ISASI FORUM

"Air Safety Through Investigation"

JANUARY–MARCH 2008

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Scene of an MD-11 cargo accident on April 15, 1999, in Shanghai, China. The aircraft departed Shanghai Hongqiao International Airport with two pilots and one flight technician on board. It crashed at a construction site 3 minutes after takeoff (see article on page 5). Photo by Wu Yibing, CAAC.

ISASI FORUM
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AIR SAFETY INVESTIGATORS
INCORPORATED AUGUST 31, 1964

A Decade of Progress

By Frank Del Gandio, President

The past 10 years have been phenomenal for ISASI. Our individual membership has increased by 150 members. Our corporate members have significantly increased, bringing the active total to 129. In 2000, we purchased office space for ISASI headquarters for $101,000. The office condominium unit is now valued at $250,000. The purchase has saved ISASI approximately $240,000 over the past eight years. A portion of our total office space is leased to other agencies. The income generated reduces our expenses by $8,760 per year. Due to the financial success of our recent seminars we have been able to retire our mortgage, which reduced our annual expenses by another $9,600. In addition, ISASI lobbied for and successfully acquired a "nonprofit" tax exemption from Virginia state personal property and real estate taxes. This further reduced our yearly expense by $10,000. To sum up, our Society's financial situation has changed from a negative status to a financially secure position.

What have we accomplished in the world of aviation safety? I'll start with our "Reachout Workshops" program, which has successfully brought knowledge and expertise regarding accident investigation and safety management to many persons around the world. We have completed 24 Workshops attended by 1,141 participants.

Statistics show that delegate participation at ISASI annual seminars has increased. I attribute this to the excellent quality of the presentations. ISASI 2002 Taipei, Taiwan, and ISASI 2007 Singapore opened the door to the Asian air safety population. Thanks to an anonymous donor, in 2005 we initiated a program to identity the "Best Paper" presented at the annual seminar. The author(s) receive an Award of Excellence in the form of a plaque and a monetary award.

The founding of the ISASI Rudolph Kapustin Memorial Scholarship Fund is still another significant endeavor. It was established in 2002 and honors all ISASI deceased members. The Scholarship's purpose is to encourage and assist aviation students enrolled in the studies of aviation safety and aircraft accident investigation. The program has been so financially successful that we were able to select and provide funds for three recipients for 2007. Generosity is contagious—the recipients of the Award of Excellence for "Best Paper" for ISASI 2007 donated their $500 award to the Fund. Since its inception, $18,875 has been donated to the Fund, and nine students have been named recipients. As a result of the program, two scholarship recipients have gained positions in the aviation safety field. All ISASI Rudolph Kapustin Memorial Scholarship Fund donations are fully tax-deductible in the U.S.

The development of the ISASI website is our newest line of communication to you. The site gives members access to the membership database, *ISASI Forum* articles, Reachout reports, *ISASI Proceedings* dating back to 1970, annual seminar updates, and other important information relative to your Society. The *ISASI Forum* continues as the premier publication of your Society.

Our numerous "working groups" have been productively active. The Cabin Safety, Air Traffic Services, and Investigators Training and Education Working Groups have published guidelines that have been approved by your national Council. The guidelines have been mailed to all governmental investigative agencies in ICAO. The guidelines are also available on the ISASI website. And most recently, ISASI has been granted observer status at ICAO, and we have been invited to participate in the 2008 AIG Meeting in Montreal.

Our Society has indeed been very active over the past decade, accomplishing many effective programs to improve aviation safety worldwide. While I have been your president for the past 10 years, our success has been a collaborative effort of your Executive officers, your international councilors, office manager, and most importantly the continued support of you, the membership.

ISASI has assumed sponsorship of the international Industry Human Factors Working Group, which aims to develop better guidance for investigating human performance. These experts will produce a series of training modules emphasizing state-of-the-art human factors considerations in accident investigation.

Our Society has indeed been very active over the past decade, accomplishing many effective programs to improve aviation safety worldwide. While I have been your president for the past 10 years, our success has been a collaborative effort of your Executive officers, your international councilors, office manager, and most importantly the continued support of you, the membership. I constantly receive accolades from individuals attesting to the professionalism exhibited by ISASI and its members. ISASI is truly an international society covering a broad spectrum of the aviation safety community.

I thank you for the honor to serve as president. It is truly a rewarding and gratifying experience. ◆

V.P.'s Corner

Aircraft 'Accident' Investigators or Aircraft 'Incident' Investigators?

By Ron Schleede, Vice-President

While thinking about a theme for my comments, I noticed an item on the Internet about the Eastern Airlines L-1011 that crashed in the Everglades near Miami, Fla., on Dec. 29, 1972. Several memories came flooding back. It seemed to me that only three-and-a-half years had passed, not 35 years!

As I thought about the "old" days, I pondered how the work of an air safety investigator has changed in those 35 years.

I had just begun my career with the U.S. NTSB in October 1972. It seemed very quiet until Dec. 8, 1972, when a United Airlines Boeing 737-200 crashed on approach to Midway Airport in Chicago, Ill. Forty-three of the 61 occupants and two persons on the ground were killed. I was assigned to the go-team as a human factors investigator trainee, my first on-scene accident investigation for the NTSB.

We were still on scene at Midway, on Dec. 20, 1972, when a North Central Airlines DC-9-31, taking off at Chicago O'Hare Airport, collided with a Delta Air Lines Convair 880 that had just landed. Ten occupants of the DC-9 were killed in the accident. A second NTSB go-team was sent to Chicago. Nine days later, the Eastern L-1011 crashed killing 100 of the 176 occupants. A third NTSB go-team was dispatched.

An Internet search revealed an additional five fatal airline accidents outside of the U.S. in December 1972, killing 239 persons. Worldwide, there were about 70 airline accidents in 1972, killing about 2,500 persons. Fortunately, those numbers were the highest for the next 35 years (excluding the 9/11 events). Another Internet search revealed only about 10 fatal airline accidents worldwide in 2007, with none in the U.S. It would seem that the honed skills of professional air safety investigators are in much less demand.

Indeed, the investigative landscapes, along with technologies and techniques of the air safety investigator, have changed considerably since 1972. But that doesn't mean the "honed skills" need be blunted because of inactivity.

Perhaps what needs to be done is a full transition from being primarily "accident" investigators to primarily "incident" investigators. I am fully aware that major strides are taking place to identify and reduce risk before accidents occur, including government and industry efforts related to Safety Management Systems concepts to deal with risk in aviation operations. However, why not investigate incidents with the same vigor that has been applied to accidents in the past? Why not use the go-team concept and commit comprehensive and dedicated resources to examine incidents? The NTSB actually considered this concept several years ago, but it failed because of lack of resources. It was easy to get resources to investigate a fatal airline accident, but not for incident investigations.

Here is one example in which it is obvious that a more-aggressive approach to examining incidents most likely would have prevented a major fatal airline accident. On Aug. 14, 2005, Helios Flight 522, a Boeing 737-300, crashed near Grammatiko, Greece, killing all 121 persons aboard. That investigation revealed scores of precursor incidents worldwide that had exhibited virtually identical circumstances to those identified in the Helios accident.

Why hadn't the air safety investigators of the world been able to turn findings from scores of incident investigations into corrective actions before the Helios crash? Perhaps, because "incident" investigators had not delved into the precursor incidents as aggressively as past "accident' investigators have done. Perhaps, it was a lack of resources to conduct comprehensive incident investigations.

I believe that air safety investigators must consider virtually every incident a precursor to a fatal accident. Consequently, senior aviation safety officials (government and industry) must ensure that adequate resources are available and are applied to incident investigations, commensurate with those applied to fatal accident investigations, to further improve the safety record.

Dick Wood, who was awarded the 2006 ISASI Jerome Lederer Award, said in his paper *Defining and Investigating Incidents*, "There is evidence we have ignored incidents… [because] we haven't adequately defined 'incidents.' An incident, properly defined, should be a precursor of a future accident. If you consult the various lists of incidents, you will see that almost none of them are precursors of accidents all by themselves. They may be an initiating event or even a key factor in an accident, but there is always more to the accident than just that single event."

I believe that air safety investigators must consider virtually every incident a precursor to a fatal accident. Consequently, senior aviation safety officials (government and industry) must ensure that adequate resources are available and are applied to incident investigations, commensurate with those applied to fatal accident investigations, to further improve the safety record.

I had a very fulfilling career as an accident investigator. I sincerely hope that today's incident investigators are given the opportunity to look back 35 years from now and feel equally fulfilled. ◆

International Cooperation Paves Safer Sky Runways

Through examples, the author demonstrates the importance of international cooperation in accident/incident investigation, and how investigation and safety management benefit from international cooperation.

By Guo Fu, East China Regional Administration, Civil Aviation Administration of China

(This article was adapted, with permission, from the author's presentation entitled International Cooperation Paves the Runway for a Safer Sky, *presented at the ISASI 2007 seminar held in Singapore, Aug. 27-30, 2007, which carried the theme "International Cooperation: From Investigation Site to ICAO." The full presentation including cited references index is on the ISASI website at www.isasi.org.—Editor)*

Case 1: An MD-11F cargo flight accident in Shanghai, China.

It is common sense that the purpose of an accident/incident investigation is to prevent the same occurrence from repeating—so to promote safety, it's important that the investigation can locate or assess the cause(s) and reveal findings in order to enable the entire system or industry to take action. And it is obvious that an investigation is one of the most effective ways to improve safety.

With an annual average growth rate of more than 16% of total air traffic volume within the last 20 years in China, the number of occurrences is increasing accordingly. In addition to the routine preventive measures adopted, we take investigation as one of the most critical means in safety management and investigate both accidents and incidents. While we may not be experienced enough in investigation aspects, China is one of the fastest-growing aviation markets.

Annex 13 provides us with not only standards or basic principles and guidelines for investigation, but also with a cooperative mechanism. Our investigation practices follow both international and domestic regulations and standards. Therefore, our investigation benefits a great deal from international cooperation.

The role of investigation

According to the basic management theory, aviation safety management activities can be classified into three different areas or phases: feedforward management, concurrent management, and feedback management.

- Feedforward management prevents anticipated unsafe events from happening by establishing certification criteria, policies, operational standards, procedures, manuals, training programs, maintenance programs, budgets, etc., that are mainly based on previous experiences or lessons learned, and sets guidelines or processes for implementing a plan, or achieving organizational objectives.
- Concurrent management monitors or oversees operational activities in processes and ensures that immediate, corrective actions be taken if any below-standard condition, deviation from the standard, or any violation is observed during operation so that performance is back on track and the plans are properly implemented or objectives achieved. Thus, it can also be called simultaneous management.
- Feedback management examines the results or consequences of operation, finds, and analyzes the causes of deviation from standards, and then makes guidelines for corrective actions or suggestions. Meanwhile the lessons learned will be fed back

Guo Fu *is an accident investigator with the general Civil Aviation Administration of China (CAAC) and is now the deputy director of the Aviation Safety Office of East China Regional Administration of CAAC. Guo Fu graduated in 1982 from the Civil Aviation University of China, with a major in avionics and in 2000 from Shanghai No. 2 Polytechnic University (with a major in computer technology application). He also has a master's degree in public administration from Shanghai Jiaotong University.*

for modifying or adjusting standards, procedures, policies, and programs, even regulations to prevent reoccurrence.

All these activities provide a safe operation platform, which acts as a solid foundation for a safe operation. Symbolically speaking, the foundation is supported by the feedforward, concurrent, and feedback management tripod. It will collapse if one of the supports fail. From the aviation point of view, a solid foundation can be seen as a concrete runway for safe flight. Therefore, you can never image that a flight would safely takeoff or land if a section or part of the runway fails.

Aviation safety investigation is a type of safety management that falls into the feedback management category. The purposes and functions of the investigation are just the same as those of feedback management. Hence, the investigation activities are as equally important as other safety management measures and play a major role in aviation safety management.

In an investigation, we collect evidence, check all the relevant aircraft systems and related operational support equipment and facilities, gather all the information associated with an incident or accident, review all the relevant documents, procedures, standards and regulations, and try every means to find out, or assess, the causes of an event. We make safety recommendations in order to alert the whole system or industry to take actions to prevent or improve on the basis of findings, including any defect or latent unsafe condition found in the fields of management, design, manufacturing, equipment, operation and maintenance, and human factor issues or lessons learned from an event. With all these measures practiced, the investigation functions as one of the most effective tools of safety protection.

Cooperation in investigation

In Annex 13 to the Convention on International Civil Aviation, the most frequently used words are the state of occurrence, the state of registration, the state of the operator, the state of design, and the state of manufacture. This language shows very clearly that an aviation investigation is a multinational endeavor. We can also find in Annex 13 that obligations and the rights are shared among all these nations. From these points of view, the Annex provides us with not only standards or basic principles and guidelines for investigation, but also a cooperative mechanism. So, it sends a strong signal that investigation cooperation is the international standard for aviation safety investigation.

Case 2: A CRJ-200 passenger flight that crashed in Baotou, China.

In the conduct of an investigation, many reasons exist for the need for cooperation. Though ICAO plays a key role in enhancing cooperation, there are many other factors that drive the investigation itself to seek international cooperation. Aviation is a complex system that is an interacting combination, at any level of complexity, of people, material, machines, tools, software, facilities, and procedures. Furthermore, with globalization and the rapid development in aviation, the investigation will be influenced by different factors, such as new technologies, technical expertise or know-how, different cultural backgrounds, language, political systems, etc. It is evident that an investigation has become a global challenge that needs global cooperation and solutions. One nation's resources sometimes are not adequate to fulfill the requirements of an investigation. Only when an internationally cooperative relationship is established can an efficient and beneficial investigation be achieved.

To investigate an occurrence, we need help and assistance from

- investigation authorities with resources and power to help coordinate and communicate,
- investigators and experts from other nations with knowledge of their nation's safety regulations and policies, operational standards, expertise or know-how of the aircraft and its equipments or systems, and
- other operational supportive facilities, from organizations with special investigation equipment or facilities—otherwise, we couldn't have a good investigation.

Investigation practices in China

Investigation practices in China benefit from international cooperation in terms of technical support and coordination. We have many rules to follow when we conduct an air safety investigation in China. They include both international and domestic standards. In addition to Annex 13, our investigation will be in compliance with the following regulations:

- Law of Civil Aviation of PRC
- Law of PRC on Work Safety
- Civil Aircraft Flight Accident & Incident Investigation (CCAR395)
- Civil Aircraft Flight Incident (MH2001-2004)
- Procedure of Civil Aircraft Accident Investigation (MD-AS-2001-001)
- Classification Standard for Aircraft Flight Accident (GB14648-93)
- Classification for Ground Accidents of Civil Aviation (GB18432-2001)
- Response to Aircraft Accident and Family Assistance (CCAR-399)
- Civil Aviation Safety Information Management (CCAR-396)

A two-leg investigation system is adopted in our investigation practices. According to our regulations, an investigation will be conducted by different organizations depending on the consequences of an event. Traditionally speaking, the investigation function is shared between the Civil Aviation Administration of China (CAAC) and the State Council or its authorized department. More specifically, the State Council is responsible

for the investigation into a significant major air transport accident, while CAAC investigates major air transport accidents and incidents. Usually a significant major accident investigation used to be organized by a temporary organization set up by the State Council, but things have changed since the State Administration of Work Safety (SAWS) was established in 2001.

