Approach and Landing Still Warrant Safety Emphasis

Accidents and fatalities rose in global commercial jet operations in 2007.

BY RICK DARBY

Approach and landing continue to predominate as the riskiest phases of flight for commercial jets worldwide, according to Boeing's latest statistical summary.[1,2]

Five of the 10 fatal accidents and 10 of the 14 major accidents occurred in the approach — including initial approach — and landing phases of flight in 2007.[3] That compares with four of the seven fatal accidents and five of the eight major accidents in 2006.

One accident during cruise, one during takeoff, one during climb, one during taxi and one during load/unload were categorized as fatal, major or both for 2007.

Boeing's data include accidents involving commercial jet airplanes heavier than 60,000 lb (27,216 kg) maximum gross weight, and exclude types manufactured in the Russian Federation or the Soviet Union.

There were 286 accidents involving passenger airplanes in the 1998–2007 period, compared with 285 in the 1997–2006 period (Table 1). Fatal accidents involving passenger airplanes in those periods numbered 78 and 75, respectively. Fewer cargo aircraft, 70, were involved in accidents in the most recent period than in the earlier period, 79. Fatal accidents involving cargo carriers also declined from 14 in 1997–2006 to 12 in 1998–2007.

Accidents, Worldwide Commercial Jet Fleet, by Type of Operation

	All Accidents		Fatal Accidents		Onboard Fatalities (External Fatalities)*	
Type of operation	1959–2007	1998–2007	1959–2007	1998–2007	1959–2007	1998–2007
Passenger	1,236	286	458	78	27,032 (773)	5,105 (185)
Scheduled	1,139	269	415	74	22,999	5,048
Charter	97	17	43	4	4,033	57
Cargo	218	70	67	12	237 (327)	42 (76)
Maintenance test, ferry, positioning, training and demonstration	110	8	40	0	186 (66)	0 (0)
Totals	**1,564**	**364**	**565**	**90**	**27,455 (1,166)**	**5,147 (261)**
U.S. and Canadian operators	498	72	169	13	6,078 (445)	365 (82)
Rest of the world	1,066	292	396	77	21,377 (721)	4,782 (179)
Totals	**1,564**	**364**	**565**	**90**	**27,455 (1,166)**	**5,147 (261)**

*External fatalities include ground fatalities and fatalities on other aircraft involved, such as helicopters or small general aviation airplanes, that are excluded.

