Business Aviation Safety Strategy

A Blueprint for Making
a Safe System Safer

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Genesis of a Safety Strategy

Safety is a high priority for business aviation and its inherent safety culture has resulted in a very good safety record. The significant attention to aviation safety has evolved over many years of applying industry good practices, influenced by the demand by aircraft owners for the highest level of safety. However, the industry recognizes that there is a need for continuous improvement in order to maintain this level of safety in a rapidly changing aviation system and to make a safe system even safer.

Continuous improvement in aviation safety, with balance achieved between safety and efficiency, demands that all participants in the system challenge the processes, the culture and themselves, to identify weaknesses and to seek corrective solutions. Experience demonstrates that safety is a good business practice. Although self analysis is important for individuals and operators, there is also a broader need to view the system as a whole and to develop a system-wide strategic plan, a blueprint or roadmap, to ensure linkages and to foster creativity that will lead to a better overall system.

The International Civil Aviation Organization (ICAO) encouraged such a safety Roadmap at an Air Navigation Commission/Industry meeting held in Montreal in May of 2005. Subsequently, a number of organizations worked together through the Industry Safety Strategy Group (ISSG) consisting of those sectors of the broad aviation system primarily interested in large commercial aircraft operations (IATA, ACI, Airbus, Boeing, CANSO, FSF, and IFALPA). Subsequently, the business aviation industry recognized a need to develop a more dedicated supplementary blueprint focusing on initiatives of the business aviation community.

The development of a business aviation safety strategy was placed in the hands of a team of business aviation industry representative organizations from the International Business Aviation Council and its Member Associations, with support from the Flight Safety Foundation (FSF).

Objective of the Safety Strategy

The broad objective of the Business Aviation Safety Strategy is continuous improvement of business aviation safety. The Strategy has been developed by the global business aviation community to ensure coordination of the many safety initiatives of the industry and to assess and plan for further improvement. The initiatives in this Strategy list all of the safety programs of the industry. It is intended that the Strategy serve as the business aviation input to the ICAO Global Aviation Safety Plan.

The aviation industry as a whole has long been recognized as the global leader in the research, development and implementation of advanced safety programmes. Significant safety advances have been made in both safety equipment and safety processes. Therefore, a business aviation safety strategy should recognize and build on progress made by the aviation industry over the years.

The Business Aviation Safety Record

Developing a Safety Strategy requires an understanding of the strengths and weaknesses of the system. The accident record serves as a prime indicator, but the industry must also rely on information derived from as many additional sources as possible. For example, the willingness to apply effective safety standards can serve as measure of the safety culture of the industry. Information from regulators and service providers can also provide valuable data.

The International Business Aviation Council routinely publishes an annual Safety Brief summarizing the accident record for business aviation. Macro information is provided as well as specific data for three business aviation sub-sectors:

1.   Business aviation commercial (on-demand air taxi),
2.   Corporate aviation,
3.   Owner-operated.

The record for the three sub-sectors over a five year period (2001 – 2005), which includes all turbine powered business aircraft, is per the following table.

Business Aircraft Accident Rates 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)	7,272,523	317	95	4.36	1.31
Corporate	12,234,674	41	10	0.33	0.08
Owner-operated	12,582,108	128	47	1.02	0.37
*All Business Aircraft	32,179,309	510	160	1.58	0.50

* includes all turbine business aviation aircraft.

In the case of corporate aviation, the safety record is amongst the best in all of aviation. While there remains room for further improvement for this sector, the record of the other two sectors warrants renewed focus.

The Business Aviation Safety Brief is developed primarily using data from a broader study completed for IBAC by Robert E. Breiling and Associates. Examples of other useful sources include incident data from service providers and regulators, such as navigational errors and height keeping deviations.

A summary of relevant safety data and conclusions that will assist in determining potential actions towards improvement are:

1.   The accident rate for corporate aviation is essentially the same as the record for scheduled commercial air transport jet aircraft weighing over 60,000 lbs.[1]

2.   The record for all business aircraft combined is relatively good but there is room for improvement. [1]

3.   The commercial air taxi rate is significantly higher than corporate aviation and is also higher than the non-scheduled commercial rate published by Boeing for jet aircraft over 60,000 lbs (0.31 accidents per 100,000 departures). [1]

4.   The Owner Operated rate is essentially the same as the rate for non-scheduled commercial jet aircraft weighing over 60,000 lbs. [1]

5.   The accident rate trend for business aviation over the past five years, using a running five year average, has no statistically significant change.