The SAWS is an affiliated organization of the State Council, and it acts as the executive office of the Work Safety Committee of the State Council. One of its major functions is to supervise the national work safety and conduct or coordinate investigation of significant major accidents, and major accidents occurring within the territory of mainland China. However, its actual investigation activities involve other accident investigations, including general aviation accident investigation and ground aviation accident investigation. SAWS will conduct these types of investigation when it has enough professionals to do so.

The aviation geographical purview of mainland China is divided by seven regional administrations. Within CAAC, the investigation is arranged according to the geographical purviews of the regional administrations. Each regional administration is responsible for conducting an investigation when the following has occurred in its region:

- an incident involving a commercial air transport or a general aviation aircraft.
- a ground accident.

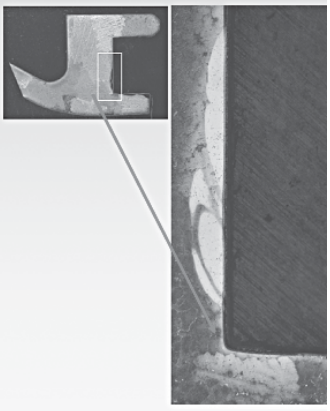
For a major accident, or foreign carrier accident investigation, it is the general CAAC's (headquarters) responsibility to investigate. It can also delegate its investigation authority to relevant regional administrations accordingly.

Investigation regulations

Civil Aircraft Flight Accident & Incident Investigation-CCAR395 outlines all the requirements for the investigation. The main contents are organization of investigation, investigator, notification, investigation, and report. One of the most important features of the regulation is cooperation, which reflects the spirit of Annex 13. Actually, the main contents of the regulation are quite similar to those of Annex 13. The following is the important information of the regulation.

Scope of investigation—Regulation requires the investigation of both accidents and incidents. Although definitions of the accident and incident are almost the same as those in Annex 13, there are more-detailed classifications for the levels of accident and incident, and items are explained. For instance, Civil Aircraft Flight Incident (MH2001-2004) gives the definition of incident and lists items considered as the precursor of the accident. There are two different types of accidents in our classifications—one is flight accident and the other is ground aviation accident. Classification Standard for Aircraft Flight Accident (GB14648-93) defines and classifies the flight accident and as does the Classification for Ground Accidents of Civil Aviation (GB18432-2001).

- Close-up of the transverse section through the OD forward foot of the 4th stage LPT vane cluster, showing likely weld repaired material at the bottom surface under the coating.
- The investigation revealed that the 4th stage LPT vanes were cracked and fractured by high-cycle fatigue at the non-conforming radii, which probably resulted from the vane overhaul.



Basic principles for investigation—Our basic principles must be followed if an investigation is conducted.

- Independent: Investigation shall be conducted independently—no other organization or individual is allowed to interfere.
- Objective: Investigation shall be fact driven, objective, fair, and scientific and cannot have any intent of subjectivity.
- Detailed: Investigation shall analyze and determine the causes of the accident or incident and contributing factors, including any defect concerning aircraft design, manufacture, operation, maintenance, personnel training, and company's management policies, and regulator's rules and regulations and implementation.
- Thorough: Investigation shall not only analyze and determine the cause of the accident and contributing factors, but also analyze and determine factors that are not directly related to the accident, but have potential impact to flight safety and related issues.

Investigation practices

In most cases, an investigation team will be formed immediately upon receiving an occurrence according to the authorization. The size of the team will depend on the consequence and significance of the occurrence. A full go-team will be comprised of investigators from flight operation, airworthiness, ATS, aeronautical meteorology, aviation security, airport management, flight recorders, failure analysis, ground handling, weight and balance, aviation medical, survival factors, human factors, safety management, and some peripheral groups involved—for example, site protection, site clean, and aftermath assistance need to be coordinated.

The investigation process usually has three phases, from notification through final report. We may describe them as rescue and evidence collection; facts, preliminary report, and analysis; conclusion and recommendation. The requirements of the notification, preliminary report, and format final report are the same as those of Annex 13.

We must inform the authorities of the state of manufacture, the state of registry, the state of the operator, and ICAO accordingly, even though the field representatives of the manufacturer are ready to offer help under most cases. And most of the time we have speedy responses with willingness to provide assistance from the relevant authorities. In our practices, we have received assistance from many foreign investigative authorities both in accident and incident investigation. There is no doubt that we have shared a good experience working together with our international partners during an investigation. It is obvious that re-

(continued on page 29)

Standardizing International Taxonomies

Common taxonomy is an indispensable tool to define common safety issues and complementary ways to globally enhance aviation safety.

By Corey Stephens (MO3790), Olivier Ferrante (MO4749), Kyle Olsen, and Vivek Sood

(This article was adapted, with permission, from the authors' presentation entitled Standardizing International Taxonomies for Data-Driven Prevention, *presented at the ISASI 2007 seminar held in Singapore, Aug. 27-30, 2007, which carried the theme "International Cooperation: From Investigation Site to ICAO." The full presentation including cited references index is on the ISASI website at www.isasi.org.—Editor)*

The development of an industry-accepted taxonomy, defined as a classification scheme of keywords and definitions and which can also be considered the "safety language" of information systems, plays an essential role in safety. It goes beyond just identifying occurrence categories. As more data sources and systems become available for use in reactive (post-accident) and proactive safety programs, the importance of well-developed and agreed-upon standards becomes very apparent for data-driven safety initiatives. Industry-accepted standards aid in data sharing and analysis. Common taxonomies and definitions establish a standard industry language, thereby improving the quality of information and communication. With this common language, the aviation community's capacity to focus on common safety issues is greatly enhanced. The safety issues are commonly defined, which facilitates tracking the effectiveness of their mitigation solutions.

The investigation site can be the starting point for data collection. When data are collected and recorded using a standard taxonomy, the data become even more valuable to investigators. Each investigator studying worldwide data is relying on these standardized definitions. In addition, the investigation results can be exchanged among organizations and with the International Civil Aviation Organization (ICAO). The standardized data also forms the core of the data in the ADREP reporting scheme (ICAO, 2001). This operational framework illustrates investigation cooperation, from the investigation site to ICAO.

This article will emphasize how international cooperation in taxonomies can help prevent accidents. Some CAST/ICAO Common Taxonomy Team (CICTT) taxonomies will be presented, as will some examples of their applications that have helped facilitate data collection and analysis for accident prevention. Also discussed is some work on new taxonomies to be standardized, especially for incident investigation. These new taxonomies will help answer the following questions: How do we know that our safety strategies prevented an accident from happening, and how often? Finally, the paper addresses the last important question: How can taxonomies help safety investigators and vice-versa?

CAST/ICAO common taxonomy team history

Comprised of industry and government safety experts, the Commercial Aviation Safety Team (CAST) came together in a unique industry-government partnership in 1997 and set a goal to reduce the U.S. commercial aviation fatal accident rate by

Corey Stephens *at the time of this presentation was a senior staff engineer with the Air Line Pilots Association (ALPA)'s Engineering & Air Safety Department. He has assisted the Inter-national Federation of Air Line Pilots Associations (IFALPA) with technical expertise on international accidents. Corey Stephens was the industry co-chair to the CAST/ICAO Common Taxonomy Team (CICTT) and served as an ALPA representative to the Commercial Aviation Safety Team (CAST)—Joint Implementation Monitoring Data Analysis Team (CAST—JIMDAT).*

Olivier Ferrante *joined the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA) in 2000 and has been working with the Federal Aviation Administration (FAA) (Continued Operational Safety) since November 2005 under a BEA-FAA cooperation agreement. Before that, he worked with the Transportation Safety Board of Canada. Olivier holds a master's degree in aviation engineering from the French National Civil Aviation School (ENAC) and a post-graduate degree in human factors from Paris University.*

Kyle Olsen *joined the FAA Aircraft Engineering Division in 1970 and is now manager of Continued Operational Safety for the FAA Transport Airplane Directorate. He has been deeply involved with CAST since 1997. Kyle was the FAA certification project manager for the L-1011 and MD-11 and was manager of the Propulsion Branch in the FAA Los Angeles Aircraft Certification Office. He has a bachelor's degree in aerospace engineering from the University of Southern California.*

Vivek Sood *is the manager of FAA's Aviation Safety (AVS) Aviation Safety Information Analysis and Sharing (ASIAS) center. He holds commercial, flight instructor, and dispatcher certificates. He has worked in the aviation sector for the last 18 years, particularly in the area of safety analysis. Vivek is a member of the CICTT and is the government co-chair of the Runway Confusion Study Group sponsored by CAST. He has a master's degree in aviation and aerospace operations and a bachelor's degree in aeronautical science from Embry-Riddle Aeronautical University.*

80% over the next 10 years.

Though CAST has focused primarily on the U.S. aviation system, throughout its history CAST has reached out internationally to help improve aviation safety around the world. A large number of international organizations are members and observers of CAST, including the European Aviation Safety Agency (EASA), the Joint Aviation Authorities (JAA), and other ICAO member states. CAST's impact and leadership extends to regional safety alliances around the world, and its principles have been incorporated into the newly released ICAO global safety roadmap.

CAST has developed an integrated, data-driven strategy to reduce the commercial aviation fatality risk in the United States. To date, CAST has completed 40 of the 65 most promising safety enhancements identified to reduce the leading causes of fatal commercial aviation accidents in the United States. Adoption of these enhancements has been a major factor in the substantial reduction of the fatal accident rate over the past 10 years. CAST is redirecting its efforts to the analysis of incident data to identify emerging safety risks.

To continue to achieve reductions in the accident rate, it is necessary to expand into analysis of incident and normal operation data to unearth changing and emerging threats in a proactive manner. Access to the data is a vital component of this risk analysis. The use of CICTT taxonomies by all organizations will be critical to further advancements in aviation safety. The absence of a common taxonomy and the lack of industry data-sharing initiatives greatly diminishes the ability to recognize emerging risks and increasing threats before their manifestation in an accident or serious incident.

Before the formation of the CICTT (CAST/ICAO Common Taxonomy Team), there was no universal standard for safety data. A focus on safety worldwide at that time resulted in the startup of many disparate efforts. This in turn made the development of a common worldwide safety agenda extremely difficult. It was decided that an international industry and government standard must be developed, made up of common and "non-proprietary" standards.

Non-proprietary standards were needed since proprietary or patented taxonomies had contributed to stovepiping of data. ICAO and CAST jointly chartered the CICTT in 1999. The Team is charged with developing common taxonomies and definitions for aviation accident and incident reporting systems. CICTT includes experts from ICAO, several air carriers, airframe and engine manufacturers, pilot associations, regulatory authorities, transportation safety boards, and members from North America and Europe, and indirectly from more countries. CICTT is co-chaired by one representative from ICAO and one from CAST.

tions for its annual statistical summary of accidents (Boeing, 2006).

The CICTT Occurrence Categories are also used by the Safety Indicator Study Group (SISG)—a group formed by ICAO after the 1999 Accident Investigation and Prevention Divisional Meeting (AIG 99). Since 2001, SISG has met annually to exchange, review, and jointly classify accident

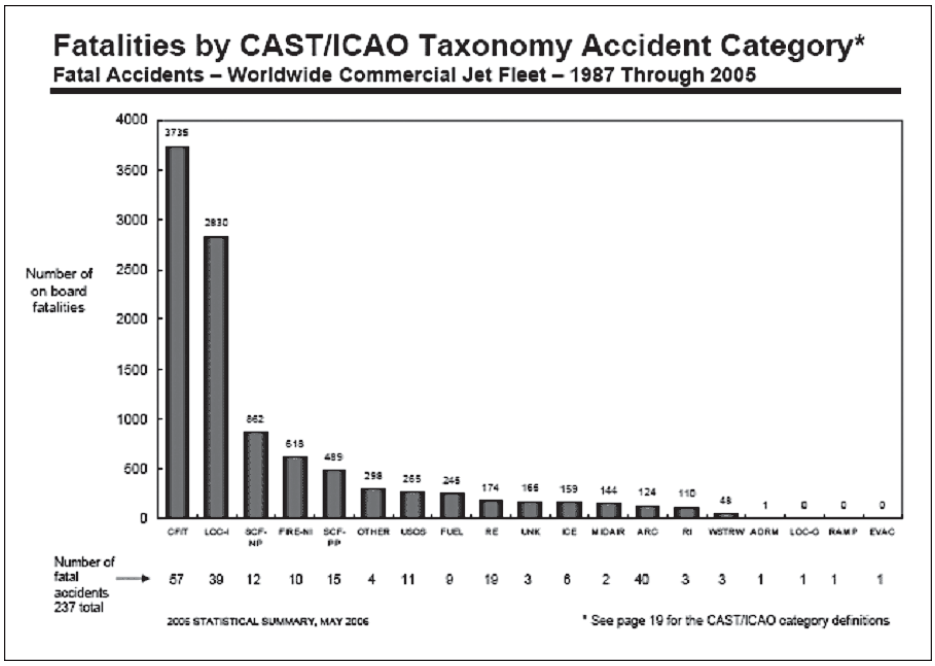


Figure 1. Boeing statistics based on CICTT Occurrence Categories.

The original taxonomies established by the CICTT activity were Occurrence Categories, Phase of Flight, Aircraft Make/Model/Series, and Engine Make/Model. The Occurrence Categories and Phase of Flight definitions were completed in 2002. The Aircraft Make/Model/Series values were established in 2004, and the Engine Make/Model values activity started in 2006. Both the Aircraft and Engine taxonomies are updated quarterly. The establishment of these original taxonomies lays the foundation for

- worldwide sharing of common accident/incident data,
- focused, data-driven, coordinated safety agendas,
- common investigation, reporting, and post-accident analysis, and
- shifting from reactive to proactive safety assessments.

CICTT product applications examples

Industry has been gradually implementing CICTT products. Figure 1 shows how the Boeing Company adopted CICTT definitions and incident data to produce consistent safety statistics.

Figure 2 (page 10) illustrates the downward trend of controlled flight into terrain (CFIT) accidents. This example shows a "common taxonomy benefit" for CFIT prevention since a common understanding of this issue was needed before tackling it.

The efforts undertaken these past years to prevent CFIT accidents (the acronym CFIT was less known 20 years ago) introduced new safety nets to successfully address this accident category. The common categorization of a problem and its coding greatly helped to better identify it and monitor its trend. Above all, it contributed to gathering a global consensus. The different stakeholders (industry and government) could "talk" about the same issue and consequently act in a coordinated manner.