Source: Boeing Commercial Airplanes

Table 1

2007 Airplane Accidents, Worldwide Commercial Jet Fleet

Date	Airline	Model	Accident Location	Phase of Flight	Description	Damage	Fatalities	Major Accident
Jan. 1	Adam Air	737-400	Near Sulawesi Island, Indonesia	Cruise	Loss of control	Destroyed	102	●
Jan. 13	Gading Sari Aviation Svcs	737-200	Kuching, Malaysia	Landing	Landing short	Destroyed		●
Jan. 25	Regional Airlines	F-100	Pau, France	Takeoff	Bird strike and overrun	Substantial	(1)	●
Feb. 4	Tampa Cargo	DC-8	Miami, Florida, U.S.	Landing	Right main landing gear collapse	Substantial		
Feb. 18	Shuttle America	EMB 170	Cleveland, Ohio, U.S.	Landing	Runway overrun	Substantial		
Feb. 21	Adam Air	737-300	Surabaya, Indonesia	Landing	Hard touchdown	Destroyed		●
Mar. 7	Garuda Indonesia	737-400	Yogyakarta, Indonesia	Landing	Runway overrun	Destroyed	21	●
Mar. 12	Biman Bangladesh Airlines	A310	Dubai, United Arab Emirates	Takeoff	Landing gear collapse	Substantial		
Mar. 16	Kish Air	MD-82	Kish Island, Iran	Landing	Gear-up landing	Substantial		
Mar. 23	Ariana Afghan Airlines	A300B4	Istanbul, Turkey	Landing	Landing excursion	Substantial		●
Apr. 17	Pakistan Intl. Airlines	A310	Karachi, Pakistan	Landing	Hard touchdown	Substantial		
Apr. 30	Royal Air Maroc	737-500	Bamako, Mali	Takeoff	High-speed rejected takeoff	Substantial		
May 5	Kenya Airways	737-800	Near Douala, Cameroon	Climb	Crashed after takeoff	Destroyed	114	●
May 25	Indonesia AirAsia	737-300	Medan, Indonesia	Landing	Hard landing	Substantial		
Jun. 28	TAAG Angola Airlines	737-200	M'banza Congo, Angola	Landing	Landed short	Destroyed	5 (1)	●
July 1	Air China	767-200	Beijing, China	Load/ Unload	Landing gear collapse	Substantial		
July 10	Sky King	737-200	Tunica, Mississippi, U.S.	Parked	Mechanic fell onto ramp		(1)	
July 12	Delta Air Lines	777-200	Atlanta, Georgia, U.S.	Tow	Flight attendant fall			
July 17	Aerorepublica	EMB 190	Santa Marta, Colombia	Landing	Runway excursion	Destroyed		●
July 17	TAM Linhas Aereas	A320	São Paulo, Brazil	Landing	Landing overrun	Destroyed	187 (12)	●
Aug. 18	Swiss European Airlines	RJ100	London , U.K.	Landing	Tail	Substantial		
Aug. 20	China Airlines	737-800	Okinawa, Japan	Taxi	Fuel-leak fire	Destroyed		●
Aug. 29	Myanmar Airways	F-28	Dawei, Myanmar	Landing	Landing gear collapse	Substantial		
Sept. 14	Magnicharters	737-200	Guadalajara, Mexico	Landing	Gear-up landing	Substantial		
Sept. 14	Avstar	737-200	Ndola, Zambia	Landing	Flight attendant seat failure			
Sept. 16	One-Two-Go Airlines	MD-82	Phuket, Thailand	Landing	Hard landing, fire	Destroyed	90	●
Sept. 23	Kenya Airways	737-300	Nairobi, Kenya	Load/ Unload	Cargo loader crushed		(1)	
Oct. 11	AMC Airlines	MD-83	Istanbul, Turkey	Landing	Flaps-up approach, overrun	Substantial		
Oct. 26	Philippine Airlines	A320	Butuan City, Philippines	Landing	Landing overrun	Destroyed		●
Oct. 28	Air Europa	737-800	Katowice, Poland	Approach	Struck approach lights	Substantial		
Oct. 28	AeBal	717-200	Palma, Spain	Load/ Unload	Wing struck by an airport passenger bus	Substantial		
Nov. 1	Mandala Airlines	737-200	Malang, Indonesia	Landing	Landing gear collapse	Substantial		
Nov. 7	Nationwide Airlines	737-200	Cape Town, South Africa	Takeoff	Lost engine during takeoff	Substantial		
Nov. 9	Iberia Airlines	A340	Quito, Ecuador	Landing	Landing overrun	Destroyed		
Nov. 30	Atlasjet Airlines	MD-83	Near Isparta, Turkey	Initial approach	Crashed in mountainous terrain	Destroyed	57	●
Dec. 12	Arkefly	767-300	Chania, Greece	Taxi	Wing tip struck tower	Substantial		
Dec. 14	JetBlue	EMB 190	New York, New York, U.S.	Parked	Struck by a taxiing 747	Substantial		
Dec. 30	TAROM	737-300	Bucharest, Romania	Takeoff	Struck maintenance vehicle	Substantial		
38 total accidents							**576 on-board (16) external**	

Intl = International; Svcs = Services

Note: Airplanes manufactured in the Commonwealth of Independent States or the Soviet Union and commercial airplanes used in military service are excluded.

