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Business Aviation Safety Brief

Summary of Global Accident Statistics

2003-2007

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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 2008. Breiling's detailed Report contains information on accidents from all regions of the world.

This Business Aviation Safety Brief covers a five year period from 2003 to 2007. IBAC will update the Brief annually and the IBAC Planning and Operations Committee (POC) 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.

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.

Listings of Business Jet and Turboprop accidents that occurred in the preceding calendar year (i.e. 2007) are contained in Appendices A & B.

The compilation, analysis and publication of safety data is an essential foundation for the development of measures to prevent accidents and thus, is not a means unto itself. In this regard, and as a separate IBAC initiative, the International Standard for Business Aircraft Operations (IS-BAO) was introduced in 2002 and was designed to raise the safety bar by codifying safety best practices.

Recognizing that it will be many, many years before safety data will reflect the impact of the IS-BAO, IBAC commissioned an independent, retrospective analysis to subjectively assess the extent to which (i.e. in terms of probability) had the IS-BAO been implemented by the operator concerned the accident could have been prevented. A synopsis of the findings of this study are presented in Section 5.0.

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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 2007, the last year covered by the report, is as follows:

2007 Global Business Aircraft Population	
Business Jets	15,527
Turbo Props	12,521
All Turbine Business A/C	28,048

Table 2.1a

Analysis

Business aircraft in North America represent 67.7% of the global fleet. South and Central America have approximately 11.1% and Europe 12.1% of the world's fleet. Other regions account for the remaining 9% of the fleet.

2.2 Number of Flight Hours

The 2007 summarized flight hour totals are as follows:

2007 Global BusAv Flight Hours	
Business Jets	6,072,410
Turbo Props	4,751,179
All Turbine Business A/C	10,823,589

Table 2.2a

Analysis

For the period 2003-2007, flying hours in North America represents 67% of the total, Europe 11.8%, Central/South America 11%, and the rest of the world 10%.

2.3 Number of Departures

The number of business aviation departures in the 2007 year is as follows:

2007 Global BusAv Departures	
Business Jets	4,432,416
Turbo Props	3,218,955
All Turbine Business A/C	7,509,174

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 2003 – 2007)

3.1 Accidents by Operator Type

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

Accidents by Operator Type - Jet Aircraft				
Business Jet Aircraft	Total Accidents (5 yrs)	Fatal Accidents (5 yrs)	Average Total Accidents per year	Average Fatal Accidents per year
Commercial	90	27	18	5.4
Corporate	34	4	6.8	0.8
Owner Operated	19	4	4.8	0.8
Government	3	2	0.6	0.4
Fractional	8	0	1.6	0

Table 3.1a
*(Note: No analysis provided for **Manufacturer** operations conducted with **Jet Aircraft**)*

Accidents by Operator Type - Turbo Prop Aircraft				
Turbo Prop Aircraft	Total Accidents	Fatal Accidents	Average Total Accidents per year	Average Fatal Accidents per year
Commercial	214	64	42.8	12.8
Corporate	16	5	3.2	1.0
Owner Operated	102	35	20.4	7.0
Government	10	4	2.0	0.8
Manufacturer	1	1	0.2	0

Table 3.1b
*(Note: No analysis provided for **Fractional** operations conducted with **Turbo Prop Aircraft**.)*

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	10 6.5%	22 14.4%	8 5.2%	7 4.6%	8 5.2%	3 2.0%	15 9.8%	80 52.3%	153 100%
Turbo Props	15 3.8%	56 14.1%	43 10.8%	46 11.6%	10 2.5%	20 5.0%	72 18.2%	135 34%	397 100%

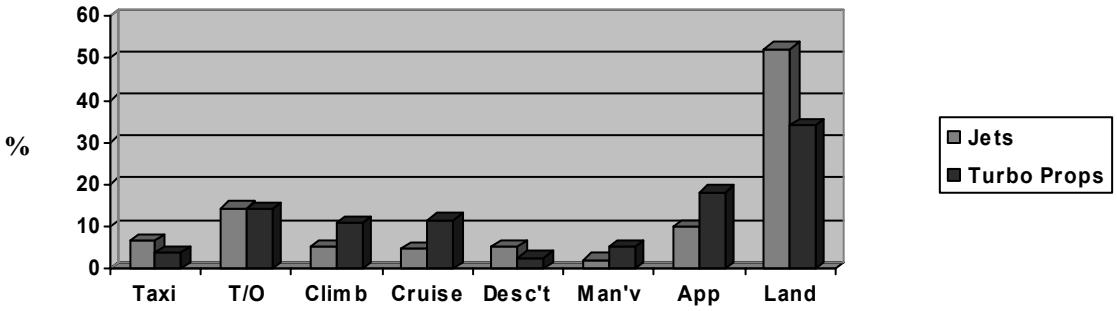


Table 3.2a

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												
	2003		2004		2005		2006		2007		**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	0.51	0.21	0.73	0.19	0.56	0.13	0.69	0.13	0.63	0.13	**0.58**	**0.14**
Turbo props	2.24	0.75	1.85	0.54	1.46	0.39	1.39	0.41	1.6	0.56	**1.73**	**0.53**
All Bus A/C	1.31	0.45	1.31	0.45	0.98	0.25	1.01	0.26	1.05	0.32	**1.09**	**0.32**

Table 4.1a

Note: Some of the above figures have been re-stated as a result of the availability of subsequently published accident investigation reports and/or additional information.

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 67% of the global total, it is unlikely that the distortion generated by the assumption will be very large.