6.   For jet aircraft, 53% of accidents are in the landing phase. Other most common accidents are in the take–off phase (18%) and approach phase (10%).[1] The air carrier landing accident rate is approximately 45% (US fleet).[2]

7.   Accidents for Turbo-prop aircraft follow a different trend, with 24% being in the approach, 23% in the landing, and 14% during the take-off. [1]

8.   In turboprop operations, 70% of accidents are single pilot operations, whereas 63% of the total operations are single pilot (Breiling study of US fleet).[3]

9.   Although it is difficult to determine the number of flying hours for jet aircraft single pilot operations it is noteworthy that one current small jet aircraft qualified for single pilot (SP) has an accident rate three times higher than dual pilot aircraft of similar type. [3]

10.   16.8% of all fatal accidents involved training flights (US fleet). [3]

11.   Ferry flights (positioning) compose 10% of flights conducted and account for 36% of accidents. Positioning flights therefore have 5.4 times the likelihood of being in an accident. (US fleet). [3]

12.   An independent study of the safety value of the IS-BAO indicates that if the standard had been implemented and followed, 70% of the accidents could have been avoided (based on a study of 500 accidents over a five year period).[4]

13.   Within United Kingdom airspace, business aviation operators have a disproportionately high number of altitude deviations.[5]

14.   Business aviation operations on the North Atlantic have a disproportionately high number of gross navigation errors (GNEs) and significant height deviations.[6]

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[1] IBAC, Business Aviation Safety Brief, 2006
[2] Boeing – Statistical Summary of Commercial Jet Airplane Accidents Worldwide Operations 1959-2005
[3] Breiling, Robert E Associates, 2001-2005 World Turbine Aircraft Accident Review, 2006
[4] Woodhouse, Accident Analysis - Jet and Turboprop Business Aircraft 1998-2003 - Potential Impact of IS-BAO
[5] UK NATS Study, as presented at EBACE2007.
[6] According to data provided by the NAT Central Monitoring Agency (CMA) for the period January 2005 to September 2006

Mapping a Safety Strategy

A Safety Strategy is best developed and administered using a clear map to effectively illustrate and manage the accepted direction. Key elements, or safety themes, serve as the foundation upon which safety initiatives can be formulated and added. Mapping the safety themes is a subjective exercise, so it can most effectively be done through a think-tank approach involving a number of industry safety specialists.

The conclusion of such an industry analysis was a strategy constructed around the following major safety themes:

1. Culture,
2. Codes of Practice (including SMS, training and human factors)
3. Adherence to industry standards,
4. Regulatory Framework (rules and oversight),
5. Data collection and analysis,
6. Safety equipment and tools,
7. Air Navigation and Airport Services,
8. Industry Support Services.

These safety themes can be depicted as a <u>Safety Star</u> which can be used to guide the path of the Business Aviation Safety Strategy.

Blueprint for an Action Plan

Business Aviation must continuously reach for the Star. The rays of the Safety Star light the path needed to achieve aviation safety excellence; the safety target themes or paths form a nucleus around which a detailed blueprint can be built.

1. Culture

Organizational safety culture means that everyone, from the chief executive down through the entire company, is committed to continuous safety improvement, always watching for potential hazards and their associated risks, and then developing and implementing appropriate and effective mitigation to either eliminate the hazards or reduce the risks to an acceptable level. An imbedded safety culture is arguably the most significant element of the foundation for safety excellence. It is even more powerful when it includes the elements of a "Just Culture". Just Culture" is the term used to describe the safety-supportive balance between system and individual accountability and includes achieving a balance between an open learning safety culture and the need to hold individuals accountable for their choices. Where a just culture is inherent and is effectively documented, other elements will more easily fall into place. Where it doesn't exist, safety cannot be optimized.

> *Note: An example of explanatory information on a Just Culture can be found at*
> http://www.flightsafety.org/gain/just_culture.pdf

Given the large number of companies operating business aircraft and the diversity in the 14,000 global operators of business aircraft, universal achievement of a safety culture throughout the industry will be elusive. Nevertheless, the following activities are planned to help expand the number of companies committed to a safety culture.

1.1   Develop a brochure that explains the critical importance of achieving a safety culture in a flight department. The brochure should be targeted at chief executives of companies that operate business aircraft. It must be developed to assist conscientious flight department managers to plant the safety culture seed throughout the company.