Source: Boeing Commercial Airplanes

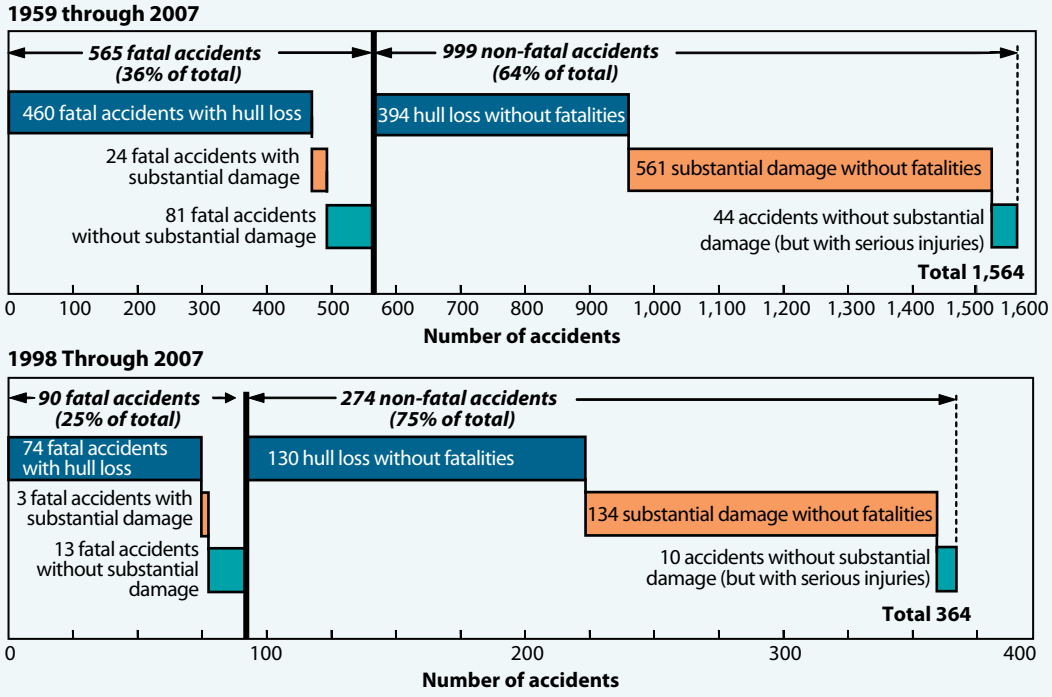
Table 2

Accidents totaled 38, with 576 on-board fatalities and 16 external fatalities (Table 2, p. 50). That compares with 28 accidents and 498 on-board fatalities in 2006.

In the most recent 10-year period, fatal accidents accounted for 25 percent of the total (Figure 1), compared with 36 percent of the total accidents for the 49-year period beginning in 1959. The number of fatal accidents without substantial airplane damage was 14 percent of the total of fatal accidents in both the past 10 years and from 1959 onward.

Accidents by Injury and Damage

Worldwide Commercial Jet Fleet



Note: Airplanes manufactured in the Commonwealth of Independent States or the Soviet Union are excluded because of lack of operational data. Commercial airplanes used in military service are also excluded.

Source: Boeing Commercial Airplanes

Figure 1

Among nonfatal accidents, those involving substantial damage accounted for 49 percent in 1998–2007, 56 percent in 1959–2007. Accidents without substantial damage but with serious injuries were 3.6 percent of the nonfatal accident total in the 10-year period, compared with 4.4 percent in the period from 1959 onward.[4]

The U.S. Commercial Aviation Safety Team (CAST)/International Civil Aviation Organization (ICAO) Common Taxonomy Team published updated categories and definitions for aviation occurrences that have been adopted by Boeing and other civil aviation organizations.[5] In the 1998–2007 period, "loss of control — in flight" was the CAST/ICAO category that accounted for both the highest number of on-board fatalities and the highest number of accidents (Figure 2, p. 52). By contrast, in the 1997–2006 period, there were more "controlled flight into or toward terrain" (CFIT) fatal accidents — 20 — than loss of control accidents — 19.

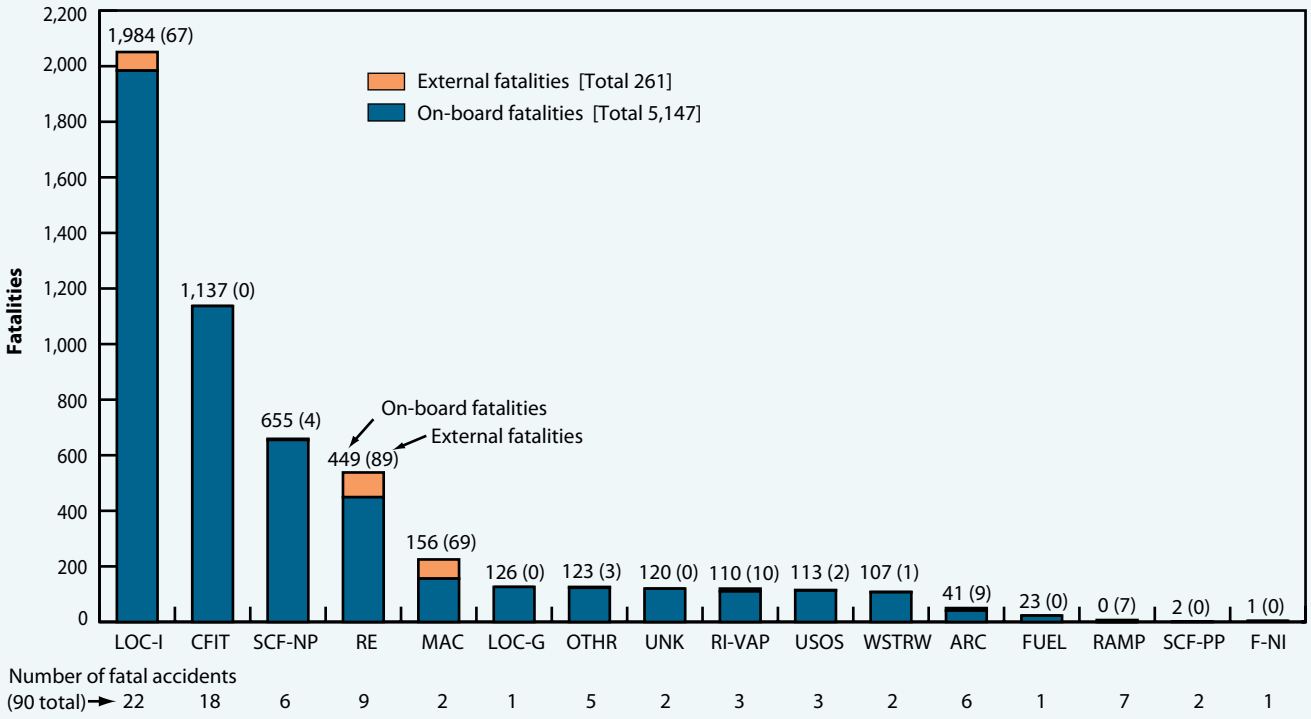
The 1,655 on-board fatalities from CFIT accidents in the preceding 10-year period was higher than the 1,137 in the most recent period, suggesting that the industry may be making progress in reducing CFIT.