The percentage of flight hours based on FAA published statistical data for each of the three categories in the USA is as follows:

Commercial (Air Taxi)	30.4%
Corporate	55.3%
Owner-operated	14.3%

Ed note:
Additional information is provided at Appendix C. The profiling for the above three categories has changed significantly from that in all previously published Safety Briefs. Consequently the data presented in the tables which follow cannot be directly compared with that in the same tables in previous editions of the Safety Brief, and vice versa.

Assuming a similar global division into Commercial (Air Taxi), Corporate and Owner-operated aircraft, the accident rates per 100,000 flight hours are as follows (based on data over 5 years):

Global Accident Rates by Operator Type *(Extrapolated)*
(per 100,000 flight hours)
All Business Aircraft

Operator Type	Hours of Operation (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	15,112,410	314	91	2.08	0.60
Corporate	27,490,667	40	9	0.15	0.03
Owner-operated	7,108,798	121	37	1.70	0.52
*All Business Aircraft	49,711,877	540	158	1.09	0.32

Table 4.2a

*Note: *This line includes the three lines above it, plus **Government**, **Manufacturers** and **Fractional** aircraft operators. Also included are accidents involving operators for which insufficient information was available to assign the operator type.*

Global Accident Rates by Operator Type *(Extrapolated)*
(per 100,000 flight hours)
Jet Aircraft

Operator Type	Hours of Operation (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	7,741,729	90	27	1.16	0.35
Corporate	16,782,963	34	4	0.2	0.02
Owner-operated	3,124,340	19	4	0.61	0.13
*All Business Aircraft	27,649,034	159	40	0.58	0.14

Table 4.2b

*Note: *This line includes the three lines above it, plus **Government**, **Manufacturers** and **Fractional** aircraft operators. Also included are accidents involving operators for which insufficient information was available to assign the operator type.*

Global Accident Rates by Operator Type *(Extrapolated)* *(per 100,000 flight hours)* **Turbo Prop Aircraft**					
Operator Type	Hours of Operation (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	7,876,434	214	64	2.72	0.81
Corporate	9,531,148	16	5	0.17	0.05
Owner-operated	4,655,259	102	35	2.19	0.75
*All Business Aircraft	22,062,843	381	118	1.72	0.53

Table 4.2c

*Note: *This line includes the three lines above it, plus **Government**, **Manufacturers** and **Fractional** aircraft operators. Also included are accidents involving operators for which insufficient information was available to assign the operator type.*

Analysis

The accident rates calculated in Table 4.2a 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 and Owner-Operated sectors 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.

Ed note:
Additional information is provided at Appendix C. The profiling for the above three categories has changed significantly from that in all previously published Safety Briefs. Consequently the data presented in the tables which follow cannot be directly compared with that in the same tables in previous editions of the Safety Brief, and vice versa.

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

Business Jet Accidents and Rates by Departures *(per 100,000 departures)*					
Accident Rate	Departures	Accidents (5 Years)		Accident Rate	
		Total	Fatal	Total	Fatal
Large Jet Aircraft	4,195,342	25	5	0.68	0.12
Medium Jet Aircraft	6,408,258	45	12	0.70	0.19
Light Business Jets	8,896,299	85	23	0.96	0.26
*All Business Jets	19,921,926	159	40	0.80	0.20

Table 4.3a

Business Turbo Prop Accidents and Rates by Departures *(per 100,000 departures)*					
	Departures	Accidents (5 Years)		Accident Rate	
		Total	Fatal	Total	Fatal
Large Turbo Prop	785,337	57	16	7.25	2.03
Medium Turbo Prop	13,338,623	293	92	2.20	0.69
Light Turbo Prop	822,932	31	10	3.77	1.22
All Turbo Prop	14,946,892	381	118	2.55	0.79

Table 4.3b

All Business Turbine Accidents and Rates by Departures *(per 100,000 departures)*					
	Departures	Accidents (5 Years)		Accident Rate	
		Total	Fatal	Total	Fatal
All Business Aircraft	34,868,818	540	158	1.55	0.44

Table 4.3c

If an assumption is made that the distribution of departures for operator types of commercial (30.4%), corporate (55.3%) and owner-operated (14.3%) is relatively the same as the distribution between flight hours, the accident rates by type of operation can be calculated as follows:

Business Aircraft Accident Rates by Operator Type *(Extrapolated)* *(per 100,000 departures)* **All Business Aircraft**					
Operator Type	Departures (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	10,600,120	314	91	2.96	0.86
Corporate	19,282,456	40	9	0.27	0.05
Owner-operated	4,986,240	121	37	2.42	0.74
*All Business Aircraft	34,868,818	540	158	1.55	0.44

Table 4.3d

Business Aircraft Accident Rates by Operator Type *(Extrapolated)* *(per 100,000 departures)* **Jet Aircraft**					
Operator Type	Departures (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	5,578,139	90	27	1.61	0.48
Corporate	12,092,609	34	4	0.28	0.03
Owner-operated	2,251,177	19	4	0.84	0.18
*All Business Aircraft	19,921,926	159	40	0.80	0.20

Table 4.3e

Business Aircraft Accident Rates by Operator Type *(Extrapolated)* *(per 100,000 departures)* **Turbo Prop Aircraft**					
Operator Type	Departures (5 yrs)	Total Accidents	Fatal Accidents	Total Accident Rate	Fatal Accident Rate
Commercial (Air Taxi)	5,336,040	214	64	4.01	1.2
Corporate	6,457,057	16	5	0.25	0.08
Owner-operated	3,153,794	102	35	3.23	1.11
*All Business Aircraft	14,946,892	381	118	2.55	0.79

Table 4.3f

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.

