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# Business Aviation Safety Brief

Summary of Global Accident Statistics

1998-2002



[www.ibac.org](http://www.ibac.org)

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## 1.0 Introduction

Business Aviation has established a record as one of the world's safest forms of transportation. Professionally flown aircraft of all sizes are operated on unscheduled routes to all corners of the globe, yet the safety record continues to be excellent in spite of the very challenging operating environment.

The exemplary safety record of business aviation can be attributed to professionalism and attention to safe operating practices. The business aviation community promotes safety through industry standards and good training, as well as through monitoring and analysing safety information to facilitate continuous improvement. The business aviation representative associations assist operators by providing safety data and programs in their respective countries. The Council representing the national and regional associations at the global level, the International Business Aviation Council (IBAC), has in turn developed a program to collect and analyse worldwide information. To that end, IBAC has contracted with Robert Breiling and Associates to develop global data on business aircraft accidents.

Summary information presented in this Brief is taken from the analysis conducted by Robert Breiling and Associates in 2003. Breiling's detailed Report contains information on accidents from all regions of the world, including data for each aircraft type.

This Business Aviation Safety Brief covers a five year period from 1998 to 2002. IBAC will update the Brief annually and the IBAC Planning and Operations Committee (POC) and Flight Operations and Safety Work Group will review the information continuously to determine useful trend data. In addition, the IBAC Governing Board has determined that the Safety Brief will be scrutinized from time to time by independent organizations and feedback will be considered by IBAC's POC and the Brief will be amended for Issue No.3 in 2005.

This summary data includes all accidents involving aircraft when used in conducting business operations. It does not include accidents of business aircraft when used in airshows and other non-business related flying.

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## 2.0 Business Aviation Community

### 2.1 Number of Turbine Aircraft

The Breiling Report contains data covering a five year period for the global population and the distribution of aircraft by region. A summary of the aircraft population in 2002, the last year covered by the report, is as follows:

2002 Global Business Aircraft Population	
Business Jets	12,581
Turbo Props	9,995
All Turbine Business A/C	22,576

**Table 2.1a**

#### Analysis

Business aircraft in North America represent 72% of the global fleet. South and Central America have approximately 10% and Europe 10% of the world's fleet. Other regions account for the remaining 8% of the fleet.

### 2.2 Number of Flight Hours

The 2002 summarized flight hour totals are as follows:

2002 Global BusAv Flight Hours	
Business Jets	4,766,230
Turbo Props	4,187,280
All Turbine Business A/C	8,953,510

**Table 2.2a**

#### Analysis

Flying hours in North America represents 72% of the total, Europe 10%, Central/South America 10%, and the rest of the world 8%.

## 2.3 Number of Departures

The number of business aviation departures in the 2002 year is as follows:

2002 Global BusAv Departures	
Business Jets	3,486,300
Turbo Props	2,667,057
All Turbine Business A/C	6,153,357

**Table 2.3a**

*(Note: These are derived figures based on flight hours and sector durations typical for each category of jet and turboprop aircraft.)*

## 2.4 Organization of the Community

Business Aircraft operations are classified into three (3) separate categories:

### 1. Business Aviation Commercial

Aircraft flown for business purposes by an operator having a commercial operating certificate (generally on-demand charters).

### 2. Corporate

Non-commercial operations with professional crews employed to fly the aircraft.

### 3. Owner Operated

Aircraft flown for business purposes by the owner of the business.

*(Note : Consult IBAC for formal definitions of the three categories. Two additional classifications are included in the Breiling Report, namely Government (public operations) and Manufacturer aircraft. These are not, by their use, considered to be "business aircraft", but are included in the data for completeness.)*

## 3.0 Business Aircraft Global Accident Data (5 year period 1998 – 2002)

### 3.1 Accidents by Operator Type

A summary of the total accidents over five (5) years by type of operator is as follows:

<b>Accidents by Operator Type (Jet Aircraft)</b>				
Business Jet Aircraft	Total Accidents (5 yrs)	Fatal Accidents (5 yrs)	Average Total Accidents per year	Average Fatal Accidents per year
Commercial	61 (54.5%)	20 (58.5%)	12.2	4.0
Corporate	24 (21.4%)	5 (14.7)	4.8	1.0
Owner Operated	17 (15.2%)	7 (20.6%)	3.4	1.4
Government	4 (3.6%)	2 (5.9%)	0.8	0.4
Manufacturer	6 (5.4%)	0	1.2	0

**Table 3.1a**

<b>Accidents by Operator Type (Turbo Prop Aircraft)</b>				
Turbo Prop Aircraft	Total Accidents	Fatal Accidents	Average Total Accidents per year	Average Fatal Accidents per year
Commercial	169 (57.6%)	57 (52.3%)	33.6	11.4
Corporate	25 (8.5%)	10 (9.2%)	5.0	2.0
Owner Operated	88 (30.0%)	38 (34.9%)	17.6	7.6
Government	10 (3.4%)	4 (3.7%)	2.0	0.8
Manufacturer	1 (.03%)	0	0.2	0

**Table 3.1b**

### Analysis

The majority of business aircraft accidents occur in the commercial category, where operations are governed by commercial regulations (such as FAA Part 135 and JAR OPS 1). The next most frequent number of accidents occurs with aircraft flown by business persons. Accidents of corporate aircraft remain rare.