1.2   Investigate the feasibility of promoting the formation of safety clubs whereby operators in a given geographical area can meet periodically to discuss safety programmes and best practices available to them.

1.3   Develop tools and guidance material to help the industry to undertake cultural assessments.

2. Codes of Practice

The industry must continually learn from itself. Industry Codes of Practice provide the mechanism for the industry to take innovative new safety and security programmes from progressive flight departments and make them readily available to others. Codes of Practice can also be applied by regulators in rulemaking as it reduces workload for regulatory agencies and provides an efficient mechanism for the industry and safety officials to ensure current rules

are in place. They also tend to make regulations more succinct, as reference can be made in the rules to industry codes of practice.

The business aviation industry developed the International Standard for Business Aircraft Operations (IS-BAO) between 1999 and 2002, and since May 2002 it has been recognized as the gold standard for companies demonstrating a high level of safety achievement. The IS-BAO, a set of performance-based standards, is readily scalable and has been successfully implemented by owner – operators, flight departments, both large and small, and by a number of on-demand air taxi/charter operators i.e. holders of an FAR Part 135 Certificate or equivalent.

A Safety Management System (SMS) is the cornerstone for the IS-BAO, which provides a mechanism for companies to continuously improve safety. The industry must routinely challenge itself to assess and improve the Code of Practice. Activities planned for enhancing the code are:

2.1   Annual review by the IS-BAO Standards Board, refinement and continuous improvement of the industry Code of Practice and delivery of an updated standard to all document holders.

2.2   Obtaining feedback from operators, auditors and other stakeholders on the IS-BAO to use as part of the continuous improvement process.

2.3   Develop and implement a marketing strategy to ensure global awareness and knowledge of the industry Code.

2.4   Enhance information contained in Member Association web sites.

2.5   Promote alignment between all industry safety programs such as the NBAA Management Guide and NBAA Professional Development Program, and ensure linkage with the IS-BAO.

2.6   Linkage of the safety standard to international and national business aviation regulatory requirements.

2.7   Review the industry standards to enhance provisions for training, particularly on human factors.

2.8   Complete an analysis of accidents occurring in the landing phase of operation.

2.9   Complete a study of accidents occurring during training and positioning flights.

2.10   Address means of mitigating identified hazards associated with single pilot operations.

3. Adherence to Industry Standards

Industry codes of practice embodied into an industry standard are developed and maintained by industry governing bodies. However, it is incumbent on operators to voluntarily apply them and to continually test their effectiveness. The safety standards will not achieve their objective if flight departments do not implement and apply them conscientiously.

Mechanisms are needed to ensure that flight departments have a tool by which to measure success and to affirm regulatory compliance to company executives, insurance companies and other stakeholders.

    3.1   Monitor the IS-BAO Certificate of Registration programme to ensure auditors remain current and audits are conducted consistently and thoroughly.

    3.2   Research the value of IS-BAO with the insurance industry and capitalize on partnerships opportunities.

    3.3   Publish a summary of the independent analyst's study of the safety value of the IS-BAO.

    3.4   Complete a comprehensive review of NAT Gross Navigation Errors attributed to business aviation.

    3.5   Develop and implement an Education Strategy to help the industry understand industry codes of practice.

4. Regulatory Framework

Differences in rules and procedures between States around the world represent inherent safety deficiencies. There is need for harmonized rules, based on realistic and effective international standards. The business aviation industry strongly encourages contemporary performance-based rules for both commercial and non-commercial operations that are proportional to the risks and are designed to match modern day operational imperatives.

Activities planned to promote improved rules are:

    4.1   Encourage and assist the International Civil Aviation Organization to modernize the Standards and Recommended Practices (SARPs) for International General Aviation Operations (Annex 6 Part II).

    4.2   Participate in ICAO and other standards development organizations towards improvement in regulatory provisions.

    4.3   Contribute to the work of the European Aviation Safety Agency (EASA) and other civil aviation authorities to implement realistic and effective rules applicable to general aviation, consistent with the ICAO SARPS for international general aviation operations.

4.4   Work with EASA and other civil aviation authorities to implement realistic and effective rules applicable to aircraft conducting commercial on-demand air taxi operations.

4.5   Promote the acceptance and use of ICAO SARPs to facilitate rule harmonization.

5. Data Collection and Analysis

A system of metrics for safety in business aviation provides the critical information needed by the industry to influence positive change.