ASIAS in the United States

The FAA promotes the open exchange of safety information to continuously improve aviation safety. To further this basic objective, the FAA established the ASIAS (Avia-

tion Safety Information Analysis and Sharing) center.

A fundamental problem faced by ASIAS is the heterogeneous nature of the data systems that have been developed by the various organizations. The systems typically feature text blocks that are not governed by controlled vocabularies and contain data values that do not conform to any common standard (aircraft make/model codes). In addition, the systems store data in database structures that have little in common. As a result, safety analysts are faced with a mosaic of data that can only be viewed one piece at a time. ASIAS addressed these problems by implementing a data-management strategy known as the Advanced Data Architecture (ADA). The principal objective of the strategy was to enhance the analytical value of existing data sources by creating an operational environment that supports the rapid and cost-effective integration of data from multiple sources.

The development of ASIAS has allowed the FAA to standardize data-management practices and address data quality issues. Having developed and deployed a data-management framework, ASIAS is focusing its efforts on the development and adoption of common taxonomies and definitions and analytical methodologies. ASIAS has made significant progress in developing analytical capabilities by establishing internal data standards and using CICTT taxonomies.

By focusing on standardizing key data elements initially, like aircraft make and model, airport names, state names, country names, and operator names, ASIAS is able to link databases and establish interoperability among multiple source systems. Through the ASIAS web-based portal (see Figure 3), users are able to query multiple systems in a single query.

The global query search can mine several databases by entering a unique aircraft model thanks to the CICTT Aircraft Make/Model/Series standard. Figure 4 depicts a single query for a Boeing 737-800 and its associated results.

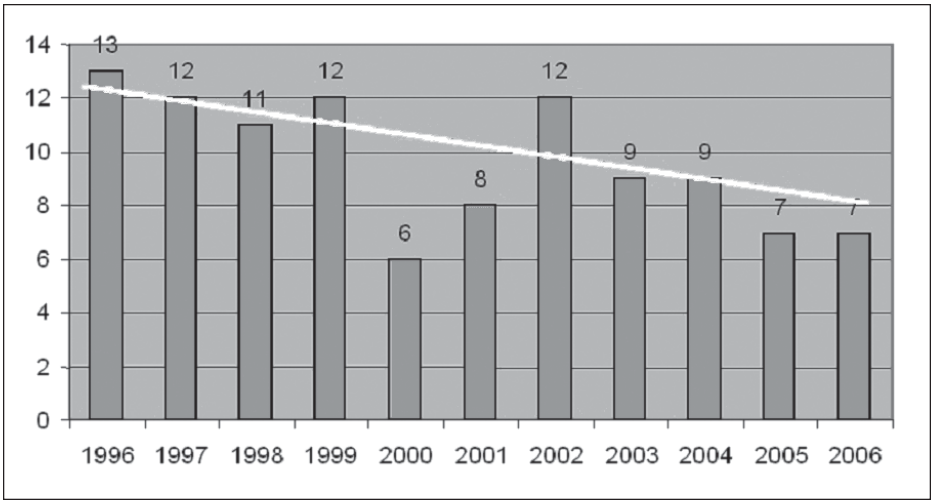


Figure 2. Worldwide evolution of CFIT accidents (Source: ICAO SISG 2007).

ECCAIRS in Europe

The ASIAS "portal" approach and the European Coordination Center for Aviation Incident Reporting Systems (ECCAIRS) share objectives. The European Commission provides a common tool for users across Europe to encode accidents and incidents into compatible repositories. ECCAIRS is based on the ICAO ADREP (Accident/Incident Data Reporting) 2000 taxonomy (Menzel, 2004). This common tool facilitates electronic exchanges and data integration among organizations from different countries (not necessarily from the European Union). Safety analyses can then be based on larger data sets.

The ADREP taxonomy has adopted CICTT products throughout the years. ADREP implemented the Occurrence Categories in 2004 and will adopt the CICTT Aircraft Make/Model/Series standard in its next release. Taxonomy changes take time as they generally require changing the structure of existing systems. Such a migration has to be planned and coordinated among the various organizations involved.

The European Aviation Safety Agency, which operates ECCAIRS, directly implemented the CICTT Aircraft Make/Model/Series standard in its new airworthiness directive database. This new compatible database should facilitate investigations and enhance continued operational safety. For example, while working on a given occurrence, an investigator should easily be able to verify pending issues in the airworthiness directives system in relation with the Aircraft Make/Model/Series mentioned in the notification. This verification would be done electronically with a high degree of confidence because of the common standard.

Interconnecting safety information systems

Common taxonomies are enabling tools that can accelerate the collection and consolidation of facts during an investigation. This can be done by interconnecting safety information systems (at national or international levels) or by making them interoperable like ASIAS. Studies have demonstrated the feasibility of interconnecting, for example, U.S. and European safety systems, by combining information technologies and common taxonomies. The efforts undertaken by CICTT enable safety information systems to talk to one another (or to be cross-visible) and safety data to have the same meaning in respective systems.

Investigators soon will have easier and faster access to a growing number of data systems for their searches of similar incidents. The challenge is to avoid being buried by the exponential increase of electronic data. "Intelligent" classification schemes are needed more than ever.

During ISASI 2006, Dick Wood stressed that "an incident, properly defined, should be a precursor of a future accident." He also added that if we consult the current lists of incidents, none of them are precursors to accidents by themselves. They may be an initiating event or even a key factor in an accident, but there is always more to the accident than just a single event. The majority of these predefined lists of incidents (or taxonomies) deal with "visible" incidents. This means we already know what they are, their causal factors, and their solutions. Because they are generally isolated events caught by the redundant safety nets, they do not degenerate into accidents. There is a tendency to ignore them. The "real" precursor is a situation that is not "single error safe." Consequently, it becomes crucial to better understand the safety nets of the system and their effectiveness in preventing accidents.

"Hard" and "soft" safety nets

ECCAIRS allows investigators to record technical safety nets as well as to keep track of the failure of the expected function of these "hard" barriers. On the other hand, when analyzing incidents and human defenses, it is not yet possible to keep track of those factors that saved the day, such as a successful third-party intervention or the application of the relevant procedure. These successful human interventions that prevented an incident from turning into an accident or minimized accident outcomes are not currently uniformly recorded in databases, probably because taxonomies illustrate the recent efforts in enhancing safety through the addition of technical safety nets like those available in the ADREP taxonomy. This is more in line with a reactive paradigm where a safety net (a new system or regulation) is added because of an accident, whereas the successful human interventions have not yet been recorded in a standardized way through a common "positive taxonomy."

The aviation system has indeed achieved an impressive safety level across time by creating redundant systems and adding safety layers for prevention and mitigation. The "single error safe" system started with the airplane itself. Much of the airplane design criteria are meant to provide a redundancy wherein the failure of any system or part of a system does not lead to an accident. This concept has been extended to the other components of the aeronautical system. The Airborne Collision Avoidance System (ACAS), Minimum Safe Altitude Warning System (MSAW), Terrain Awareness and Warning System (TAWS), standard operating procedures (SOPs), and training are examples of "hard" and "soft" safety nets that prevent accidents. However, the effectiveness of these safety measures is difficult to assess. Our safety statistics are presently only using negative indicators, such as accident or fatality numbers.

We need to develop an easy-to-use target taxonomy that would enable "rough" trend analyses of some key safety nets (both "soft" and "hard") of the aviation system. Having better indications of the coverage of these safety nets should facilitate their monitoring and should contribute to reinforcing the resilience of the aeronautical system.

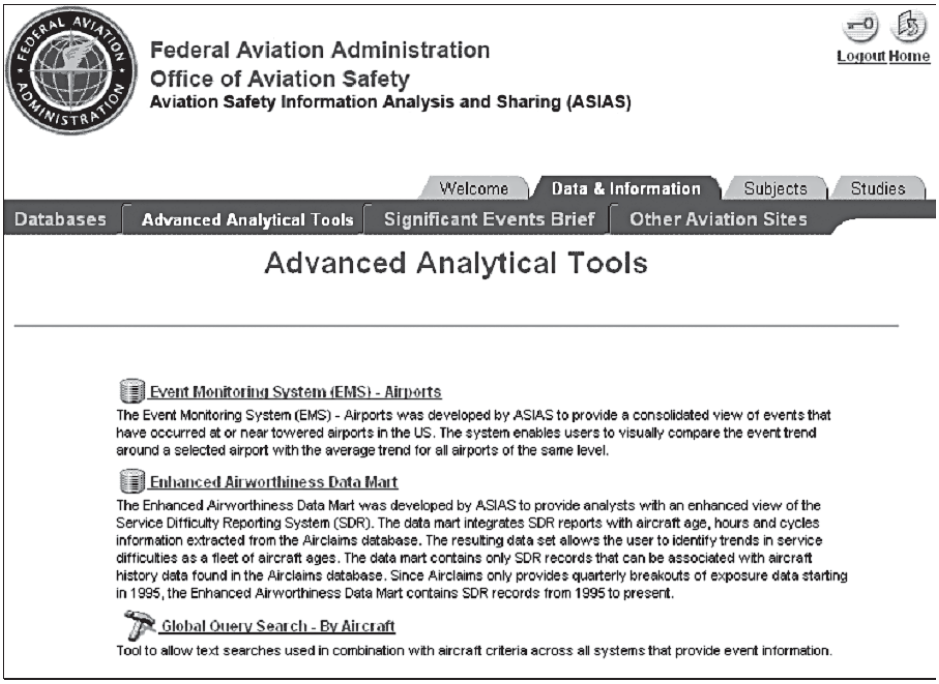
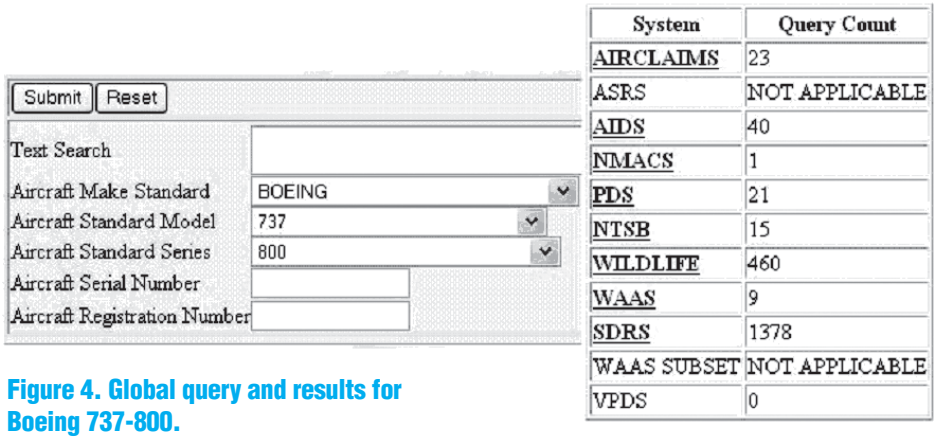


Figure 3. Access to global query search—by aircraft.



System	Query Count
AIRCLAIMS	23
ASRS	NOT APPLICABLE
AIDS	40
NMACS	1
PDS	21
NTSB	15
WILDLIFE	460
WAAS	9
SDRS	1378
WAAS SUBSET	NOT APPLICABLE
VPDS	0

Figure 4. Global query and results for Boeing 737-800.

Positive taxonomy sub-team

CICTT has chartered a sub-team to develop a positive taxonomy that aims at better identifying the safety nets and assessing their effectiveness, with emphasis on the successful human interventions. Human factors have generally been considered in relation to accident causes or as performance limitations. The sub-team will—

- consider the human factor as a safety factor;
- record successful human interventions in databases, and
- capitalize on positive taxonomy to increase the resilience of the aeronautical system.

This shifting from a reactive to a proactive focus is not new. For example, L. Benner and I. Rimson, in 1995, suggested in the following situations

- To redirect data acquisition concentration from accidents (which identify causes or operational failures) to incidents (which identify both operational failures and successful recoveries).
- To try to find answers to the question "What went right to prevent it?" instead of "What went wrong to cause it?"
- To acknowledge both the ubiquity of human error and the human capability to recover from errors. Redirect resources toward successful intervention processes that thwart accident progression, thereby focusing on adaptation to error rather than error perpetuation.
- To expand the focus of investigations to include positive factors.

The positive factors mentioned more than 10 years ago are included in the Terms of Reference of the positive taxonomy sub-team.

CICTT concept banks

Another major challenge faced by aviation safety analysts is the extensive use of free text

to capture important information related to accidents and incidents. Simple facts, such as date, time, operator, altitude, and location, are easily collected using structured data fields. Acquiring a thorough understanding of what happened, how, and why, however, requires a subject matter expert to interpret the narrative component of the report if there are no structured data fields. Accident narratives can be lengthy and complex. Depending on the nature of an analysis, subject matter experts may be required to read thousands of reports. As a result, a safety analysis can be a very time-consuming and expensive undertaking.

One approach to addressing the free-text issue is to develop text-mining concepts. A concept, simply stated, is a collection of words that have been related to a subject. Concepts can be combined to form complex concepts that include word strings and use text-mining techniques, such as stemming and word proximity rules, to assess the strengths of relationships among words.

In a recent study using the concepts for automation and confusion, analysts were quickly able to search 5.4 million records to identify 800 reports for further analysis. Figure 5 illustrates some concept banks in relation to another study on Boeing 737 pressurization events.

The objective of the CICTT Text-Mining Concepts Taxonomy is to develop a shareable collection of concepts (concept banks) and structure them within a taxonomy that will facilitate easy retrieval by the aviation community. The development of concept banks greatly helps exploit the current databases that do not operate a common safety language yet. A next step could be merging the concept banks within new structured fields for improved trend analyses.

Better defining "serious incident"

These sub-teams are part of a wider effort that has been trying to address the challenge presented by ISASI's President Frank Del Gandio in his opening speech of ISASI 2006 ("Incidents to Accidents—Breaking the Chain"): "To do this right, we will need to sharpen traditional investigative and analytical skills to understand visible, high-risk incidents that come to our attention."

Braking the chain requires having tools to sift through the increasing number of reported occurrences in order to "find that needle in a haystack that might really be worth understanding...," as noted by Del Gandio. These tools are needed because investigation organizations do not have the time or resources to investigate everything that might be reported under the current reporting rules. This brings up the "serious incidents" that should be the outcome of this sifting process.

As a result of the ICAO Accident Investigation and Prevention Divisional Meeting 1992, the term "serious incident" was included in Annex 13 and defined as "an incident involving circumstances indicating that an accident nearly occurred." This paved the way for the investigation of serious incidents. How can reality be assessed 15 years after AIG 92? In some countries, serious incidents are treated like accidents by the investigation authority. Even the flight safety departments of many airlines investigate incidents and serious incidents. Nevertheless, not all incidents that should be defined as serious incidents are investigated. It is clear to anyone that the investigation of a serious incident can contribute as much to flight safety as the investigation of an accident with a fatal outcome. It is equally clear that it is nearly impossible to spend as much time and effort on this kind of investigation.