4.4 Comparison With Other Aviation Sectors

IBAC is experiencing increasing difficulty in drawing meaningful comparisons of business aviation safety data i.e. accident rates per 100,000 departures with those developed and published for other sectors of the aviation community. The incongruencies inhibiting such comparisons include; operational classification i.e. commercial vs. non-commercial, classification of accidents involving fatalities i.e. passengers only or crew, hull loss accidents, range of aircraft MCTOM encompassed by the data, lack of disaggregation by power plant i.e. turbojet, turboprop or recips etc. While it is unlikely that these incongruencies can ever be fully reconciled, IBAC is making every effort to understand and identify these factors and will continue to promote international recognition of the IBAC safety data.

Aviation Sector	Fatal Accident Rate (per 100,000 departures)
All Business Aircraft (Jet and Turbo Prop)*	0.44
Corporate Aviation (Jet and Turbo Prop)**	0.05
All Business Jets***	0.20
Boeing Annual Report – Jet aircraft MCTOM over 60,000lbs engaged in commercial scheduled passenger operations.****	0.05

Table 4.4a

*Per Table 4.3c. IBAC rate is 5 year average.
**Per Table 4.3d. IBAC rate is 5 year average.
***Per Table 4.3a. IBAC rate is 5 year average.
****Boeing – Statistical Summary of Commercial Jet Airplane Accidents, Worldwide Operations 1959-2007. Rate is for a 10 year period.

Ed Note:
The format and content of this section of the Safety Brief has been revised compared with all previous Issues. In this regard, it is noted that the rate in the Boeing published Summary for 2006 is for Fatal Accidents, whereas the rate previously published was for Fatal and Hull Loss Accidents. The Hull Loss rate for the 10 year period is 0.12.

4.5 Accident Rate Trend

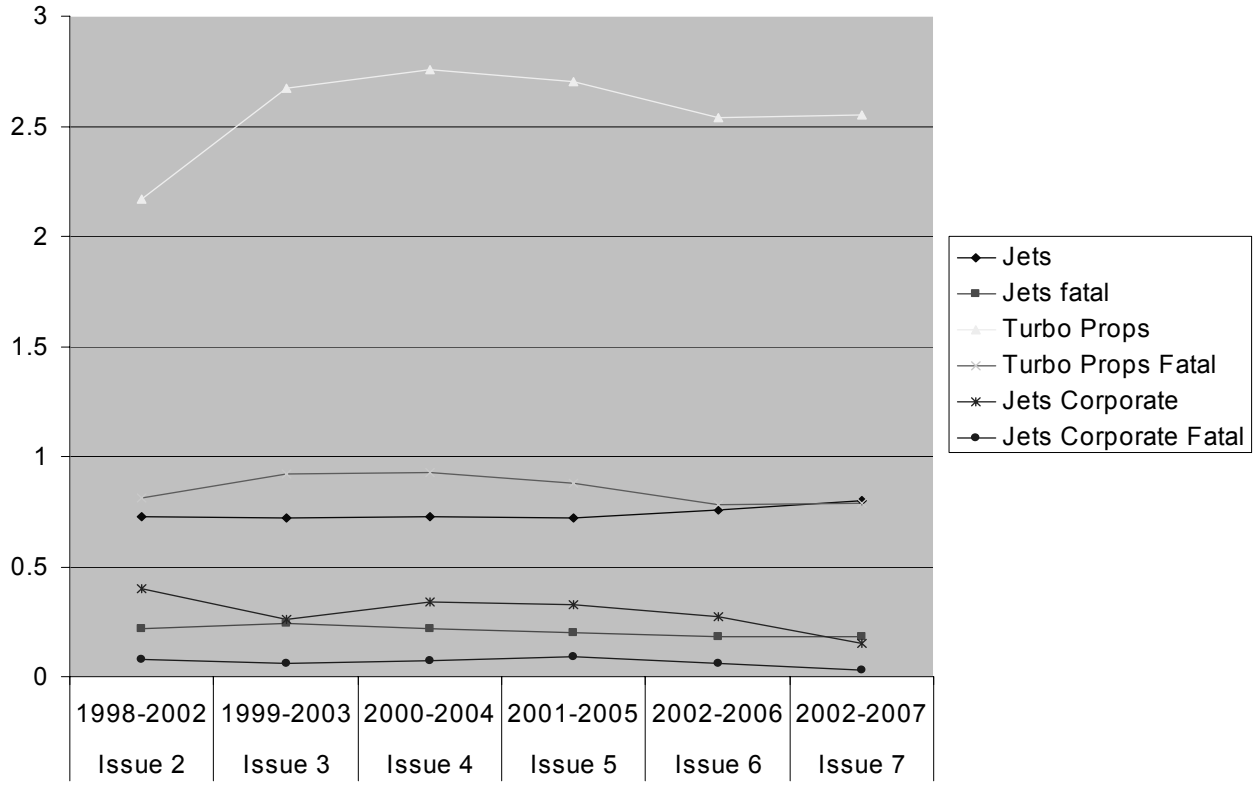


Table 4.5a

5.0 IS-BAO Safety Value

A Code of Practice

The International Standard for Business Aircraft Operations (IS-BAO) is an industry safety standard introduced in 2002 as the industry's code of practice designed to raise the safety bar by codifying safety best practices. Given that there are very few accidents in the business aviation community, it will be many years before a determination can be made regarding whether or not the IS-BAO is making a safety impact. Therefore, to assess the safety value a study was initiated based on historical accident data.