Notes

1. Boeing Commercial Airplanes. *Statistical Summary of Commercial Jet Airplane Accidents: Worldwide Operations 1959–2007.* Available via the Internet at <www.boeing.com/news/techissues>.

2. Boeing adopts the ICAO definition of an *accident* as "an occurrence associated with the operation of an airplane that takes place between the time any person boards the airplane with the intention of flight and such time as all persons have disembarked, in which death or serious injury results from

Fatalities by CAST/ICAO Taxonomy Accident Category, Worldwide Commercial Jet Fleet, 1998–2007



CAST = Commercial Aviation Safety Team ICAO = International Civil Aviation Organization

ARC = abnormal runway contact; CFIT = controlled flight into or toward terrain; F-NI = fire/smoke (non-impact); FUEL = fuel related; LOC-G = loss of control (ground); LOC-I = loss of control (in flight); MAC = midair/near midair collision; OTHR = other; RAMP = ground handling; RE = runway excursion; RI-VAP = runway incursion (vehicle, aircraft or person); SCF-NP = system/component failure or malfunction (non-powerplant); SCF-PP = system/component failure or malfunction (powerplant); USOS = undershoot/overshoot; UNK = unknown or undetermined; WSTRW = wind shear or thunderstorm.

No accidents were noted in the following categories: AMAN = abrupt maneuver; ADRM = aerodrome; ATM = air traffic management/communications, navigation, surveillance; CABIN = cabin safety events; EVAC = evacuation; F-POST = fire/smoke (post-impact); GCOL = ground collision; ICE = icing; LALT = low altitude operations; RI-A = runway incursion (animal); SEC = security related; TURB = turbulence encounter.

Notes: Principal categories are as assigned by CAST. Airplanes manufactured in the Commonwealth of Independent States or the Soviet Union are excluded because of lack of operational data. Commercial airplanes used in military service are also excluded.

Source: Boeing Commercial Airplanes

Figure 2

being in the airplane, or direct contact with the airplane or anything attached thereto, or direct exposure to jet blast; the airplane sustains substantial damage; or the airplane is missing or is completely inaccessible." Occurrences involving test flights or the result of hostile action such as sabotage or hijacking are excluded.

3. Boeing defines *major accident* as one in which any of three conditions is met: the airplane was destroyed, or there were multiple fatalities, or there was one fatality, and the airplane was substantially damaged. Flight Safety Foundation supports the use of this term to identify the most severe accident category, in place of the traditional term *hull loss*, which the Foundation believes is more significant for insurance actuarial purposes than as a safety risk metric.

   Substantial damage is "damage or failure which adversely affects the structural strength, performance or flight characteristics of the airplane, and which would normally require major repair or replacement of the affected component."

4. A *serious injury* is one that "requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or results in a fracture of any bone (except simple fractures of fingers, toes or nose); or involves lacerations which cause severe hemorrhage, nerve, muscle or tendon damage; or involves injury to any internal organ; or involves second or third degree burns, or any burns affecting more than 5 percent of the body surface; or involves verified exposure to infectious substances or injurious radiation."

5. The taxonomy is described at <www.intlaviationstandards.org>.