Investigation authorities have stressed the need to bring more consistency to the interpretation of a serious incident. Resources would be well spent to identify serious incidents that avoided becoming accidents because of luck. These serious incidents should highlight the gaps and weaknesses of the system.

How taxonomies help

The introduction of a positive taxonomy could help safety investigators in classifying incidents and Annex 13 serious incidents by putting more emphasis on causes rather than on consequences. Most incident lists describe known outcomes whose causal factors (and solutions) are also known. Considering "positive" factors should change the way occurrences are being considered and could help address the challenge of finding new accident precursors. The following short checklist of questions from "Towards a Human Factor 'Positive' Taxonomy for Occurrence Analysis" paper by B. Boudou, Y. Pouliquen, and O. Ferrante could also be useful:

1. Why did this incident not turn into an accident?
2. Was there equipment, a decision, and/or a procedure that prevented an accident from occurring?
3. In the case of an accident, could it have been more serious?
4. What prevented the accident/incident from being more serious? For example, if a passenger is injured, is it worth considering that his environment (seat, seat belt, etc.) contributed to his survival?
5. Are the results of this occurrence only a matter of circumstances?
6. Was there any human (positive) factor that reduced the seriousness of the accident/incident?

The answer to the last question should be very helpful in classifying an occurrence as a serious incident. In other words, if the consequences appear to be merely a matter of circumstances, meaning that no human positive intervention was identified, then the occurrence could be considered a serious incident and investigated in depth. It could help identify causes that are more difficult to observe than effects.

The introduction of such a taxonomy, as well as the six questions previously mentioned, would help analysts and investigators classify, consider, investigate, and analyze occurrences. It would mean an alteration to the overall framework that should be discussed during the next ICAO Accident Investigation and Prevention Divisional Meeting (AIG 2008 tentatively scheduled for September 2008 in Montreal). Some proposals could include

- for the short term, guidance material such as a checklist of questions.
- for the medium/long term, common fields in databases to better assess the resilience of the overall system.

If we want to be more proactive, we should collect data that would help assess the resilience of the existing safety nets. If, for example, the first elements of an investigation cannot highlight a safety net, that is, there was no damage nor injury thanks to luck, then the occurrence should be investigated in depth. Common taxonomies are tools that help shift focus from consequences to causes.

Weighing pros and cons

The image of a balance leveraging production goals versus safety goals is commonly used by Safety Management System (SMS) programs. The positive taxonomy aims at completing this tool with a "safety balance" that would leverage the "new" positive factors versus the "usual" negative ones. This should help decision-makers better assess the pros and cons of a safety decision. For example, regarding the language issue for air traffic control, authorities in some coun-

tries may have to decide about implementing the systematic use of the English language for radio communications in areas with significant international traffic. In such cases, a risk analysis should also take into account the times when the use of the local language prevented a misunderstanding of a non-native speaker from turning into a hazardous situation. To have a more complete picture of the reality of operations, the reporting systems must flag and record the safety nets (that is, positive factors), such as the use of another language, which prevented accidents. If we generalize this example, we need to have a global and common approach to ultimately producing consistent data to give decision-makers a more complete picture of the aviation system.

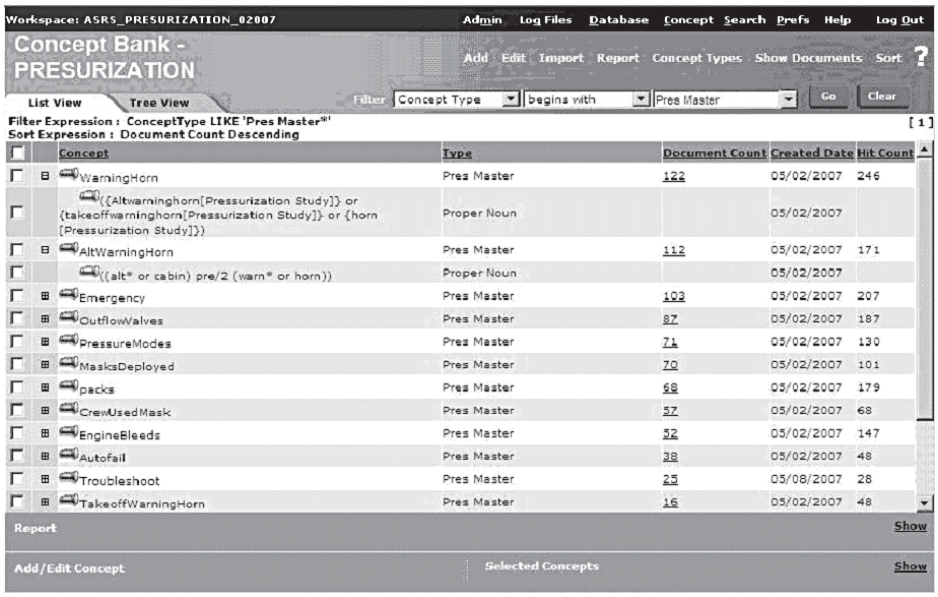


Figure 5. Examples of "concept banks" applied to various text-based data sources.

Safety investigator roles

Safety investigators are the end-users of data systems in one way or another—either by entering data or by querying it for investigation or analytical purposes. They are instrumental as they collect and provide the facts on which the safety data are based.

When the Annex 13 tools and resources are applied to serious incidents, safety investigations can explore more in-depth the causal factors with clear cause and effects relationships, especially from a human factors standpoint, because all actors survived and can recollect the circumstances of the hazardous buildup. More investigations on serious incidents shared through the existing ADREP framework could provide quality data, ideally data also recording the strengths and weaknesses of the system.

The next step could be to combine incident, serious incident, and accident data to establish enhanced "reading grids" to better diagnose the risks. This can currently be done in hindsight. Foresight capabilities are on the horizon if we all apply the same approach to serious incidents. Safety investigators could thus mine more similar incidents (precursors?) and build complete and convincing safety cases powered by more and better data. With more and more documents in electronic format and numerous reporting systems, there is a great potential for enhanced tools (based on common taxonomies) having foresight capabilities.

The safety investigators who provide the facts and data that will ultimately feed these analytical tools should be involved in these expanding new activities. Participation in the newly founded international working groups is more than welcomed from both industry and government representatives. The challenge consists of jointly developing a universal set of simple tools, accepted and used by all for data-driven prevention. CICTT could ultimately have an impact on the investigation framework if supported by the various stakeholders, especially by ISASI and its members.

The future

Taxonomies have evolved in line with the scope of investigations (technical failures in the 1950s/1960s, human failures in the 1970s/1980s, and organizational failures in the 1990s). Failures are tied to accidents. As we are moving toward incident investigations, why not have successes tied to incidents?

The rise of the Internet and powerful databases like Google have been underexploited for accident and incident investigations. The resources offer promising safety prospects if everybody shares the same safety language and if taxonomies are transcribed into user friendly tools. The efforts already undertaken by CICTT enable safety information systems to talk to one another and safety data to have the same meaning in respective systems. This common taxonomy is an indispensable tool to define common safety issues and complementary ways to globally enhance aviation safety.

Looking into the future, emerging information technologies will greatly improve our ability to collect data but, at the same time, make it even more difficult to conduct safety analyses. This is because the data-management environment is simply not equipped to handle an exponential growth of data. For example, low-cost, sensor-equipped processors are starting to be deployed on everything from aircraft parts to produce in the grocery stores. These sensors can measure and regularly report over wireless networks various attributes such as locations, performance factors, or environmental conditions that are of interest to us. A single airliner equipped with thousands of these low-cost sensors could report various parameters every second. A fleet of these aircraft could generate terabytes of data per day and give new meaning to the expression "information overload."

The technology to enable these capabilities is on the horizon. However, if it is difficult to manage aircraft accident/incident reports, how will the information systems adapt to the new technologies and their potential impact? How will value be derived from the new data? How will analyses be conducted and new safety hazards identified?

The CICTT is addressing standardization issues by developing an industrywide consensus as to what business rules and naming conventions should be applied to key aviation descriptors and data elements. The long-term goal of this effort is the development of a core universal aviation language that will maximize the industry's capability to analyze and share aviation safety data and information. The CICTT is nearing the completion of the first phase of the effort and will be moving on to subsequent phases. ◆

Small Plane Search in Atla

An example of how cooperation among an accredited investigation team, local authority, local marine professionals, and the general public helped bring closure to an investigation and to the pilot's family.

By Joseph Galliker (M03322)

(This article was adapted, with permission, from the author's presentation entitled International Investigation: General Aviation Accident in Atlantic Waters, *presented at the ISASI 2007 seminar held in Singapore, Aug. 27-30, 2007, which carried the theme "International Cooperation: From Investigation Site to ICAO." The full presentation including cited references index is on the ISASI website at www.isasi.org.—Editor)*

One of the two remaining aircraft in the hangar at Narsarsuaq.

On Feb. 2, 2007, three identical factory-new Cirrus SR20s were enroute from Goose Bay, Canada, to Reykjavik, Iceland. While diverting to Narsarsuaq, Greenland, due to weather ahead, the engine of one of the aircraft failed twice due to low engine oil pressure and loss of engine oil. Engine oil appeared on the windshield. The engine could not be restarted. Gliding from cruising altitude, the pilot was able to reach the coastal waters of the first rock islands in southern Greenland (approximately 45 nautical miles southwest of Narsarsuaq near the "SI" NDB). The pilot ditched the aircraft but drowned outside the aircraft.

Site investigation in Greenland

In Greenland, aviation accident investigation falls into the jurisdiction of the Accident Investigation Board of Denmark. The investigator-in-charge (IIC) proceeded to Greenland to conduct the field investigation. On arrival in Narsarsuaq, he met up with the representative of the aircraft manufacturer, engine manufacturer, and the representative for the next of kin of the pilot.

The pilots of the remaining two aircraft had already been telephone interviewed by the investigator-in-charge. As both of these pilots had communicated with the aircraft in distress, and searched for and located the pilot and the aircraft, they became prime witnesses. The two pilots stated they found their colleague floating about 70 meters from the aircraft. The aircraft itself was afloat with the tail broken (but still attached) protruding above the surface of the water. The sea had waves and swells (5-7 feet). Water temperature was -1 to +1 C.

The alarm and mobilization of the local emergency response plan had also been initiated immediately, and the first helicopter (AS350) reached the area within about 10 minutes. Shortly after, the first rescue helicopter was joined by a second one (Sikorsky S-61). The S-61 retrieved the lifeless pilot and flew him to the Qaqortoq hospital (30 kilometers), where he was pronounced dead. The S-61 helicopter "froze" the location of the floating aircraft on GPS. The next day it was reported that the aircraft had sunk.

The days following the arrival of the IIC were plagued by extremely cold, wind, and snowy weather conditions. Proceeding to the accident site was postponed by the IIC pending safe flying weather for the AS350 helicopter.

The two remaining aircraft were placed in the only hangar in Narsarsuaq, in nice

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ntic Waters

and cozy 20 degrees Celsius temperature. Going to the hangar from the hotel was a different story. High winds (100 kilometers/hour) and cold temperatures prevailed for days. The effects were, for example, that reading glasses were blown off one of the team member's face and promptly flew "straight and level" until later the next day they were found by a search party 50 meters downwind. The two aircraft were checked for fuel level and balance, as well as service bulletin status.

Two service bulletins were of interest, "Oil Breather Tube Insulation" and "Engine Winterization Kit." They had not been incorporated for the flight.

Finally, on a Saturday, the sky cleared and the wind was calm. This was the time to fly to the site. The intention by all was to see if the aircraft could be seen under water, if any debris could be spotted on the shores of the nearby small rocky islands, and have the helicopter pilot comment on the location of the aircraft. Equipped with three GPS units, we set off. One of the GPS units was a Garmin 295 with maps for Greenland.

On the way, the pilot showed us some earlier crash sites—all well preserved, some dating back to the second World War. The coastal islands were clearly visible on the maps of the GPSs, and we soon found the spot matching the coordinates taken at the site on the day of the rescue operation. The site was open water, with some white chunks of glacier ice, fairly calm sea, at a distance of about 200 meters from the shore of an approximately 50 by 100 meters solid-rock island.

We thought it would be best to check the shore of the nearest island for any debris or other evidence of the aircraft. Anxiously scanning the steep, rocky shore, we could not see a single shred of anything but crystal clear water (would qualify as premium mineral soda water in any big city). Suddenly one team member shouted, "I see it. I see it!" We all turned to his side of the helicopter, and indeed could see the shape of what looked like a white airplane under water. A minute later, big disappointment; on closer investigation it turned out to be a sand patch in about 20 meters of water. We learned from that, as later there were similar sightings.

Flying further out from the shore of the island, another call "for stop it" occurred. This time it was clearly a paper page like a flight plan or chart, floating horizontally about a meter under the surface of the water. The location was about 300 meters farther out to sea from were the aircraft had been ditching. We searched for an amount of time but could not find anything else, but we were getting a feel for the ditching and pilot rescue locations and their reference to the island. We returned to Narsarsuaq, somewhat disappointed, but appreciating what nature is like out there.

We realized boats with sonar and barges with cranes would be required for the next step to determine the depth of the seabed at the ditching location, then search for the aircraft and, if found, to lift it and bring it ashore in the nearest town (Qaqortoq).

But where in Greenland is such equipment available and at what cost? By speaking with local fishermen, they expressed the following concerns about the aircraft location and what could happen to the aircraft itself:

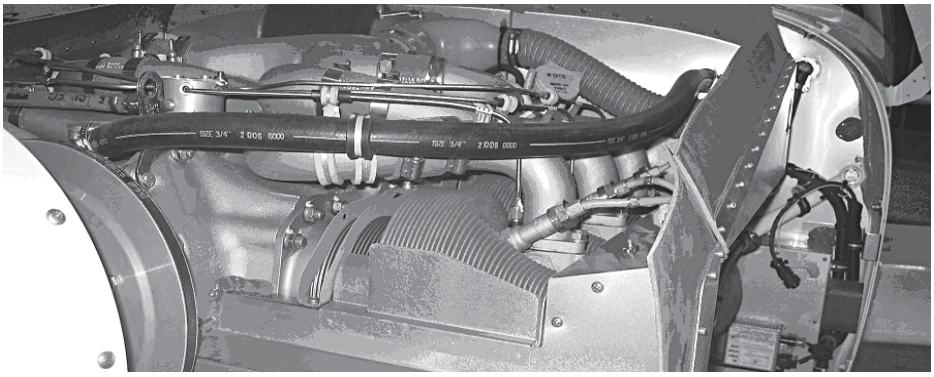
- Strong currents (north/south and tidal east/west).
- Icebergs in March to May to crush the aircraft on the seabed (icebergs can reach depths of 30 meters or more).
- Angle at which the aircraft sunk to the bottom of the seabed.
- Seabed surface could be anything from large rock boulders to sand or steep inclines or crevasses.
- The depth at the site. There are some recent charts that show general and sparsely measured depths farther out (~241 meters).