An analysis of past accidents required a considerable amount of subjective assessment as the analysts had to review the details of accidents against a full understanding of the IS-BAO to make a value judgment regarding whether the accident may have been avoided if the IS-BAO had been implemented.

The study was conducted by an independent analyst who reviewed a total of 500 accidents covering the period between 1998 and 2003. A total of 297 accidents of the 500 were considered to contain sufficient information to be further assessed. The study against the provisions of the IS-BAO standard was performed to determine a level of probability that if the flight department had known about and implemented the IS-BAO the accident may have been avoided. The data was classified and analyzed to determine the potential impact of the IS-BAO and the accidents were rated on a five point scale ranging from certainty of prevention to no effect.

Two assessments were made. First, the analysts made the assumption based on indicators that the flight department may have implemented the IS-BAO, and if implemented, the potential for accident avoidance. The accidents were then further analyzed to determine the potential outcome given that the IS-BAO was implemented in full before the accident. An audit by an accredited auditor leading to an IBAC Certificate of Registration is the recommended means of demonstrating full implementation.

As part of the analysts' work, the accidents were classified in a number of different ways to see if there were any meaningful trends in the prevention probability between the different factors. Classification methodologies applied include:

1. Simple Four Factors – Human, Technical, Environmental and Management.
2. Events – or significant type of accident (such as loss of control).
3. Breakdown on Human Factors.
4. Boeing Accident Prevention Strategies.

Probabilities were calculated for all accidents, phase of fight, type of accident, four factors (per above), type of operation, Commercial or non-commercial, fatalities and single versus two pilot operations.

A further step in the methodology included a quality assurance analysis by a group of current pilots through an assessment of a random selection of twelve accidents as a means of verifying the results of the analysts.

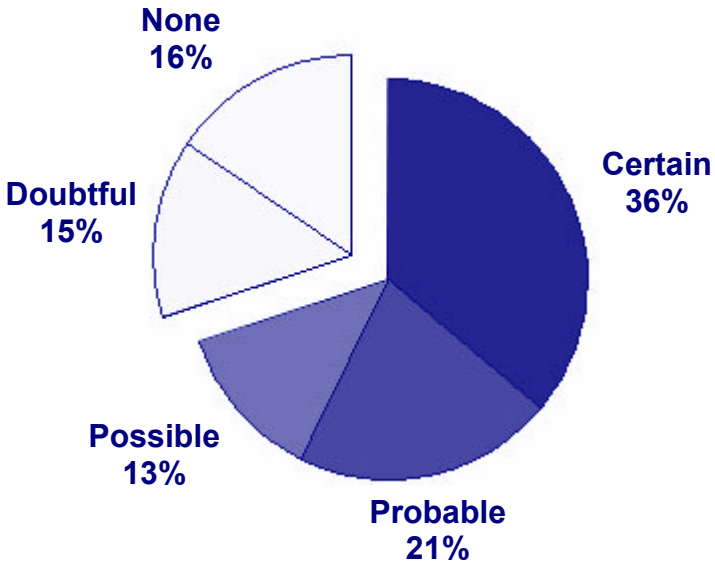
Results of Analysis

Criteria A

Assumes Operators Had Completely Implemented IS-BAO Prior to the Occurrence.

This part of the analysis made the assumption that the operator had implemented the IS-BAO standard in full. An assessment was then made regarding the potential that the accident could have been prevented. The following were the results of the assessment.

Certain of prevention	36.0% (107 of 297 accidents)
Probable prevention	21.2% (63 of 297)
Possible prevention	12.8% (38 of 297)
Doubtful of prevention	14.5% (43 of 297)
No prevention possibility	15.5% (46 of 297)

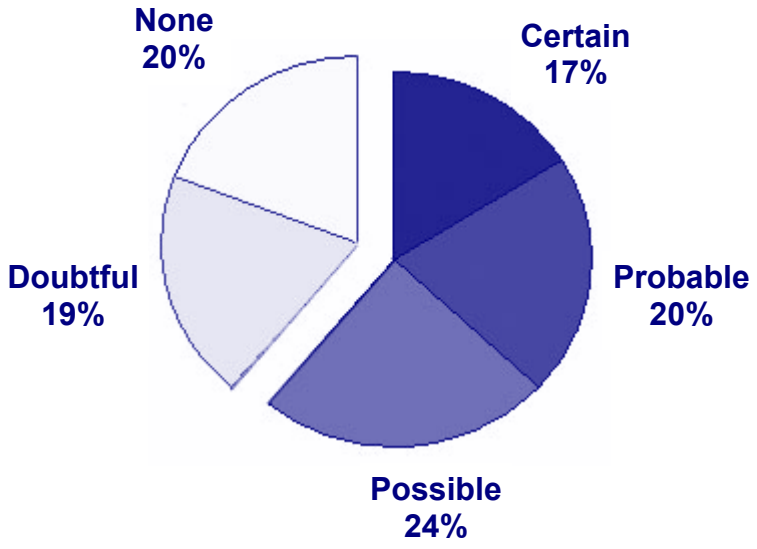


Conclusion - The probability of prevention is 57.2%, with a further 12.8% possible for a total of 70% potential that the aircraft accident could have been avoided.

Criteria B
Takes into Account Operators Background and Probability of Introduction of IS-BAO.