ICAO does not collect, analyze or publish safety data for general aviation. The safety data prepared and analyzed annually by ICAO is focused on commercial operations typically involving large, transport category turbine- powered aeroplanes engaged in scheduled and non-scheduled operations (pax and cargo). This means that while ICAO is in a position to pursue data-driven safety initiatives for this sector of civil aviation, it is unable to do so for general aviation (Annex 6 Part II).

The IBAC Business Aviation Safety Brief, published annually, is the most comprehensive, if not the only, source of global safety data for business aviation.

Mechanisms are needed to measure the level of safety achievement and to monitor trends. Concurrently, there is a need to determine weaknesses and deficiencies so that attention can be focused on achieving safety improvement. There is an ongoing need to collect and analyze data on aircraft incidents, accidents, safety issues, accident rates and causal factors.   Planned activities include:

5.1   Manage the contract with Robert Breiling and Associates to ensure continuity of data collection.

5.2   Make changes to the Business Aviation Safety Brief to demonstrate the safety value of the IS-BAO industry code of practice.

5.3   Partner with aircraft manufactures and aviation authorities to share accident, incident and safety related data and information and improve/validate exposure data (hours/sectors operated)

5.4   Conduct an analysis on reasons for runway accidents involving business aviation aircraft/operators.

5.5   Explore an arrangement with ICAO such that ICAO could, to some   degree, 'recognize' the safety data produced by IBAC.

6. Safety Equipment and Tools

Rapid advances over the past couple of decades in aviation electronics have provided aviation with extraordinary safety enhancements. Continued development of systems such as Enhanced Ground Proximity Warning Systems and Airborne Collision Avoidance Systems will improve safety even further.

Flight Data Analysis (FDA aka FOQA) has proven its value as a powerful safety tool within the airline industry and has been proven to be highly cost effective. Annex 6 Part I requires that FDA programmes be implemented by commercial operators.

Business aviation should constantly seek new safety tools, evaluate them and encourage their introduction. Planned activities are:

6.1 Develop a business aviation policy on Flight Data Analysis including the required alliances to implement such a program.

6.2 Partner with Flight Safety Foundation and other organizations to promote corporate Fight Data Analysis (FDA) and to facilitate publication of safety information.

6.3 Conduct analyses of available safety equipment and the associated benefits and provide relevant information to Member Associations and operators (examples include EGPWS, ACAS etc).

6.4 Work with manufacturers, service providers and operators to develop and encourage data link communications.

6.5 Monitor development of smoke, fire and fumes detection equipment and determine the best means to advise operators of the progress.

6.6 Assess the benefits of tools such as Threat and Error Management (TEM) and determine how best to incorporate these initiatives into the industry code of practice.

7. Air Navigation and Airport Services

Aviation safety is strongly influenced by the quality of the air navigation and airport infrastructure and services. These services are generally provided by government or private bodies; however, the business aviation industry must be prepared to assist in the development and monitoring of good standards and the identification of deficiencies. Industry bodies must be structured and be able to communicate relevant operational information to flight departments and must assist in the communication of information regarding changes to systems. Activities planned are:

7.1 Administer an ongoing Advisory Group on Communication, Navigation, Surveillance/ Air Traffic Management (CNS/ATM), with participation by operators and manufacturers, which can continuously serve as an industry focal point and information clearing house to facilitate the safe, timely and effective CNS/ATM implementation by the business aviation community,

7.2   Develop a mechanism to contribute directly to ICAO bodies that are tasked with the standardization, development, implementation and application of CNS/ATM systems.

7.3   Monitor FDA over a period of time to determine if there programmes needed to reduce runway accidents.

7.4   Encourage use of Runway Awareness and Advisory Systems (RAAS) to reduce runway and taxiway errors.

8. Support Services

Business aviation is highly reliant on specialized support services provided for training, flight planning and operational management. The quality and ready availability of these services have a direct influence on the level of safety in the industry. Activities targeted at enhancing support services are:

8.1   Monitor and promote the concept of flight department pools for the purpose on sharing safety management services.

8.2   Collaborate with Member Associations and training service providers to identify and resolve training issues and to promote good training practices.

8.3   Encourage flight training institutions and operators to expand their simulator training programs to include operations where greater risk exists.

8.4   Encourage flight planning organizations to ensure aircraft data reflects the actual performance capabilities of the aircraft for which the calculations are made.