The days following the arrival of the IIC were plagued by extremely cold, wind, and snowy weather conditions.

Aircraft search

The investigator-in-charge discussed the search for the aircraft with Greenland and Danish authorities. It became clear that the cost would be prohibitive. The wife of the pilot asked her representative to the investigation to explore a "low-cost solution," to find and raise the aircraft. She felt she needed to see the aircraft for closure.

In June, with permission and cooperation of the IIC, the representative for the pilot began to contact the local police (Qaqortoq), which provided contacts to local owners of boats. It became soon clear that the resources were limited. The representative proceeded to Narsarsuaq then to Qaqortoq



One of the two remaining aircraft—oil breather tube.

LEFT: Trawler with drag net. MIDDLE: Danish Navy charting ship—SKA-12. RIGHT: The two ships surveying the seabed in the site area.

to inquire and speak with local professionals in person. The plan was to find someone who could scan the seabed at the site with an echo sounder, then if the aircraft was spotted, try to lift it. How, was not clear yet.

Speaking to crewmembers of the Danish Ice Patrol Unit based in Narsarsuaq brought forward good maps of the site area. They had checked the site from time to time by flying over it with their helicopter. They also suggested contacting the only diver in the area, as he had lots of experience finding "things" under water. They also suggested contacting two Danish Navy ships, which were on a mission to chart the southern Greenland seabed out of Qaqortoq. They had been docking in Qaqortoq harbor for the last few weeks. "How lucky can one get," I thought to myself.

It took a while to find the diver (Kaj), as he was held in a remote location by bad weather. His wife, however, provided good information of his capabilities. Not only was he a diver, but he also owned two 10-meter boats, well equipped with echo lots (as they are called locally). In the meantime, wandering around the harbor in Qaqortoq and speaking with people also provided hope for finding the aircraft and lifting it. No sight of Danish Navy ships though. They had left in the morning, bound to be at sea for a few days.

Walking one evening on the pier, I saw a 20-meter trawler come in and moor. Looking at the net, it seemed massive with steel balls and huge grommet-like rubber rings.

"What can you do with this net?"

"What do you have in mind?" the captain/owner asked.

"Looking for an aircraft out in the Niaqornaq Island area."

"How big is the aircraft?" After he understood the situation and possible depths, he summarized: "We can find the aircraft as our drag net can trawl to 300 meters. Also at a depth of around 100 meters, we can snag it with the net and lift it and bring it right into this harbor." He then showed and explained the gear and the measuring and navigation equipment—latest state of the art.

He suggested that I go with the diver and survey the seabed in the area around the GPS coordinates of the aircraft last seen, to provide him a feel for the make up of the ground (level sand, boulders, or crevasses, etc.) as well as the exact terrain depths a few hundred meters around the site.

This experience is a good example of cooperation among an investigation team with accredited members, local authority, local professionals, and general public to help the investigation (cause) and the pilot's family (closure).

The diver was available the next day, and with good planning we went off to the site (25 kilometers from Qaqortoq). On the way, one of the Danish Navy ships, the SKA-12, appeared on the horizon. Our captain contacted it by radio to ask about exact depths in the site area. In a cooperative tone of voice, an officer came back and asked for the site coordinates. Ten minutes later we received depths of several locations in the site area.

We proceeded and found the exact site with the help of the GPS coordinates taken last February. Scanning the seabed with echo lots on each of the ships, the seabed showed up as a level plateau bordered by the rock island on one side, by a rise in terrain (42 meters depth) on the north/east side, and a plateau of about 300 meters length, parallel to island (depth 70 meters), then a shallow drop to the open sea. Boat No. 2 was searching the south end of this plateau when he called on the radio, "I got something unusual here. I can not identify it, but there is something here."

We began to drag with the anchor for a while in the area, recording the tracks of the ships at the same time.

After about an hour of dragging with an anchor, we felt a net could do a better job and began the trip back to Qaqortoq (2.5 hours).

We were satisfied with the work we had performed and the information we were able to bring back. The following is a list:

- Checked the shore of the island for evidence—nil found.
- Measured and recorded the depths and make up of the seabed in the greater site area.
- Confirmed witness statements by helicopter and two Cirrus aircraft pilots as to the distance from shore to aircraft and pilot, which was measured.
- Checked performance of a certain type of immersion suit by wearing it while floating in the sea or a period of time.
- Marked the point of "interesting returns" by the echo lot.
- The feeling of actually having been at the site.

The investigator-in-charge was briefed. The next step should now be the dispatch of the trawler, fully staffed and accompanied by the diver and his staff. The cost should be reasonable, as the trawler is expected to complete the search in 1 or 2 days.

This experience is a good example of cooperation among an investigation team with accredited members, local authority (Ice Patrol, Police, Danish Navy), local professionals, and general public to help the investigation (cause) and the pilot's family (closure). ◆

***Editor's note**: The Danish AIB has since contracted the trawler for the recovery of the aircraft. The recovery operation is pending weather conditions and iceberg movements.*

Safety and Cultural Challenges

The key to successful cooperation is certainly the capacity and the will to listen to one's interlocutors, to understand the cultural and historic differences, and to make compromises.

Sochi accident

By Alexey Morozov, IAC (Interstate Aviation Committee), Russia and Sylvain Ladiesse, BEA (Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile)

(This article was adapted, with permission, from the authors' presentation entitled Russia/France: Safety and Cultural Challenges in International Investigations, *presented at the ISASI 2007 seminar held in Singapore, Aug. 27-30, 2007, which carried the theme "International Cooperation: From Investigation Site to ICAO." The full presentation including cited references index is on the ISASI website at www.isasi.org.—Editor)*

Globalization has created many challenges to society in terms of the transfer of knowledge and know-how. It has highlighted the need for humans to adapt themselves to systems and activities outside their usual orbit, and to understand cultural differences in order to further international cooperation. Aviation accident investigations require close international cooperation between states, whether they are involved in design, manufacture, operations, registration, or through the passengers on board.

Language barriers and cultural differences are the main obstacles to a correct understanding of the approach taken, and consequently, to a common agreement on working methods. Investigators applying basic human values such as adaptability and the capacity for dialogue can overcome these impediments.

Annex 13 to the Chicago Convention sets out the international standards for technical investigations, and thus provides a framework for bilateral or multilateral cooperation in case of an accident. However, this framework leaves wide scope for interpretation as to the concrete outcome of this cooperation. In practice, there are many cases where the various participants work in isolation without any interaction. Equally, at times, reports arrive at the destination with no warning, or comments issued by an investigative body are not taken into ac-

Alexey N. Morozov, *36, graduated from Moscow Aviation University as a specialist in flight dynamics, aircraft control systems, and flight tests. He joined the Interstate Aviation Committee (IAC) in 1994. In 1997 he became the head of the FDR Research Division, and in 1998 the vice-chairman of the IAC Air Accidents Investigation Scientific and Technical Support Commission. In 2005 Alexey became the chairman of the Air Accident Investigation Commission and from 2006, keeping the previous position, he was promoted to IAC vice-chairman, responsible for all IAC activities in the field of accident investigation.*

Sylvain Ladiesse, *31, received a master's degree in aerospace engineering and aviation operations from the French National Civil Aviation School (ENAC). He joined the BEA in 1999 and acted as investigator-in-charge, accredited representative, or group leader on many investigations. As of September 2007 he is resident twinning advisor in Ukraine in the framework of a European project aimed at implementing the JARs. Sylvain holds a commercial pilot's license.*

count. Such cases compromise the mutual confidence necessary between investigative bodies and fail to meet our goal of improving safety.

During 2006, the Commonwealth of Independent States (CIS) suffered three major accidents, two of which involved Airbus airplanes. The first occurred in May near Sochi and the second in July at Irkutsk. The Interstate Aviation Committee (IAC) conducted the investigations, and the French BEA (Bureau d'Enquêtes and d'Analyses pour la sécurité de l'aviation civile) participated as state of design.

The two states had signed a memorandum of understanding in 1993, which was renewed in 2005. They worked together in the context of an A310 accident investigation in 1994. This collaboration brought to light different working methods. Nevertheless, the two events that occurred in 2006 allowed the IAC and the BEA to get to know each other better, to develop a climate of confidence, and to overcome cultural differences. The progress of the investigation into the Irkutsk accident reflected this positive state of mind and showed a strong desire to work together for the benefit of safety.

The events

Sochi—On May 2, 2006, at 22 hours 13 minutes UTC, an A320, registered EK-32009 and operated by Armavia Airlines, was undertaking a passenger flight from Yerevan, Armenia, (CIS) to Sochi, Russia, (CIS) at night in instrument meteorological conditions and crashed into the Black Sea near Sochi Airport. The IAC was advised of the accident on May 3, 2006, at 02 hours 15 minutes Moscow time.

The IAC's final report concluded that the crash resulted from controlled flight into terrain while attempting a climbing maneuver after an aborted approach to Sochi Airport at night, with weather conditions below the established minima. While performing the climbout with the autopilot disengaged, the captain, while under stress, made nose-down control inputs due to a loss of pitch and roll references.

Subsequently the captain's pitch inputs were insufficient to prevent the accident. Along with the inadequate control inputs by the captain, contributory factors to the accident were the lack of necessary monitoring of the aircraft descent parameters (pitch attitude, altitude, vertical speed) by the copilot and the absence of proper reaction by the crew to the EGPWS warnings.

The high degree of cooperation between the French and Russian investigators ensured that the lessons learned in the course of this investigation, both in technical and human terms, could subsequently be applied in case of another accident. These lessons were able to be applied only 3 months later at Irkutsk.

Irkutsk—On July 8, 2006, at 22 hours 44 minutes UTC as it was landing at Irkutsk Airport, an A310, registered F-OGYP and operated by OAO Aviakompania Sibir, landed, overran the runway end at approximately 180 kilometers/hour and at a distance of 2,140 meters and on a magnetic bearing of 296° from the aerodrome reference point and collided with the perimeter fence. The aircraft broke apart and burst into flames. One hundred twenty five people died, including both pilots and three cabin crew. Sixty passengers and three cabin crew suffered physical injuries of various degrees of severity.

A commission appointed by the IAC conducted the investigation into the accident. Specialists from the Federal Transport Oversight Authority, Rosaviatsia, Rosaeronavigatsia, Irkutsk Airport, the airlines Aeroflot, Rossiskiye avialini, and Sibir, as well as the accredited representative from the BEA as state of design, manufacturer, and registry (France), and from the NTSB, who represented the state of the engine developer and manufacturer (U.S.), as well as their advisers from Airbus and P&W, participated in the investigation.

During the course of the investigation, the Commission requested information about the cabin reconfiguration carried out by Lufthansa Technik (Germany). In accordance with ICAO Annex 13, this information was provided via the BFU (Bundesstelle für Flugunfalluntersuchung), which also appointed an accredited representative.

The IAC completed the technical inves-

Irkutsk accident

The Interstate Aviation Committee (IAC) conducted the investigations, and the French BEA (Bureau d'Enquêtes and d'Analyses pour la sécurité de l'aviation civile) participated as state of design. The two events that occurred in 2006 allowed the IAC and the BEA to get to know each other better, to develop a climate of confidence, and to overcome cultural differences. The progress of the investigation into the Irkutsk accident reflected this positive state of mind and showed a strong desire to work together for the benefit of safety.

tigation in May 2007 and concluded—

"The cause of the accident to the A310 F-OGYP operated by Siberia airlines was erroneous and uncontrolled actions by the crew during rollout after landing in a configuration with one thrust reverser deactivated. After touchdown, the captain, while acting on the reverse thrust lever of the right engine, inadvertently and in an uncontrolled manner moved the throttle lever of the left engine, whose thrust reverser was deactivated, from the 'idle' to significant forward thrust position. Inadequate monitoring and call-outs of aircraft speed and engine parameters by the copilot did not allow the crew to perform the necessary actions, either of moving the left throttle back to idle or of shutting down the engine. The crew had enough time to recognize the situation."

IAC—BEA: Two organizations, two approaches

The IAC was established in December 1991 pursuant to the Intergovernmental Agreement on Civil Aviation and Use of Air Space, which was concluded by 12 newly independent states (CIS) with a view to

- preserving common aviation rules and airworthiness standards,
- maintaining a unified system for certification of aviation equipment and its manufacturers and international categorized aerodromes and their equipment,
- conducting independent investigation of aircraft accidents, and
- coordinating the efforts in the area of civil aviation development and harmonizing the national programs development of air traffic organization systems.

The IAC operates on the basis of, and in full compliance with, applicable international law and national laws of the member states, exercising the powers vested in it by presidential and governmental decrees and appropriate legislative acts. Its headquarters is located in Moscow.

The principal aim of the IAC is to ensure safe and orderly development of civil aviation and efficient use of air space by the states that are party to the Agreement.

The IAC investigates all aircraft accidents that involve aircraft from its member states whether they occur on their territories or elsewhere, as well as other aircraft accidents covered by the appropriate international agreements. IAC activities related to investigations fully conform to recommended international practices, in particular Annex 13.

The BEA was created in 1946 and is attached to the Ministry of Transport. The BEA carries out investigations and issues its reports in a completely independent manner. Its offices and technical services are located in the Paris region at Le Bourget Airport. It also has regional offices in Toulouse, Bordeaux, Rennes, and Aix-en-Provence.

In addition, in the context of Annex 13, the BEA represents France in investigations carried out abroad for any accident or incident involving

- an aircraft of French design or manufacture or registry (for example Airbus and ATR airplanes, Eurocopter helicopters).
- an aircraft operated by a French airline (Air France, Corsair...).
- French passengers.

The European directive on aviation accident investigations specifically forbids that investigations aim to apportion blame or liability to persons or companies involved in the event.

Different working procedures

The IAC and the BEA work according to the standards and recommendations set by Annex 13 as well as to internal procedures, which may differ. Some examples of these specific features include:

The IAC designates a Commission of Inquiry that plays the role of investigator-in-charge in a collegial manner. Its members may or may not come from the IAC, but they are generally chosen for their specialized technical knowledge. The investigator-in-charge directs this Commission, which itself supervises sub-commissions and working groups. The latter work independently and provide reports to the Commission.

Accredited representatives have access to all of the information gathered by investigators, but they are not invited to work within the sub-commissions or working groups.

The final report includes an additional paragraph, compared with the format recommended by the ICAO, which is entitled "Shortcomings" and groups together all of the failings identified by the Commission in the course of the investigation and acts as a bridge to the safety recommendations that follow.

In the case of a major investigation, the government Commission that is usually created to deal with the aftermath of an accident and to arrange support for the families of the victims has to be informed relatively rapidly on the causes of the accident. Thus, the IAC has to provide the "Conclusion" of the investigation report before the consultation procedure on the whole draft final report is fully completed by foreign parties to the investigation.