The assessment of whether the accident may have been prevented if the flight department had known about the IS-BAO, and if the operator was sufficiently responsible to implement the standard and had done so thoroughly, produced the following results:

Certain of prevention	17.2% (51 of 297 accidents)
Probable prevention	20.2% (60 of 297)
Possible prevention	23.9% (71 of 297)
Doubtful of prevention	19.2% (57 of 297)
No prevention possibility	19.5% (58 of 297)



Conclusion - The probability of prevention is 37.4%, with a further 23.9% possible for a total of 61.3% potential that the aircraft accident could have been avoided.

Criteria C
Probability of Prevention by Types of Operation and Aircraft.

The analysis showed that there is a greater probability that the accident could have been prevented for jet aircraft type accidents versus turboprop. This was a trend consistent through most methods of analysis and type of accident, although in some cases there was little to distinguish between jet and turboprop probabilities. For example, for the landing accidents (the most common type of accident) the probability of prevention was much greater for jets than turboprop aircraft. Yet, for loss of control accidents there was substantially no difference. The reason for the difference considered by the analysts was that there would be a greater potential for prevention in two pilot operations more typical in jet aircraft.

As would be expected there was a significantly greater probability of prevention related to Management Factors compared to Environmental factors, whereas Technical Factors and Human Factors ranked in the middle of these two.

There was no significant difference between the probability of prevention of commercial operations (air taxi) versus non-commercial. Evidence indicates that there is a higher probability that IS-BAO implementation would prevent accidents with two pilot operations versus one pilot.

Accidents with causal factors related to human performance totaled 232, and were broken down into the following;

1. Knowledge Based (no standard solution) 37
2. Rule Based (need to modify behaviour) 46
3. Skill Based (routine practiced tasks) 149

There was no significant difference between the probability of prevention between these three categories.

Conclusion

The study by an independent analyst indicates that the IS-BAO standard has considerable potential to improve safety. The extent of potential benefit depends significantly on the commitment of the operator to implement and adhere to the standard.

Appendix A

Business Jet Accidents 2007

2007 Business Jet Accidents

Date	Model	Description	Region	Phase	Operator	Fatalities
07/01/2007	Premier I	Aircraft substantially damaged during a hard landing, LaMole Apt.	Europe	Landing	Corp	No
09/01/2007	L-24F	Aircraft impacted hilly terrain and burned 15 mi from airport	C.A.	Descent	Comm	Yes
10/01/2007	L-35A	Damaged during intentional aileron roll by PIC who lost control	N.A.	Cruise	Comm	No
12/01/2007	CE-525	Crashed shortly after liftoff, nose baggage door opened	N.A.	Climb	Comm	Yes
24/01/2007	CE-55OBvo	Aircraft overran runway landing, Samedan, Switzerland	Europe	Landing	Comm	No
24/01/2007	CE-550	Aircraft landed long, slid off runway end into localizer	N.A.	Landing	Comm	No
13/02/2007	CRJ-800	Crashed initial liftoff/climb during heavy snow storm, Moscow	Europe	Takeoff	Comm	No
17/03/2007	CE-500	Aircraft landed hard causing major wing damage	N.A.	Landing	Comm	No
23/03/2007	DA-900	Aircraft slid off runway during landing, Rifle, CO, VMC, night, rain	N.A.	Landing	Comm	No
26/03/2007	L-36A	Tire failed takeoff, abort, overshoot to right side of runway	N.A.	Takeoff	Comm	No
02/04/2007	IAI 1124	Aircraft experienced explosive decompression at FL 340	Oceania	Climb	Comm	No
03/04/2007	BE-400A	Damaged by G-II, N 309EL that rolled into it while parked	N.A.	Parked	Frax	No
03/05/2007	CE-550	Crashed during circling approach in IMC, fog, light snow	N.A.	Approach	Pvt/Bus	Yes
04/06/2007	CE-551	Crashed initial climb, possible elevator trim malf/failure	N.A.	Climb	Comm	Yes
10/06/2007	DA-900	Acft. failed to rotate on takeoff, runway overshoot, nose gr. coll.	N.A.	Takeoff	Comm	No
30/06/2007	CE-500	Aircraft crashed into a house after landing long and aborting	N.A.	Landing	Pvt/Bus	Yes
01/07/2007	NA-265	Aircraft landed long and over shot runway, VMC	C.A.	Landing	Comm	No
05/07/2007	T-39A	Control lost on takeoff due tire failure, runway overshoot	C.A.	Takeoff	Comm	Yes
06/07/2007	BE-400	Impacted other BE-400 flying formation, both landed safely	Asia	Maneuver	Military	No
21/07/2007	L-25	Hard landing followed after loss of both engines on approach	N.A.	Landing	Corp	No
11/08/2007	L-35A	Overshot runway landing due to hyd. malfunction/failure	N.A.	Landing	Comm	No
23/08/2007	L-60	Aircraft veered off rwy. side landing Westhampton, NY, hyd.malf.	N.A.	Landing	Comm	No
03/09/2007	NA-265	Takeoff aborted, aircraft veered off runway side collapsing gear	N.A.	Takeoff	Comm	No
13/09/2007	L-39C	Military trainer jet crashed during Reno air show	N.A.	Maneuver	Pvt/Bus	Yes
14/09/2007	IAI 1125	Landed long, over ran runway and impacted localizer, heavy rain	N.A.	Landing	Corp	No