Quantitative Targets

Tracking the effectiveness of the safety strategy to influence a reduction in business aviation accidents is complicated by the fact that accidents are the result of many contributing factors, making it difficult to link an accident to a given safety strategy theme.   Nevertheless, a quantitative peer assessment of the potential for accident reduction is possible by applying a target for all elements of the strategy combined. A broad target can be set and progress can be tracked against the actual trend over a period of years.

Setting broad targets by the industry based on accident rates should be realistic and based on an assessment of what is achievable. History demonstrates that a year over year improvement is not a good measure given that accidents are a rare occurrence and spikes in event plotting are inevitable. Targets should therefore be based on a longer term trend. Given that IBAC accident data reflects 5 year averages, it is suggested that targets be based on constant improvement in the 5 year running average.

At the present time incident data is available but its reliability for statistical purposes is problematic as only a small percentage of incidents are reported. At some time in the future, if improved collection and analysis tools become available such as wide use of Flight Data Analysis, this data can be applied to tracking incidents to help determine the effectiveness of the Safety Strategy and to potentially add new targets.

Business aviation associations concur that a 5% annual improvement on the 5 year running average trend is achievable. The following graph represents the target.

Business Aviation Accident Trend and Targets to 2012
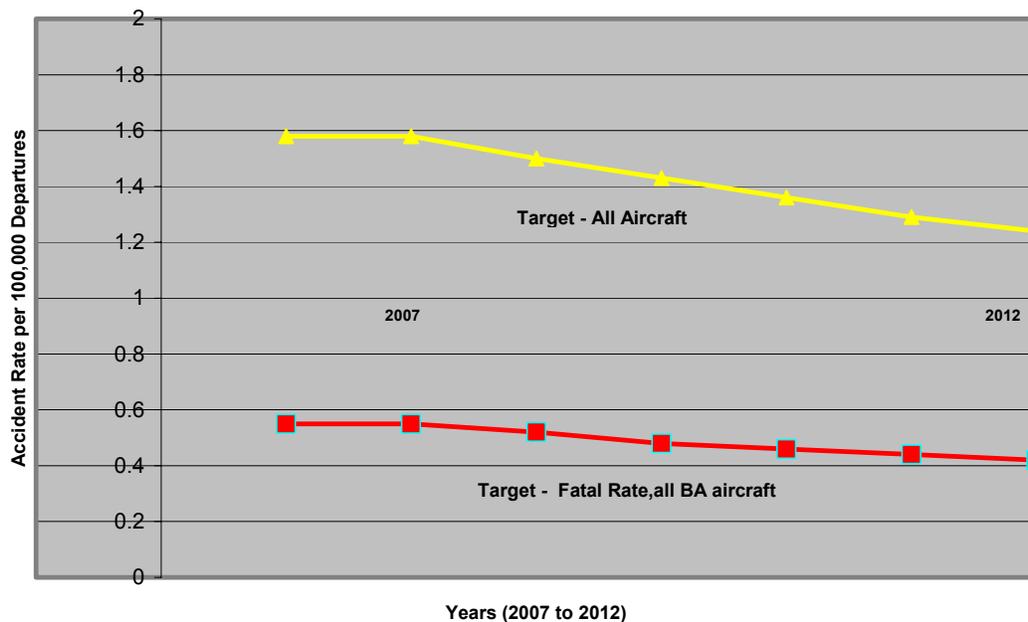
Conclusion

The safety record of business aviation is good, but the industry associations agree that opportunities exist to develop mechanisms to make it better. The objective of the Safety Strategy is to provide an overview of all of the existing and proposed safety initiatives of the industry.

The Safety Strategy in this Paper proposes initiation or continuance of a total of 38 actions under eight principle safety themes. Together they represent the building blocks that will lead to continuous safety improvement. Shooting for the Star will be worth the effort.

Mapping the strategy is only the start. The Strategy must be continuously kept alive and challenged. Results must be recorded and analyzed. Weaknesses must be assessed and the Strategy updated. After it is initially completed it is proposed that the team that developed the Strategy meet periodically to assess results and to add new initiatives.

It is clear that although some parts of the business aviation community have an excellent safety record, others warrant attention. This Strategy emphasizes actions required to improve the relevant sub-sectors. However, the greatest challenge will be to obtain universal recognition and agreement that improvement is both achievable and desirable. The Safety Strategy presents mechanisms to achieve this objective.