### 3.2 Accident Summary by Phase of Flight

Five (5) year totals by phase of flight are as follows:

Accident Summary by Phase of Flight									
	Taxi	T/O	Climb	Cruise	Desc't	Man'v	App	Land	Total
Business Jets	5 4.2%	17 14.2%	9 7.5%	5 4.2%	4 3.3%	3 2.5%	20 16.7%	57 47.5%	120 100%
Turbo Props	15 4.6%	23 7.1%	38 11.7%	37 11.4%	19 5.8%	12 3.7%	80 24.6%	101 31.1%	325 100%

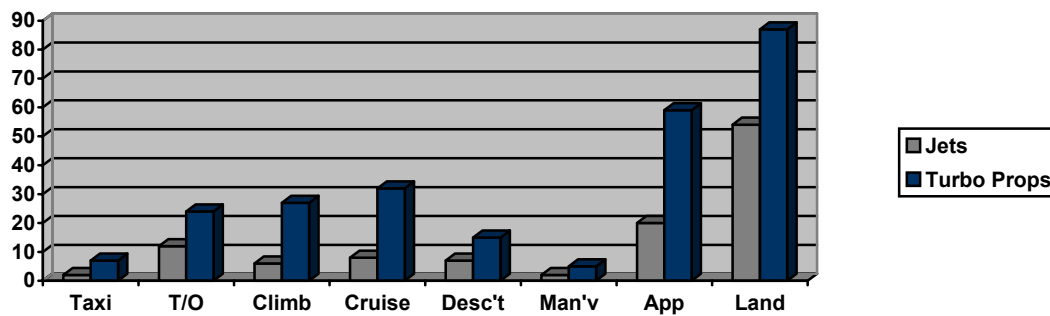
Table 3.2a

#### Analysis

The trend over a period of 35 years demonstrates a substantive decrease in the percentage of taxi accidents, and a notable decrease in accidents in the landing phase, although landing accidents remain as the most prevalent.

The trend indicates an increase in the number of accidents occurring in the approach phase. The percentage of accidents in the climb phase has also increased substantively for turbo prop aircraft. The distribution of accidents in the other phases has remained relatively unchanged.

*(Note: Supplementary data collected by Robert Breiling over a 35 year period was used to develop this trend.)*



## 4.0 Global Accident Rate Data

### 4.1 Accident Rate by Aircraft Type

The accident rate per 100,000 flight hours for each year over a five year period, as well as for the total, is as follows:

Accident Rate per 100,000 hours by Aircraft Type												
	1998		1999		2000		2001		2002		5 Year Total	
	Acc Rate	Fatal Rate	Acc Rate	Fatal Rate	Acc Rate	Fatal Rate	Acc Rate	Fatal Rate	Acc Rate	Fatal Rate	Acc Rate	Fatal Rate
Business Jets	0.55	0.16	0.62	0.18	0.43	0.17	0.58	0.20	0.50	0.10	<b>0.53</b>	<b>0.16</b>
Turbo props	1.40	0.62	1.62	0.46	1.72	0.61	1.29	0.49	1.31	0.55	<b>1.47</b>	<b>0.53</b>
All Bus A/C	0.98	0.40	1.12	0.32	1.06	0.38	0.92	0.34	0.88	0.31	<b>0.99</b>	<b>0.35</b>

Table 4.1a

### 4.2 Accident Rate by Operator Type

Global data for the numbers of aircraft in each of the business aviation operational categories (commercial, corporate and owner-operated) proved difficult to obtain as few States collect this information. Similarly, flight hours by type of operation are not available. Due to the lack of good exposure data, it was not possible to calculate, without some error, the rate of each category of operation. Additionally, the operational status of a single airframe may legally vary from flight to flight (i.e., an aircraft may be commercial on one flight and private on a flight made later on the same day or vice versa).

Nevertheless, by applying US data relevant to the division between categories of operator, and by making the assumption that the division is relatively similar for the rest of the world, an estimate of the rate by operator type can be made. Given that the North American data represents approximately 72% of the global total, it is unlikely that the distortion generated by the assumption will be very large.