Appendix A

Business Jet Accidents 2007 continued

2007 Business Jet Accidents

Date	Model	Description	Region	Phase	Operator	Fatalities
24/09/2008	G-II	Aircraft intercepted and crashed during drug run in Mexico	N.A.	Maneuver	?	No
28/09/2008	DA-900C	During taxi, a wingtip struck a parked steam roller, at TEB	N.A.	Taxi	Corp	No
07/10/2008	G-IIB	Aircraft struck trees on night approach, in IMC at closed airport	S.A.	Approach	Other	Yes
14/10/2008	NA-265	Acft hydroplaned off right side of runway in gusts & heavy rain	N.A.	Landing	Corp	No
17/10/2008	L-35A	Left wing sustained substantial damage landing	N.A.	Landing	Comm	No
27/10/2008	CE-650	Aircraft landed hard and overshot runway end onto grass	N.A.	Landing	Comm	No
29/10/2008	HS-800XP	Takeoff abort due to gear problem, runway overshoot	N.A.	Takeoff	Corp	No
04/11/2008	L-35	Aircraft crashed into neighborhood housing shortly after liftoff	S.A.	Takeoff	Comm	Yes
11/11/2008	G-IV	Nose landing gear collapsed during landing	N.A.	Landing	Corp	No
11/11/2008	Global	Global 5000 landed hard and cartwheeled in severe down drafts	N.A.	Landing	Corp	No
02/12/2008	CE-551	Aircraft went off right side of runway during landing	N.A.	Landing	Corp	No
12/12/2008	Global	Aircraft landed short causing substantial damage, Nevis Island	N.A.	Landing	Comm	No
19/12/2008	CE-510	Mustang's fuel tank collapsed and deformed wing on descent	Europe	Descent	Comm	No
26/12/2008	CL-604	Aircraft crashed on takeoff or initial climb enroute to Hong Kong	Europe	Takeoff	Comm	Yes

Appendix B

Turbo Prop Accidents 2007

2007 BUSINESS TURBOPROP ACCIDENTS

Date	Model	Description	Region	Phase	Operator	Fatalities
02/01/2007	SW-3	On landing aircraft veered off runway side due nose gear malf.	S.A.	Landing	Corp	No
07/01/2007	BE-100	Aircraft collided with terrain during conduct of a non-precision app.	N.A.	Approach	Comm	Yes
12/01/2007	CE-425	Aircraft crashed during landing under unknown circumstances	N.A.	Landing	Pvt/Bus	No
13/01/2007	AC-690A	Aircraft crashed in mountainous terrain, transponder inoperative	S.A.	Maneuver	Comm	Yes
14/01/2007	PA-46-500	Nose gear collapsed during landing after aircraft veered to left	N.A.	Landing	Pvt/Bus	No
15/01/2007	P-180	Aircraft slid off runway side into a snowbank during landing	N.A.	Landing	Comm	No
24/01/2007	BE-99	After landing the aircraft taxied into another aircraft, caught fire	N.A.	Taxi	Comm	No
3101/2007	PA-46-500	Aircraft struck large bird during flight causing substantial damage	N.A.	Maneuver	Pvt/Bus	No
02/02/2007	BE-200	Piece of tail separated following emerg. descent, windshield failed	N.A.	Cruise	Corp	No
02/02/2007	TBM-700	Aircraft crashed executing a missed approach in IMC, night, rain	N.A.	Approach	Pvt/Bus	Yes
06/02/2007	BE-200	Aircraft impacted mountainous terr. during night visual approach	N.A.	Approach	Comm	Yes
06/02/2007	BE-200C	Aircraft entered a steep turn after takeoff and crashed into water	C.A.	Climb	Comm	Yes
08/02/2007	CE-208B	Aircraft crashed during non precision inst. approach, night IMC	N.A.	Approach	Comm	No
12/02/2007	PA-31T	Aircraft crashed into a field enroute from Germany to Croatia	N.A.	Cruise	Comm	Yes
15/02/2007	CE-208B	Aircraft disappeared diverting to alternate in IMC	Africa	Maneuver	Comm	No
19/03/2007	BE-100	Aircraft overran the runway during landing	S.A.	Landing	Comm	No
20/03/2007	P-180	On landing left main gear collapsed, tire failed, fuel tank leaked	N.A.	Landing	Comm	No
22/03/2007	CE-208B	Engine caught fire during shut down, no other information	C.A.	Static	Comm	No
25/03/2007	BE-90	Main landing gear collapsed during landing, VMC, wind calm	N.A.	Landing	Pvt/Bus	No
25/03/2007	SA-226TC	Aircraft rotated late due c.g. and gear hit snow bank at rwy. end	N.A.	Takeoff	Comm	No
11/04/2007	SA-227AT	Power surge on takeoff, aircraft veered off rwy. side during abort	N.A.	Takeoff	Pvt/Bus	No
16/04/2007	CE-208B	Following steep approach to avoid trees aircraft landed hard	N.A.	Landing	Comm	No
19/05/2007	CE-208B	Power failed cruise, aircraft overran landing on short field	S.A.	Cruise	Public	No
28/06/2007	PA-46 500T	Aircraft broke up in flight due to overload airframe failure	N.A.	Cruise	Pvt/Bus	Yes
03/07/2007	BE-90E	Aircraft struck powerlines on takeoff and crashed	N.A.	Takeoff	Pvt/Bus	Yes
05/07/2007	CE-208B	Aircraft crashed during approach, no further information	Europe	Approach	Comm	No
21/07/2007	CE-208B	Aircraft collided with terrain after power loss after takeoff	S.A.	Climb	Comm	No
27/07/2007	BE-90A	Aircraft landed hard and right main gear separated prior stopping	N.A.	Landing	Pvt/Bus	No
05/08/2007	BE-90B	Aircraft crashed shortly after takeoff, no other information	N.A.	Climb	Comm	Yes
06/08/2007	BE-200	Aircraft landed hard while avoiding a donkey on the runway	Africa	Landing	Comm	No
22/08/2007	MU-2B-36	Lineman hit and seriously injured by prop while pulling chocks	N.A.	Static	Comm	No
22/08/2007	EMB-110P	Aircraft crashed shortly after takeoff, no other information	S.A.	Climb	Comm	Yes
27/08/2007	BE-90B	Aircraft landed with landing gear retracted, day, VMC	Europe	Landing	Comm	No
31/08/2007	CE-208B	Aircraft executed a forced landing after power loss after takeoff	C.A.	Climb	Comm	No
01/09/2007	SC-7	Nose wheel sunk into soft ground landing at a remote sight	N.A.	Landing	Comm	No
04/09/2007	TBM-700	Nose gear failed to retract and collapsed upon landing	Europe	Landing	Pvt/Bus	No
05/09/2007	CE-208B	Power failure in flight, aircraft crash landed 5 miles from airport	N.A.	Cruise	Comm	No