The IAC's reports are mainly intended for those in the aeronautical world, and it organizes a conference specifically for them at the end of the investigation. Only the final sections of the report are usually made public. The rest of the report is supplied upon request.

For the investigation into the accident that occurred at Irkutsk, the BEA nominated an accredited representative in its capacity as state of design, manufacture, and registry. Airbus provided technical advisers for the accredited representative. In addition, since the responsibility for continuing airworthiness for A310s had been transferred from the DGAC to the European Aviation Safety Agency, the BEA kept the Agency informed throughout the investigation.

Environmental challenges

In an international investigation involving five investigative bodies (IAC, BEA, NTSB, AAIB, and BFU), there were numerous challenges. Initially they were environmental, especially during the first few days of the investigation. The accident site (Irkutsk, in eastern Siberia) was a long way from the headquarters of each of these investigative bodies, which complicated communications. As an example, the distance between Irkutsk and Moscow, where the IAC's headquarters is located (and thus the laboratories where the CVR was read out), is 8,000 kilometers and there is a 5-hour time difference.

Further, Russia is a country where European Union and U.S. citizens can only enter with a visa. Having a dozen visas issued on a Sunday was one of the challenges that the IAC had to overcome in order to bring in the accredited representatives and their advisers.

Russian is one of the six official ICAO

languages and was naturally the working language in Irkutsk during work on gathering the facts. Within the BEA-Airbus team, few investigators spoke any Russian, and among the members of the Commission and sub-commissions present in Irkutsk, few investigators spoke English.

Lots of the difficulties in communication and in comprehension were caused by this absence of a common language. For example, the evening work progress meetings were held in Russian, and even if the BEA-Airbus team members were invited to attend, they could not understand the information shared by the members of the Commission of Inquiry.

Cultural challenges

During 2006, in the space of 4 months, the IAC had to investigate three major accidents that caused the deaths of more than 400 people. The IAC and the CIS aviation system were subjected to enormous media pressure, which obliged them to keep up a very demanding pace. This pressure was naturally passed on to the BEA, which thus had to respond to the pace. The IAC sometimes had the impression that the BEA was slow in responding to its requests, which seemed to it to be urgent, while for its part the BEA sometimes had the impression that this sustained pace implied that some things were being overlooked.

Understanding a different aeronautical system was also a challenge that had to be taken up by both sides. For the IAC, this meant understanding the relationship between Airbus, the DGAC, and the EASA, as well getting to grips with the A310's systems, its documentation, and its ergonomics—so different from that of Russian airplanes. For the BEA it meant understanding the relationship between Sibir, Rosaviatsia, and the FTOA, as well as the airplane's operational environment in Russia.

The report had to be translated into English and the translation validated by the IAC in order to have a common document to work with. Some concepts essential to an understanding of the report turned out to be very hard to translate, such as, for example, the Russian word "Kontrol," which simultaneously means "observation, monitoring, and feed back." Using an English version as a basis for discussion also meant that the IAC duplicated its work, since it had to take into account all of the comments made on both the Russian and English versions.

A desire for cooperation and consensus was present throughout the investigation. It made it possible to complete the investigation and publish the report within 10 months of the accident. All of the participants reached a common understanding of the event and, in addition, the BEA and the NTSB had no further comments to make on the final report following the various consultations.

Communicating facts to outside organizations was also a major challenge in this investigation. After the FDR readout, the airplane manufacturer relayed to the IAC and to the BEA the pressure that it was under from operators to communicate data. The IAC was not yet ready to communicate this data. Equally, the IAC, due to public pressure, had to communicate the "conclusions" of the investigation very early on, and the BEA had to comment on the findings and the conclusion of the report before having access to the factual and analytical sections.

Investigative cultures differ, and these differences came to light in the final report and the comments that the BEA made during the consultation phase. The report includes, for example, in the part entitled "Additional Information," some points of view—thus not factual—expressed by specialists who participated in the investigation. On the other hand, some comments made by the BEA were quite unexpected and presented the IAC with some difficulties in integrating or adding them to the report.

Cooperation

The approach decided on from the very beginning of the investigation was complete openness. Each investigative body had access to all the data. The investigators passed on any new data significant to the understanding of the event as soon as they got it.

Subsequently, the IAC took the time, despite heavy media pressure and the urgency of publishing the report rapidly, to consult the BEA before communicating any facts relating to the event. Airbus communications, with its operators on elements relating to the investigation, were done on the basis of a consensus reached among Airbus, the IAC, and the BEA. The final report was then considered at a preparatory meeting in the presence of the accredited representatives before being sent out for consultation. Finally, at the request of the BEA, the IAC organized a review meeting with the accredited representatives and the advisers from Airbus in order to discuss the integration of the various comments.

Both the BEA and the IAC remained patient and open-minded throughout the investigation—initially, during the fact-gathering phase in Irkutsk, then when faced with the BEA's supposed "slowness" and the IAC's supposed "overlooking" things, and finally during the various revisions to the final report.

The difference in culture implied long meetings, during which certain paragraphs could be discussed for several hours, but all of the participants maintained their desire for a consensual approach. In fact, the key to successful cooperation is certainly the capacity and the will to listen to one's interlocutors, to understand the cultural and historic differences, and to make compromises.

This desire for cooperation and consensus was present throughout the investigation. It made it possible to complete the investigation and publish the report within 10 months of the accident. All of the participants reached a common understanding of the event and, in addition, the BEA and the NTSB had no further comments to make on the final report following the various consultations. The IAC published the most important parts of the report (the analysis, the findings and the conclusion, the shortcomings, and the safety recommendations) on its website.

The best example of this cooperation concerns the safety recommendations. The BEA proposed several improvements to the safety recommendations written by the IAC, so as to extend the application of some of them to operators outside the CIS and for others to be addressed to all airplane manufacturers, underlining the fact that some themes were specific neither to the CIS nor to the Airbus A310. In the final wording of its safety recommendations, the IAC took into account all of the comments. ◆

ISASI Council Completes Heavy Agenda

(Compiled from Council meeting minutes prepared by Secretary Chris Baum and Council member written reports.—Editor)

The ISASI International Council meeting in Singapore on Aug. 26, 2007, set the 2008 budget, affirmed the cash award to accompany the annual seminar "Best Paper" selection, gave the National Societies permission to waive the late dues payment fee and the delinquent member reinstatement fee, and disbanded the Positions Working Group. In addition, reports were received from Council executives, working groups, and committees.

President Frank Del Gandio called the meeting to order. Attendees included Dick Stone, Executive advisor; Ron Schleede, vice-president; Chris Baum, secretary; Toby Carrol, proxy for Curt Lewis, U.S. councilor; Ron Chippindale, New Zealand councilor; Barbara Dunn, Canadian councilor; Caj Frostell, international councilor; Lindsay Naylor, Australian councilor; David King, European National Society president; John Purvis, chairman, Corporate Affairs Working Group; Chan Wing Keong (with guests), chairman, ISASI 2007 seminar; Marty Martinez, editor, *ISASI Forum;* and Ann Schull, ISASI office manager.

Prior to discussing items on the published agenda, there was a brief review of the current seminar plans and programs with no problems noted. Also included was a review of the potential for a monetary grant by the Singapore Tourism Board. Seminar registration figures were also reviewed.

In conjunction with the review of minutes from the May 2007 meeting, several discussions of unresolved issues and items took place. The question of copyrighting the terms "Reachout" and "Forum" was revisited. However, no further determination of the feasibility of, or process for, copyrighting these terms had been achieved. Investigation into the matter continues.

There was a continuation of the discussion begun in May regarding waiving late and reinstatement fees for delinquent members. This in turn led to further discussion about the lack of growth in membership in general. Existing bylaws do not address late fees, but a proposed revision to bylaws currently under review would cancel the reinstatement fee. Current common practice is to waive late fees on a case-by-case basis; most, but not all, fees are being waived in this manner. Discussion showed that because late fees stay at the local level, waiver authority, should any be granted, should be at that level as well. It was then moved and

PHOTOS: E. MARTINEZ

TOP: Council in session, left to right, C. Baum, D. King, R. Chippindale, R. Stone, F. Del Gandio, R. Schleede, A. Schull (guest), L. Naylor, J. Purvis, and B. Dunn. ABOVE: President Del Gandio makes his report as R. Schleede looks on.

Chan Wing Keong provides last-minute details on ISASI 2007, of which he was chairman, as B. Dunn listens.

seconded that late fees be waived at the discretion of the National Societies. That motion passed, with the notation that reinstatement fees are likely to be eliminated with the pending bylaws revision.

Continuing his report, Frank commented that ISASI issued formal seminar invitations to government investigating and/or regulating bodies of 87 countries and asked if the Council felt this practice should be continued. The consensus was that it should. Frank then briefed the Council on concerns that had been expressed by some presenters at the current seminar that their papers, if selected as backups, would not be published in the *ISASI Proceedings*. He reiterated the existing general policy that all papers will be on the conference CD-ROM provided to attendees, but only those actually presented will be published in the *ISASI Proceedings*. Regarding the Kapustin scholarship awards, he clarified that the free TSI and SCSI courses awarded to winners do not need to be used within a year.

Frank related a question that had arisen regarding a corporate member's representative who is not an individual member being selected as an ISASI Fellow. It was pointed out that such a representative is entitled to free individual membership, but that the individual must nevertheless apply for the membership for it to be activated. The discussion revealed that there is a need for a briefing to the Council on what past practice has been and what written guidance exists regarding the status of the primary and alternate representatives of a corporate sponsor vis-à-vis their individual membership status. Tom McCarthy and John Purvis will brief the Council in May.

Treasurer Tom McCarthy provided a written report and comprehensive 2008 budget outline for the Council's review and approval. In his report, Tom projected a negative cash flow of $29,700. He added, "While our negative net income figure is a bit frightening, remember that seminar net proceeds are listed as $10,000 in accordance with existing guidelines…." He noted, however, that profits from the past three seminars have been well over the projected negative figure. The Council approved the budget as submitted.

Executive Advisor Dick Stone announced the Kapustin Scholarship winners: Phillip Gregory (Embry-Riddle Aeronautical University), Marissa Liquori (Pottsdam University of New York), and Ruth Martin (Cranfield University). There was additional discussion on the Scholarship in general. The suggestion was made to solicit donations for the Fund at seminars. It was pointed out that US$1,500 doesn't go far in supporting seminar attendance by the winners. Possible ways to address this were raised, including using a complimentary corporate registration or being more innovative in soliciting airline support.

Dick also commented on the process used to select the best seminar paper. A committee comprised of Dick Stone, Graham Braithwaite, and two others makes the selection. Dick pointed out that the Council had not acted on a monetary award for the best paper. It was moved and seconded that a US$500 award should be given to the author(s) of the winning paper. It was further clarified that the award would be for the paper and the total amount awarded would remain US$500 regardless of the number of authors. The motion passed.

Regarding the status of the Human Factors Working Group (HFWG), of which he is chairman, Dick will give a status report at AIG 08. At that time, he hopes the HFWG has several modules completed.

National Societies/Councilors

Lindsay Naylor, ASASI, reported a membership of 146 and announced the resignation of President Ken Lewis and that he had been elected to the position. ANZSASI 2008 will be held in Adelaide to coincide with the 30th anniversary of ASASI.

International councilor C. Frostell discusses the ISASI Reachout program.

Barbara Dunn, CSASI, reported no change had occurred in the Society since May.

David King, ESASI president, supplemented Anne Evans written report and added that the proposed spring 2008 European seminar may be done in collaboration with Cranfield and will use the university as its venue. The format is expected to be a 1½-day technical program. A companion program is not being planned, although there may be a tour after the seminar. The goal is to develop an event with zero registration cost.

Ron Chippindale, NZSASI, reported as the main activity the hosting of the ANZSASI seminar in Wellington in June, which drew 127 registered participants. Ten participants presented membership applications. The Society will support the 2008 ANZSASI. Also, NZSASI is considering bidding for the 2012 or 2013 ISASI annual seminar. Ron submitted a written report.

Caj Frostell, international councilor, reported on upcoming Reachout Workshops: May 2008 in Kiev and Pakistan and Abu Dhabi in November 2007 [occurred November 25-28]. He said the next Reachout will mark more than 200 people trained in programs. He noted that ICAO has not provided financial support for the Reachout effort since an initial contribution. The general concept (as opposed to specific amounts) of ICAO funding can be addressed at AIG 08. Caj noted that it would be helpful to have an education campaign to help ICAO members understand what ISASI is and does. Dave King asked for a Reachout in Malawi to be considered.

ISASI Committees

Darrren Gaines, Bylaws, reported the bylaws revision is complete. Voting instruction has been sent to the membership to allow a vote on accepting the revised bylaws. Voting may be done by paper ballot or electronically.

Tom McCarthy, Membership, reports 1,409 members in good standing, 118 delinquent, 133 current corporate members, and 15 with past-due accounts. Newly recruited members for 2007 were 154 individual and 11 corporate. The goal remains to achieve 200 new individual members and 10 corporate members per year. The program to waive processing fees for new individual members joining in conjunction with an ISASI seminar is considered successful. However, the program to increase Latin American membership by reducing fees has not resulted in any increase in membership applications. Both programs will continue to be monitored.

Ron Chippindale, Board of Fellows, noted that the Committee determined the US$100 application fee should remain and be paid "up front" with half of the fee (US$50) being returned if the applicant is unsuccessful. There have been no new applications.

Tom McCarthy, Nominating, reported that 2008 is an election year. Deadline for nominations is April 1. He said the Council needs to revitalize the Nominating Committee, as he intends to resign as chairman and will not be able to serve on the Committee. He recommended that a society or chapter president be appointed as Committee chair and that each society/regional chapter should have a representative as a member. He also noted that affected international Council members should decide if they wish to run again and make the chairman aware of their decision.

Barbara Dunn, Seminar, reported that preparations for the 2008 seminar in Halifax are in good shape. The hotel contract is signed and the technical program is forming. There have been no significant developments in the preparations for the 2009 seminar in Orlando or 2010 in Sapporo.

The Positions Working Group put forward the question whether a standing WG is necessary or if positions should be developed on an as-needed basis. Following Council discussion, the standing Positions WG was dissolved and the Council directed that issues will be dealt with as the need arises. ◆

ISASI 2008 Set for Halifax, Canada

The International Society of Air Safety Investigators 39th annual international conference on air accident investigation, "ISASI 2008," will be held in Halifax, Canada, September 8-11. The conference theme is "Investigation: The Art and the Science." The event is being hosted by the Canadian Society of Air Safety Investigators. Members of that group are serving as the workforce for organizing the event. The Seminar Committee consists of Chairperson Barbara Dunn, who also serves as the Society's president; Technical Program, Jim Stewart and Nick Stoss; Sponsorship, Ron Schleede and Joe Jackson; Companion Program, Gail Stewart and Paula Demone; and seminar registration is being handled by Sharon Morphew and Gary Morphew.

