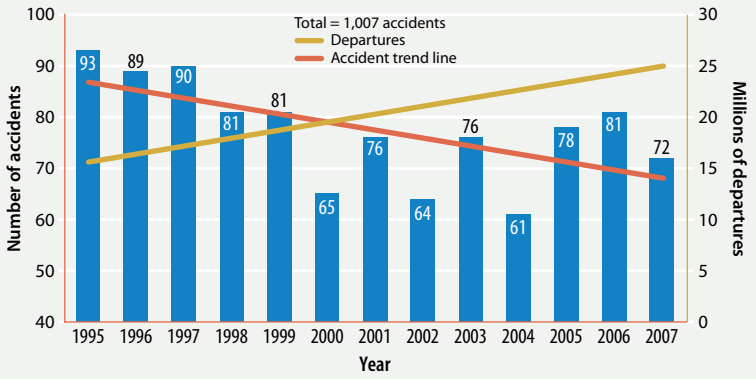
● Loss of control accident ● CFIT accident ● Runway excursion

Note: Data comprise turboprop airplanes with more than 14 seats.

Source: Ascend, Aviation Safety Network

Table 3

Approach and Landing Accidents, 1995–2007



Source: Ascend

Figure 3

ALAR study is that the Foundation's efforts have achieved some success.

In a graphical presentation of approach and landing accidents (Figure 3) from 1995 through 2007, the red line is the best fit for the trend, and it shows that the annual number of these accidents has been decreasing. The yellow line shows the increasing trend for the number of departures over the same period. So, not only did the aviation community reduce the number of approach and landing accidents — which is good — but it also accomplished this while the number of flights steadily increased. The 2009 data analysis for the FSF ALAR program update also shows that both the approach and landing accident rate and the fatal approach and landing accident rate have decreased since the Foundation launched the initiative.

In 2009, the Foundation also released the report of its Runway Safety Initiative, titled "Reducing the Risk of Runway Excursions." Runway excursions are the most common type of accident for commercial aircraft, accounting for almost one of every three major accidents. The report details the conclusions and recommendations of more than two years of work by a Foundation-led, international multidisciplinary team that addressed the challenge of runway excursions.

A recent product published jointly by the Foundation and the International Air Transport Association (IATA) — the *Runway Excursion Risk Reduction Tool Kit* — contains the runway safety report and related information. The runway excursion report also is being incorporated, along with references to the updated ALAR report, in the updated *ALAR Tool Kit*.

It is unfortunate, but true, that a significant gap persists between creating safety interventions to reduce risk and actually implementing these interventions. The U.S. Commercial Aviation Safety Team (CAST), the Foundation, IATA and ICAO, as well as other concerned organizations and individual safety professionals, have generated effective interventions for the civil aviation community that will prevent at least 90 percent of the accidents that occur each year. However, those interventions do no good unless they are implemented.

The Foundation's goal is to make aviation safer by reducing the risk of an accident. The global aviation community has achieved great successes while advancing toward that goal, but as can be seen from last year's safety record, there are still many risks yet to be mitigated. Moreover, in an industry in which risk will never be zero, we all face in 2010 and beyond a constant challenge of meeting the public's expectation of perfection as the minimum acceptable standard.

James M. Burin is FSF director of technical programs.

Accident Classification

Since 2007, Flight Safety Foundation has used "major accident" as its primary accident criterion in place of "hull loss." 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