Appendix B

Turbo Prop Accidents 2007 continued

2007 BUSINESS TURBOPROP ACCIDENTS

Date	Model	Description	Region	Phase	Operator	Fatalities
01/09/2007	SC-7	Nose wheel sunk into soft ground landing at remote strip	N.A.	Landing	Comm	No
04/09/2007	TBM-700	Nose wheel failed to retract and collapsed upon landing	Europe	Landing	Pvt/Bus	No
05/09/2007	CE-208B	Power failed in flight, aircraft crash landed 5 miles from airport	N.A.	Cruise	Comm	No
11/09/2007	CE-208B	Aircraft damaged during forced landing after power loss in climb	C.A.	Climb	Comm	No
19/09/2007	BE-90B	Both engines failed on final, acft landedl/2 mi. short of runway	N.A.	Approach	Pvt/Bus	No
19/09/2007	PA-42	Nose gear failed to extend due to a fractured steering link	Europe	Landing	Comm	No
20/09/2007	SC-7	Aircraft collided with trees departing a remote strip after repairs	N.A.	Climb	Comm	Yes
26/09/2007	F-406	Aircraft collided with ground shortly after takeoff	Africa	Climb	Comm	Yes
04/10/2007	BE-C90A	Aircraft crashed into mountain at 11,677 ft. night, VFR	N.A.	Descent	Comm	Yes
07/10/2007	CE-208B	Aircraft impacted terrain , VFR in questionable weather, night	N.A.	Maneuver	Pvt/Bus	Yes
11/10/2007	BE-200	Aircraft reported an engine problem after takeoff and crashed	S.A.	Climb	Comm	Yes
17/10/2007	SA-226T	Nose gear failed to extend due hydraulic malfunction	S.A.	Landing	Corp	No
25/10/2007	BE-100A	Undershot NDB/DME approach in IMC, rain, fog	N.A.	Approach	Comm	Yes
25/10/2007	PA-46T	During taxi, right main gear hit runway light and collapsed	Europe	Taxi	Pvt/Bus	No
31/10/2007	BE-99	Pilot initiated takeoff on side of runway, hitting objects	N.A.	Takeoff	Comm	No
04/11/2007	BE-100A	Crew called in an emergency and then crashed	C.A.	Descent	Comm	Yes
05/11/2007	CE-208B	Power loss in climb, aircraft destroyed in forced landing	C.A.	Climb		No
06/11/2007	CE-208	Aircraft damaged taxiing into other aircraft	N.A.	Taxi	Comm	No
06/11/2007	BE-100A	Aircraft crashed shortly after takeoff in fog, 1/8 mi. vis.	N.A.	Climb	Pvt/Bus	Yes
08/11/2007	BE-200	Left main gear failed to extend, aircraft landed with it retracted	N.A.	Landing	Comm	No
28/11/2007	BE-200	Gear collapsed landing on abandoned air strip, drug flight	C.A.	Landing	Stolen	No
04/12/2007	CE-208B	Late abort due engine failure, runway overshoot	C.A.	Takeoff	Comm	No
05/12/2007	CE-208	Aircraft crashed 2 mi. from airport after takeoff	N.A.	Climb	Comm	Yes
07/12/2007	P-180	Acft. veered 180 deg. on rwy.landing due improper steering use	N.A.	Landing	Comm	No
09/12/2007	BE-90C	Aircraft impacted terrain during approach	Europe	Approach	Corp	Yes
10/12/2007	BE-200	Aircraft crashed into a hangar attempting to return and land	N.A.	Approach	Corp	Yes
11/12/2007	SA-227AC	Prop hit electrical box, prop blade broke off during taxi	Europe	Taxi	Comm	No
12/12/2007	CE-208B	Aircraft struck by taxiing aircraft while parked	Africa	Static	Comm	No
12/12/2007	PA-31T	Pilot failed to extend gear prior landing	N.A.	Landing	Pvt/Bus	No
18/12/2007	CE-208	After departure, aircraft lost power, lost alitude and crashed	N.A.	Climb	Comm	No
20/12/2007	CE-208	Aircraft lost power and ditched in water 25 mi. so. of Bahamas	N.A.	Cruise	Comm	No
21/12/2007	BE-90B	Lost both engines and ditched 1:45 hrs. after departure	C.A.	Cruise	Comm	Yes
25/12/2007	SA-227AC	Assymetrical reverse obn landing, aircraft went off runway side	S.A.	Landing	Comm	No

Appendix C

Methodology

1. Annual Accident Assessment

IBAC contracts annually to Robert Breiling and Associates to assess and collate business aviation accidents. The Breiling Report provides IBAC with operating hours for each aircraft type as well as accident statistics by aircraft type, by operator type and by area of the world. IBAC uses the information to publish a summary report in the annual *Business Aviation Safety Brief*.