Dunn says the Seminar Committee will honor the 100th anniversary of the construction of the Silver Dart at Baddeck, Nova Scotia, in late 1908. Built by the Aerial Experiment Association, chaired by Dr. Alexander Graham Bell, the Dart first flew on Feb. 23, 1909. John A.D. McCurdy took off from a frozen lake completing the first controlled power flight in Canada and the British Empire.

Made of steel tube, bamboo, friction tape, wire, and wood, the Dart was powered by a V-8 engine, supplied by Glenn Curtis, which developed 35 horsepower at 1,000 rpm. The Canadian Army looked upon the aircraft with skepticism, believing that airplanes would never amount to much in actual warfare.

The Silver Dart was flight tested at Petawawa, Ontario. On its fifth flight, while trying to land on sandy terrain, one wheel struck a rise in the ground and the craft was wrecked. On the 50th anniversary, a replica was flown at Baddeck to commemorate that first flight. The legacy of the Silver Dart continues to live on, and the replica is on constant display in the Canadian Aviation Museum in Ottawa.

The 3-day technical program will be held at the Halifax Marriott Harbourfront Hotel, 1919 Upper Water Street, Halifax, Nova Scotia. The hotel is located on Halifax harbor in the center of historic downtown. The Marriott is close to shops, historical sites, and nightlife. The city itself was established in 1749 and is one of the world's most strategic harbors, having been an integral part of the Allied war effort during both World Wars. Known as "A Navy Town," Halifax, as well as the province of Nova Scotia itself, has a strong civil and military aviation history. As the home of Maritime Command for the Canadian Forces, Halifax has been host to members of the military from five continents. The Maritime Provinces have also been an essential component in the development of transatlantic and international civil aviation.

Seminar details as to costs and programming are now in the reconciliation stages and will be posted in the next issue of *ISASI Forum*, as well as on the seminar website, which is also nearing completion.

In announcing the seminar's Call for Papers, in support of the theme "Investigation: The Art and the Science," Jim Stewart said, "We are looking for papers that will deal with the hard and soft aspects of investigation, in particular, new ideas that will lead us to improved investigation, whether it be techniques, management, process, technology, factual analysis, high tech, or low tech. The subject matter can be as broad as the imagination or expertise of the presenter. The Technical Committee wants to reach beyond the normal papers and explore new ideas. We are also very interested in hearing from full-time investigators or agencies that have recent experience with new techniques or processes and their experiences in applying them. For the art side, we are interested in subjects ranging from dealing with the news media and relatives to interview techniques. The art of communication may also be worthwhile."

The schedule for submission of paper proposals for ISASI 2008—indication of interest and subject matter (for readers of the *Forum)* March 1. A detailed abstract is due May 1, and the final paper in electronic format is due July 1.

All submissions may be made to Stewart electronically at e-mail: papers@rogers.com, and in hard copy to 307-1500 Riverside Dr., Ottawa, ON, Canada, K1G 4J4. ◆

ISASI Executive Nominations Due April 1

Nominations for election to the ISASI offices of president, vice-president, secretary, treasurer, U.S. councilor, and international councilor for the term 2009-2010 are due to the Nominating Committee by April 1.

Each potential candidate whose name is submitted to the Nominating Committee must have consented to the submission. The nominator must submit a short biographical sketch of the nominee. Nominees must be at least a full member in good standing to be eligible for office within ISASI. Nominations should be sent to the ISASI office, attention Nominating Committee. ◆

CORRECTION

In the October/December issue of *Forum*, the caption of this photo of an ISASI 2007 speakers' panel incorrectly identified N. Athiniotis as L. Anthinotas (first person on left). We apologize for this oversight.—*Editor*

2007 Annual Seminar Proceedings Now Available

Active members in good standing and corporate members may acquire, on a no-fee basis, a copy of the *Proceedings of the 38th International Seminar*, held in Singapore Aug. 27-30, 2007, by downloading the information from the appropriate section of the ISASI web page at http://www.isasi.org. The seminar papers can be found in the "Members" section. Alternatively, active members may purchase the *Proceedings* on a CD-ROM for the nominal fee of $15, which covers postage and handling. Non-ISASI members may acquire the CD-ROM for a US$75 fee. A limited number of paper copies of *Proceedings 2007* are available at a cost of US$150. Checks should accompany the request and be made payable to ISASI. Mail to ISASI, 107 E. Holly Ave., Suite 11, Sterling, VA USA 20164-5405.

Preface: Welcome to Singapore
By Frank Del Gandio, President, ISASI
Opening Address: Importance of International Cooperation in Aircraft Accident Investigation
By Raymond Lim, Minister for Transport and Second Minister for Foreign Affairs, Singapore
Keynote Address: Sharing Experience And Knowledge
By Mark V Rosenker, Chairman, U.S. National Transportation Safety Board
Lederer Award Recipient: 'Independence and Integrity' Mark Tom McCarthy
By Esperison Martinez, Editor

SESSION 1—Moderator David McNair
Royal Australian Navy Sea King Accident Investigation—Indonesia April 2, 2005
By Nicholas Athiniotis and Domenico Lombardo, Defence Science and Technology Organization, Australia
Russia/France: Safety and Cultural Challenges in International Investigations
By Alexey N. Morozov, Interstate Aviation Committee and Sylvain Ladiesse, BEA
International Cooperation Paves the Runway for a Safer Sky
By Guo Fu, East China Administration, CAAC

SESSION 2—Moderator Sue Burdekin
Winter Operations and Friction Measurements
By Knut Lande, Accident Investigation Board, Norway
Utilization of the Web-Based GIS to Assist Aviation Occurrence Investigation
By Tien-Fu, Yeh, Wen-Lin Guan, and Hong T. Young, Aviation Safety Council
Use of Reverse Engineering Techniques to Generate Data for Investigations
By Peter Coombs, AAIB, UK
Using Checklists as an Investigator's Tool
By Al Weaver

SESSION 3—Moderator Alan Stray
Finding Nuggets: Cooperation Vital in Efforts to Recover Buried Data
By Christophe Menez and Jérôme Projetti, BEA
International Investigation: General Aviation Accident in Atlantic Waters
By Joseph Galliker, ASC International, Inc.
Standardizing International Taxonomies for Data-Driven Prevention
By Corey Stephens, Air Line Pilots Association; Oliver Ferrante, BEA; Kyle Olsen, FAA; and Vivek Sood, FAA
Midair Collision Over Brazilian Skies—A Lesson to Be Learned
By Col. Rufino Antonio da Silva Ferreira, José Mounir Bezerra Rahman, and Carlos Eduardo Magalhães da Silveira Pellegrino, Brazilian Aeronautical Accident Investigation Commission (CENIPA); William English, NTSB; and Nick Stoss, TSB Canada

SESSION 4—Moderator Richard Breuhaus
Convair 580 Accident Investigation: A Study in Synergy
By Ian McClelland, TAIC, New Zealand
Tenerife to Today: What Have We Done in 30 Years To Prevent Recurrence?
By Ladislav Mika, Ministry of Transport, Czech Republic, and John Guselli, JCG Aviation Services
Flight Data: What Every Investigator Should Know
By Michael Poole, Flightscape, Inc., and Simon Lie, Boeing
Sound Identification and Speaker Recognition for Aircraft Cockpit Voice Recorder
By Yang Lin, Center of Aviation Safety Technology, CAAC and Wu Anshan and Liu Enxiang, General Administration of Civil Aviation of China, CAAC

SESSION 5—Moderator Danny Ho
International Cooperation and Challenges: Understanding Cross-Cultural Issues
By Dr. Wen-Chin Li, National Defense University; Dr. Hong-Tsu Young, Taiwan, ASC; Thomas Wang, ASC; and Dr. Don Harris, Cranfield University
Very Light Jets: Implications for Safety And Accident Investigation
By Dr. Robert Matthews, Ph.D., FAA
Enhanced Airborne Flight Recorder (EAFR)—The New Black Box
By Jim Elliot, G.E. Aerospace
RSAF: Analysis and Investigation; Tools and Techniques
By Lt. Col. Suresh Navaratnam, Republic of Singapore Air Force (RSAF)
Wet Runway Accidents—The Role of Fatigue and Coercive Habits
By Capt. A. Ranganathan

SESSION 6—Moderator David King
ISASI International Working Group on Human Factors: A Progress Report
By Capt. Richard Stone, ISASI and Dr. Randy Mumaw, Boeing
International Coorperation During Recent Major Aircraft Accident Investigations in Nigeria
By Dennis Jones, NTSB
Critical Aspects of International Incident Investigations
By Deborah J. Lawrie, Robert N. van Gelder, and Jan Smeitink, Independent Safety Investigation & Consultation Services
National Transportation Safety Committee of Indonesian Presentation
By Tatang Kurniadi, Chairman, National Transportation Safety Committee, Indonesia
Going the Extra Mile
By Donald F. Knutson (Accepted for presentation, but not orally delivered due to exigent circumstances.) ◆

Members Approve Bylaws Amendments

Ninety-nine percent of members voting in the recent bylaws amendment voting process voted to approve the changes made to the bylaws by the Society's International Council. During the open voting period of Aug. 25-Oct. 25, 2007, for all eligible members, 190 members cast votes, with 188 approving the amendments noted on the ISASI website.

The Society's bylaws state: "11.2—These bylaws may be amended, repealed, or altered in whole or in part by a two-thirds (2/3) majority of the members voting. Voting shall be by letter ballot sent to all eligible voting members. A minimum of sixty (60) days shall expire between the mailing and closing of ballots which concern amendments to the bylaws."

In early August 2007, President Frank Del Gandio mailed to each member in good standing information regarding the voting process, which involved both the U.S. mail system and electronic voting through the ISASI website. He noted that the International Council (IC) had directed Bylaws Committee Chairman Darren Gaines "to revise our bylaws that have been in effect since our founding in 1964. The revisions will allow us to use modern-day tools and programs for everyday Society administration at significant monetary savings and will provide guidelines for responsible fiduciary and business practices." The IC approved the revisions and had them posted on the ISASI website, www.isasi.org, for members' perusal.

The final eligible vote tally return was U.S. mail 138, electronic votes 52. ◆

Continued . . .

Lederer Award Nominations Due May 1

The ISASI Awards Committee is seeking nominations for the 2008 Jerome F. Lederer Award and reminds all that the deadline for receipt of the nomination letter is May 1. Established in honor of "Jerry" Lederer, one of the foremost innovators in the field of aviation safety, the purpose of the Award is to recognize outstanding contributions to excellence in air safety accident investigation. The Award is presented each year during ISASI's annual international seminar to a recipient who is recognized for positive advancements in the art and science of air safety investigation.

Gale Braden, Committee chairman, says "The nomination process is quite simple. Any member of ISASI may submit a nomination. The nominee may be an individual, a group of individuals, or an organization. The nominee is not required to be an ISASI member. The nomination may be for a single event, a series of events, or a lifetime of achievement. The ISASI Awards Committee considers such traits as duration and persistence, standing among peers, manner and techniques of operating, and of course achievements. Once nominated, a nominee is under consideration for three years and if not selected in that period is then dropped. After an intervening year, the candidate may be re-nominated for another three-year period. The nomination letter for the Jerome F. Lederer Award should be limited to a single page."

Over the years, this Award has become recognized as one of the most significant honors an accident investigator can receive; therefore, the Jerome F. Lederer Awards Committee exercises considerable care in determining the recipient.

Braden, "asks ISASI members to thoughtfully review their association with air safety investigators and submit a nomination letter when they identify someone they consider qualified for this outstanding Award."

Nominations should be mailed, or e-mailed, to the ISASI office or directly to the Awards Committee chairman, Gale Braden, at 13805 Edmond Gardens Drive, Edmond, OK 73013-7064 USA. His e-mail address is galebraden@cox.net. He can also be reached by phone at 405-242-4815 (home), 405-517-5665 (cell). ◆

Reachout Closes 2007 with Multiple Workshops

The months of October and November 2007 saw three Reachout Workshops completed in Kiev, Ukraine; Santiago, Chile; and Abu Dhabi, United Arab Emirates, under the auspices of ISASI and local airlines and authorities.

ISASI instructors Caj Frostell and Bryan Stott worked with 34 participants through a 5-day Workshop program in Kiev. The attendees were from different departments within the State Aviation Administration (SAA) in Kiev. The program began on October 15 and was opened by Aleksander Ignatiev, deputy chairman of SAA in Ukraine, as well as Azerbaijan, Kazakhstan, and Romania. Simultaneous interpretation (English-Russian and Russian-English) was provided throughout the length of the program.

The accident investigation module contained presentations on the international requirements and obligations in ICAO Annex 13, planning and organization for a major investigation, procedures and checklists, wreckage recovery, field investigation, collecting evidence, flight recorders, technical investigation, flight operations investigation, crashworthiness, human factors, witness interviewing, handling the news media, family assistance programs, writing the final report, identification of safety deficiencies, making safety recommendations, and several interactive case studies, including a Boeing 747 overrun in Bangkok, a Boeing 737 accident near Athens, Greece, and a video of a Boeing 737 investigation in Panama. A brief half-day module as an introduction to Safety Management Systems (SMS) was also conducted. Sponsors for the event included AeroSvit Ukrainian Airlines and Ukraine International Airlines, SAA, and some workshop participants.

In November 2007, the Santiago program was hosted by the Circulo de Pilotos de Chile. Chilean sponsors included the Universidad del Pacifico, the Direccion General de Aeronautica Civil de Chile (DGAC), and Air Comet, Chile. Exponent Failure Analysis Associates of Menlo Park, Calif., Tri-Logic Solutions International, Inc. of Ottawa, Ontario, Canada, and AeroPlus STM Services of Winnipeg, Manitoba, Canada, also provided support for instructor travel and participation.

The 5-day Workshop, which began on Nov. 5, 2007, included sessions on occurrence investigation and Safety Management Systems. Jim Stewart, chairman of ISASI Reachout, and Claudio Pandolfi taught the SMS portions. Occurrence investigation was taught by Vic Gerden and Dr. Joseph Rakow. All instructors were ISASI members. Pandolfi is credited with being the driving force behind the Workshop and serves as manager of Safety Prevention DGAC, Chile.