The percentage of flight hours for each of the three categories in the USA is as follows:

Commercial (Air Taxi)	22.6%	
Corporate	38.3%	
Owner-operated	39.1%	
Total	100.0%	(Averaged over 4 years)

Assuming a similar division globally, the accident rates per 100,000 flight hours are as follows (based on data over 5 years):

<b>Global Accident Rates by Operational Category (Extrapolated)</b> <i>(per 100,000 flight hours)</i>					
Operator Type	Hours of Operation (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	9,248,590	230	77	2.48	0.83
Corporate	15,673,494	49	15	0.31	0.09
Owner-operated	16,000,878	109	45	0.68	0.28
All Business Aircraft	40,922,963	405	143	0.98	0.34

**Table 4.2a**

**Analysis**

The accident rates calculated in Table 4.2 include both turbo-prop and jet aircraft. The rate data indicates an excellent level of safety in corporate operations, whereas the accident rates in the commercial sector warrants increased attention by the business aviation community.

**4.3 Accident Rate by Departures**

There is a growing trend for organizations reporting safety data to do so using accident rates per number of departures given that safety exposure is greatest during departure and arrival. Accidents of aircraft en-route are rare except for flights in low level flight in marginal visual conditions. Accident rates per departure, or flight segment or cycle, therefore provide more realistic safety correlations.

The accident rate per 100,000 departures is as follows:

<b>Business Jet Accident and Rate by Departures</b> <i>(per 100,000 departures)</i>					
Accident Rate	Departures	Accidents (5 Years)		Accident Rate	
		Total	Fatal	Total	Fatal
Large Jet Aircraft	3,046,816	13	3	0.42	0.09
Medium Jet Aircraft	4,536,569	27	9	0.60	0.20
Light Business Jets	7,760,927	72	22	0.93	0.28
All Business Jets	15,344,312	112	34	0.73	0.22

**Table 4.3a**

<b>Business Turbo Prop Accidents and Rates by Departures</b> (per 100,000 departures)					
	Departures	Accidents (5 Years)		Accident Rate	
		Total	Fatal	Total	Fatal
Large Turbo Prop	627,459	54	22	8.61	3.50
Medium Turbo Prop	12,313,651	223	80	1.81	0.65
Light Turbo Prop	587,830	16	7	2.72	1.19
All Turbo Prop	13,528,940	293	109	2.17	0.81

Table 4.3b

<b>All Business Turbine Accidents and Rates by Departures</b> (per 100,000 departures)					
	Departures	Accidents (5 Years)		Accident Rate	
		Total	Fatal	Total	Fatal
All Business Aircraft	28,873,252	405	143	1.40	0.50

Table 4.3c

If an assumption is made that the distribution of departures for operator types of commercial (22.6%), corporate (38.3%) and owner-operated (39.1%) is relatively the same as the distribution between flight hours, the accident rates by type of operation can be calculated as follows:

<b>Business Aircraft Accident Rates by Operator Type</b> (Extrapolated) (per 100,000 departures)					
Operator Type	Departures (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	6,337,396	230	77	3.62	1.21
Corporate	10,739,923	49	15	0.45	0.13
Owner-operated	10,964,256	109	45	0.99	0.41
All Business Aircraft	28,041,576	405	143	1.44	0.50

Table 4.3d

If it is further assumed that the distribution between operator types is proportional for jets and turboprops, the accident rate for jet aircraft by operational category can be extrapolated as follows:

Jet A/C Accident Rate by Operator Type (Extrapolated) (per 100,000 departures)					
Operator Type	Departures (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	3,458,830	61	20	1.76	0.57
Corporate	5,861,645	24	5	0.40	0.08
Owner-operated	5,984,081	17	7	0.28	0.11
All Jet Aircraft	15,304,556	112	34	0.73	0.22

Table 4.3e

**Analysis**

A number of assumptions have been made related to the distribution of exposure data, and as a result the data should be used with some caution. Nevertheless, no other rate data is known to exist for worldwide business aviation. The results of the extrapolation should be sufficiently accurate to provide a reasonable comparison with accident information from other aviation sectors.

The accident rate data demonstrates that corporate aviation has an excellent safety record over the years measured. The corporate jet accident rate of 0.08 accidents per 100,000 departures compares favourably with the scheduled airline rate of 0.112 for hull loss and/or fatal accidents per 100,000 departures of jet aircraft over 60,000 lbs and 0.241 for non-scheduled and all other operations of jet aircraft over 60,000 lbs (Source: Boeing – Statistical Summary of Commercial Jet Airplane Accidents, Worldwide Operations 1959-2002). The rate for scheduled operations of jet aircraft as published by ICAO has shown a steady decrease year over year with the fatal accident rate of scheduled jet airline operations in 2002 being .081.

The data in this Brief demonstrates that there is room for improvement in the commercial business aviation sector.