To date the Brief has provided only limited information on accident by operator type due to the lack of acceptable exposure data in terms of hours of operation for each operator type.

It has always been recognized that achieving safety improvement is highly reliant on the knowledge base and understanding of the operations of greater risk so that mitigation can be determined and applied. As an indicator applied to assessing risk, business aviation places importance on statistical comparisons of the accident rate between the different business aviation operational types, namely accident rates for operations of corporate aviation, on-demand commercial and owner operated. Given the difficulty in obtaining exposure data for the hours attributed to each operational type, in the past it has been difficult to obtain with any degree of confidence the accident rates for each operation. However, with recent changes in the methodology and accuracy of an annual survey of general aviation and on-demand Part 135 operators by the US Federal Aviation Administration, IBAC has now concluded that data developed from the Survey is sufficiently accurate to serve as a methodology to provide a global perspective of the difference in rates between the operator types.

Percentage of Operations by Operator Type

The following distribution by operator type is applied to the business aviation hour and departure data to determine exposure by operator used to calculate accident rates: (See Attachment for methodology)

	Jet Average	TP Average	Total
Corporate	60.7%	43.2%	55.3%
Owner Operator	11.3%	21.1%	14.3%
Commercial On-Demand	28.0%	35.7%	30.4%

Table C-1

2. Availability of Exposure Data

The US FAA annually completes a survey of US operators, including hours of flight by operator type. Prior to 2006 IBAC was concerned that the gap between the total flying hours calculated by Robert Breiling was different from those of the FAA. However, over the last couple of years the gap has closed to the point that there is increased confidence in the survey results and IBAC has now concluded that the survey information is sufficiently accurate to provide a reasonable assessment of the differences between accident rates for each operator type.

The FAA survey is sent to 100% of general aviation and on-demand commercial operators of turbine aircraft in the US and follows up three times with operators that do not respond immediately. Submissions are made annually by approximately 45% of the US turbine operator population. The US business aviation fleet consists of 65% of the world fleet and the distribution between operator types is considered representative of the global fleet with the exception of the European fleet. The global distribution and an assessment of each region is as follows;

United States	65%	
North America without the US	8%	Distribution considered similar to the US
South America	7%	Distribution considered similar to the US
Europe	11%	Probable higher percent of on-demand commercial operations.
Rest of the World	9%	Different rule structures but most would be similar to the US

FAA survey data was applied over a three year period to develop an average distribution by aircraft type (Jet, Turbo-Prop and Combined) and operator type (Commercial On-demand, Corporate and Owner-Operated). The data in Table C-1 was applied to the total business aviation hours to calculate the number of flying hours for each operational type.

3. Rate Calculation

Accident rates per operator type were calculated using accident data in the Safety Brief, along with exposure data as explained in S2 above. Tables were developed for both 100,000 flying hours and 100,000 departures.

4. Assumptions

IBAC recognizes that there is error built into the methodology, but given the lack of options the data is considered as accurate as anything available. The following assumptions that give rise to some error are:

The breakdown by operator types is derived from an FAA survey of US operators. An assumption is made that the remainder of the world will have an operator distribution similar to the US. Given that the US consists of approximately 65% of the global fleet, it is unlikely that the error due to this assumption will be very significant.

The FAA survey captured approximately 50% of the total global flying hours. It is assumed that the 50% is representative of the distribution for the complete population.

5. Sensitivity Analysis

As noted above, an assumption is made that the US distribution by operator type is representative of the global fleet distribution and yet it was also concluded that the European fleet distribution is likely different than that of the US. Given the potential that this may result in an unacceptable error, a sensitivity analysis was completed to determine the impact of a higher percentage of the European fleet being operated as on-demand charters.

Two samples for European distribution were selected to test the impact.

Operator Type	Baseline per US Survey	Sample 1	Sample 2
Commercial On-Demand	31%	60%	70%
Corporate	55%	30%	25%
Owner Operated	14%	10%	5%

Results of the analysis demonstrate a very small change when the sample data for Europe is applied. Typically, the sensitivity analysis tables conclude a difference ranging from .01% to .08% in the fatal accident rates, which demonstrates acceptable level of error for the comparison purposes intended by the statistics.

The following Table shows the results of applying to the Safety Brief Issue 6 data the two Sample distributions to the combined jet and turbo-prop fleets.

	Baseline (31/55/14 %)		**Sample 1** (Europe 60/30/10 %)		**Sample 2** (Europe 70/25/5 %)	
	Total	Fatal	Total	Fatal	Total	Fatal
Commercial On-demand	2.28	0.66	2.48	0.71	2.58	0.74
Corporate	0.18	0.04	0.19	0.04	0.19	0.04
Owner Operated	1.86	0.64	1.85	0.63	1.92	0.64
Combined	1.08	0.31	1.08	0.31	1.08	0.31