More than 85 persons attended. The professional makeup of the attendees included senior aviation managers, safety investigators and managers, members of the pilots' union LAN, flight attendants, air traffic controllers, and dispatch and maintenance personnel. All participants were awarded completion certificates following closing remarks by the general

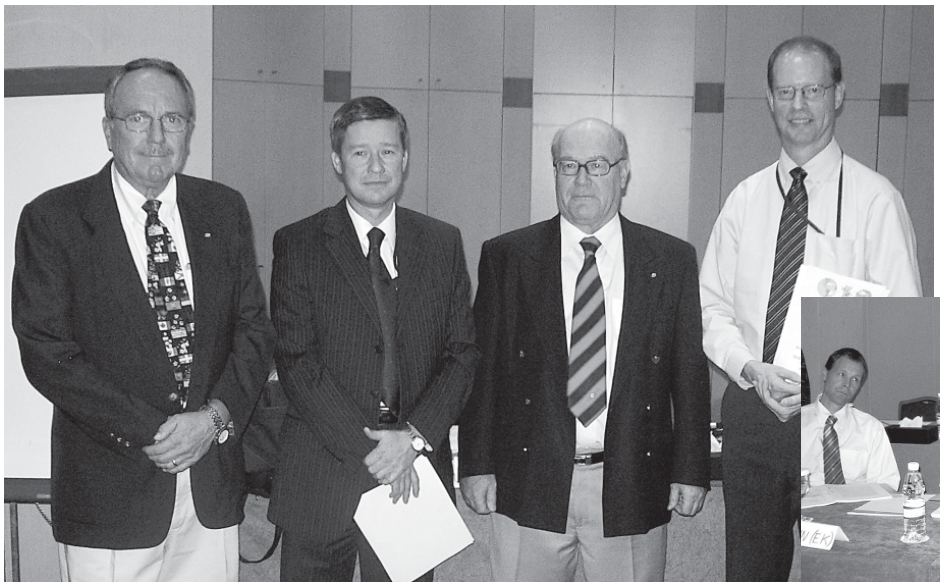
In Memorium

David W. Berger (LA1208), Westlake Village, Calif., U.S.A., Nov. 12, 2007

Harold D. Hoekstra (LM0263), Arlington, Va., U.S.A., 2007

Dale C. Jepsen (MO2765), Cape Coral, Fla., U.S.A., 2007

Dr. Henry A. Rowe (LM2735), Santa Maria, Calif., U.S.A., Sept. 12, 2007



LEFT: Reachout Workshop opening, left to right, Ron Schleede, Capt. Richard Hill, vice-president of Flight Operations, Etihad Airways; Caj Frostell; and Greg Janelle, manager of Emergency Response, Etihad Airways. BELOW: Workshop participants as they engage in lessons.

of the Chilean Air Force, Jose Huepe Perez, director general DGAC.

From Nov. 5-19, 2007, Elaine Parker and John Guselli managed a Reachout Workshop in Karachi, Pakistan. Representatives of the civil aviation authority and the aviation industry were in attendance. The Workshop focused on Safety Management System implementation and, although outside the normal ISASI Reachout mandate, proved to be worthwhile in fostering safety improvements in Pakistan.

In the closing week of Nov. 25-28, 2007, Caj Frostell and Ron Schleede conducted the Abu Dhabi Reachout program. It was opened by Capt. Richard Hill, vice-president of Flight Operations, Etihad Airways, which hosted the event and sponsored instructor travel costs.

The Workshop's content mirrored that provided in the Ukraine program but was tailored to the region from which 22 attendees came. In all, safety professionals from 11 airlines in the Middle East participated. As was to be expected, the Workshop became a very interesting forum for exchanging experiences, different ways of implementing safety strategies, catering to emergency situations, and ideas for the future.

A Workshop record 18 attendees (out of 22) applied for ISASI membership. Three of the participants were already members and Emirates and Qatar Airways were also already ISASI corporate members. Several of the other airlines represented at the Workshop are also considering ISASI corporate membership, according to the ISASI instructors. ◆

Kapustin Scholarship Administrators Issue Application Call

The ISASI Rudolf Kapustin Memorial Fund administrators, Richard Stone, ISASI Executive advisor, and Ron Schleede, ISASI vice-president, have issued the call for scholarship applications to universities and colleges whose students are eligible to participate in the program. According to the Fund's administrators, the deadline for applications is June 1.

Given the lead time to the application deadline, the Fund administrators encourage all ISASI societies, chapters, working groups, and individual members to promote the availability of the ISASI scholarship and its application procedures to students, student groups, and education centers whenever the opportunity presents itself.

The purpose of the Scholarship is to encourage and assist college-level students interested in the field of aviation safety and aircraft occurrence investigation. Eligible applicants must be enrolled as full-time students in a recognized (note *ISASI recognized*) education program, which includes courses in aircraft engineering and/or operations, aviation psychology, aviation safety and/or aircraft occurrence investigation, etc., with major or minor subjects that focus on aviation safety/investigation. A student who has once received the annual ISASI Rudolf Kapustin Memorial Scholarship is not eligible for a second award.

Continued funding for the Memorial Fund is through donations, which in the United States are tax-deductible. An award of US$1,500 (this may be increased by the International Council in May) is made to each student who wins the competitive writing requirement, meets the application requirements, and registers to attend the ISASI annual seminar. The award will be used to cover costs for the seminar registration fees, travel, and lodging/meals. Any expenses above and beyond the amount of the award will be borne by the recipient. ISASI corporate members are encouraged to donate "in kind" services for travel or lodging expenses to assist student scholarship recipients. Students granted a scholarship also receive

- a 1- year membership to ISASI.
- tuition-free attendance to ANY regularly scheduled Southern California Safety Institute (SCSI) course. This includes the 2-week Aircraft Accident Investigator Course or any other investigation courses. Travel to/from the course and accommodations are not included. More information is available at http://www.scsi-inc.com/.
- tuition free course from the Transportation Safety Institute. Travel to/from the course and accommodations are not included. More information is available at http://www.tsi.dot.gov/.

The Fund is administered by an appointed committee, and oversight of expenditures is done by the ISASI treasurer. The committee ensures that the education program is at an ISASI-recognized school and applicable to the aims of the Society, assesses the applications, and determines the most suitable

Continued . . .

candidate(s). Donors and recipients will be advised if donations are made in honor of a particular individual.

Students who wish to apply for the Scholarship may acquire the application form and other information at the ISASI website: www.isasi.org. Students may also request applications by e-mail to isasi@erols.com. The ISASI office telephone number is 1-703-430-9668. ◆

New Members

CORPORATE

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Curtis L. Lewis, President/CEO
Joe Oyler, Principle Associate
Korea Air Force Safety Ctr.
Cdr Eung-Kyun Shin
Jae-Hoon Jung, ATC Investigator
National Aerospace Laboratory, NLR
A.D.J. Rutten, manager, Air Transport Safety Institute
Qatar Airways
Capt. Abdulla Ali Johar, general manager, Flight Operations
Capt. Dharamraj Rebbapragada, Flight Safety manager

INDIVIDUAL

Adedoyin, Tosin, A., Lagos, Nigeria
Al Marzouqi, Fouad, B., Abu Dhabi, United Arab Emirates
Al Said, Saud, T., Dubai, United Arab Emirates
Al-Awadhi, Kamil, H., Quadsiah, Kuwait
Alegado, Jaime, V., Doha, Qatar
Balentine, Chad, J., Winchester, VA, USA
Barros, Andrés, Santiago, Chile
Boyd, Rodney, L., Wylie, TX, USA
Cabel (Engr.), Francis, Abu Dhabi, United Arab Emirates
Chen, Felix, S.K., Singapore, Singapore
Chiang, Vin, C., Daytona Beach, FL, USA
De Waal, Johan, G., Abu Dhabi, United Arab Emirates
Elgindi, Hisham A. Aziz, Abu Dhabi, United Arab Emirates
Engroba, Juan, D., Buenos Aires, Argentina
Franklin, Ryan, H., Ormond Beach, FL, USA
Gipson, Paul, Scottsdale, AZ, USA
Goetz, Jean-Baptiste, Abu Dhabi, United Arab Emirates
Graydon, Mike, Abu Dhabi, United Arab Emirates
Hahn, Robert, G., Gulf Breeze, FL, USA
Holland, Dennis, A., Northamptonsire, United Kingdom
Houston, Mark, D., Havelock North, New Zealand
Husain, Muhammad, M., Arad, Kingdom of Bahrain
Jay, Susan (Sue), M., Orange Park, FL, USA
Kelman, Sarah, J., Cambridge, United Kingdom
Kunteson, Randall, R., Deatsville, AL, USA
Kwajan, Francis, A., Forest Hills, NY, USA
Labrucherie, Stephan, Abu Dhabi, United Arab Emirates
Mayfield, Richard, F., Renton, WA, USA
Miranda, Ray, M., Kajang, West Malaysia
Moussa, Ali, M., Beirut, Lebanon
Naseer, Ahsan, Abu Dhabi, United Arab Emirates
Nitta, Takashi, Toyonaka, Osaka, Japan
Pinzón Müller, Eduardo, Bogota, Colombia
Qarashi, Baha, G., Abu Dhabi, United Arab Emirates
Rigby, Kevin, T., Pensacola, FL, USA
Rivera-Martinez, Alimael, Prescott Valley, AZ, USA
Ronaldson, George, Aberdeen, United Kingdom
Ross, Cameron, C., Southlake, TX, USA
Satti, Juan, A., Castelar, Argentina
Savage, Eric, R., Prescott, AZ, USA
Schonhardt, Carlos, F.G., Rio De Janeiro, Brazil
Senthil, M.S., Gopalakrishnan, Seeb Int'l Airport, Sultanate of Oman
Shappee, Eric, H., Salina, KS, USA
Skoor, Erich, J., Prescott, AZ, USA
Smith, Sean, J., Daytona Beach, FL, USA
Stauffer, Kent, M., Stow, OH, USA
Talay, James, E., Mission Viejo, CA, USA
Trono, Peter, J., Pearblossom, CA, USA
Yusof, Mohd Hisham Md., Abu Dhabi, United Arab Emirates
Zwager, Finn, Dubai, United Arab Emirates ◆

ANZSASI 2008 Plans Seminar in Australia

The Australian Society of Air Safety Investigators, in conjunction with the New Zealand Society, will co-host ANZSASI 2008 in the Stamford Grand Hotel, Glenelg, Adelaide, South Australia May 30 to June 1, according to a joint announcement by the two Societies.

Seminar registration costs will be similar to the rates of last year's seminar (around $350 Australian, and the room rates are expected to be in the $150-170 range, Australian).

Theme for the 15th Australasian safety seminar is "Transport Safety—Past, Present, and the Future." The seminar will also see a celebration of the Australian Society's 30th anniversary of its establishment.

A Call for Papers was issued earlier. The Call asked for papers on contemporary transport safety (road, rail, marine, aviation) on the issues facing the safety investigators of the future and on recent investigations. Abstract are due by February and should be sent to Paul Mayes at e-mail Paul.Mayes@Cobham.com.au. ◆

European Society Inaugurates Regional Seminar

European Society of Air Safety Investigators President David King has announced that the Society will host a 2008 inaugural regional air safety seminar, "Air Accident Investigation in the European Environment," on April 24-25, with an optional social program on April 26, at Cranfield University, which is located 50 miles north of London (nearest airports Luton, Birmingham and Heathrow).

With emphasis on current European issues in the investigation and prevention of accidents and incidents, the 2-day seminar is aimed at accident investigation professionals and will provide an opportunity to update professional knowledge and skills, as well as to meet other active air safety investigators.

Presentations will address current issues in the European environment, challenges of modern air safety investigations, and operational developments. Further details of the seminar are scheduled to be made available via the ISASI website, www.isasi.org.

For further information, contact seminar organizer Anne Evans—telephone: (44) 1252 510300, e-mail: aevans@aaib.gov.uk. Bookings: A.L. Roff, academic operations manager, Cranfield University, Cranfield, Bedford, MK43 0AL; telephone: (44) 1234 754176, fax: (44) 1234 751206, e-mail: A.L.Roff@Cranfield.ac.uk. ◆

International Cooperation Paves Safer Sky Runways *(from page 7)*

sults of the cooperation are fruitful and beneficial to the aviation industry.

Usually, several different kinds of reports will be finished and submitted during the investigation, but four are commonly adopted. They are the group report, the preliminary report, the draft final report, and the final report. Each group must finish its group report after the field investigation. It is done by the group chairman with the signature of every participant of the group, and a different opinion will be attached if there is any. The preliminary report is compiled by the team leader and is based on all the group reports and contains the factual information associated with the event. The preliminary report submission within 30 days after the occurrence is requested. The team leader approves the draft final report before it is sent to relevant organizations for review. Before the final report is released, all the comments or suggestions received will be reviewed and corrections or amendments to the report will be taken if they are accepted, or attached if denied.

We have received much valuable assistance and international cooperation from our foreign partners in safety investigations, which have made our investigations successful. The following case introductions will show how valuable cooperation is in a safety investigation and for safety improvement.

Cases

MD-11 cargo accident—On April 15, 1999, an MD-11F departed Shanghai Hongqiao International Airport, operating as a regularly scheduled international cargo flight with two pilots and one flight technician on board. It crashed at a construction site 3 minutes after lifting off. The airplane was totally destroyed by high-energy impact force and a post-crash fire.

After the accident, the CAAC forwarded notification of the accident to the state of manufacture, the state of registration, the operator, and ICAO. A joint investigation team was formed in accordance with the provisions of Annex 13. The investigation received technical support from the relevant investigation authorities, aircraft manufacturer, engine manufacturer, airlines, and component manufacturers during the investigation.

The team made a thorough search of the crash site and found the memory circuit board of the solid-state cockpit voice recorder (SSCVR) and pieces of tape from the quick access recorder (QAR) and recovered the engines, control systems and surfaces, and other most important components.

The SSCVR's memory circuit board, all collected pieces of QAR tape, and the Electronic Engine Controllers (EEC) were sent to the United States for data retrieval. The whole contents of the SSCVR and EEC were successfully retrieved in the NTSB lab and engine manufacturer's lab, respectively, which helped investigators understand what happened in the cockpit and the engines' performance before the crash. A joint bulletin of the accident, signed by the three parties, was released in three nations on April 27, 1999, and excluded the possibilities that the accident was caused by any explosion, sabotage, or ATC mishandling.

Members of the joint investigation team and their advisors gathered at the Boeing flight safety facilities in Long Beach, Calif., for flight simulation tests. The simulation was performed more than 100 times.

The accident scenario was at last understood on the basis of all the analyzed, collected factual information; tests conducted; recorded information retrieved; and key systems, parts, or components examined.

The probable cause of the accident was the flight crew's loss of altitude situational awareness resulting from an altitude clearance wrongly relayed by the first officer and the crew's overreaction with abrupt flight control inputs.

With all the help and assistance from our foreign partners, we could then reconstruct the accident scenario and better understood the accident.

CRJ-200 accident—On Nov. 21, 2004, a CRJ-200 aircraft departed Baotou Airport at 08:21 (Beijing local daylight time) for a scheduled passenger flight from Baotou to Shanghai, and 1 minute later it crashed in a park near by.

The investigation was instituted and organized by SAWS. CAAC was on the technical investigation team since it was a significant major accident. The technical investigation team was comprised of the state of occurrence, the state of aircraft manufacture, and the state of engine manufacture. One of the probable causes of the accident was wing contamination due to frost. At the beginning of the investigation, it was very hard for most of us to believe that frost contamination would result in such a tragedy, though we knew that ice or snow would impair the wing's performance if it was contaminated with either one.

Through the discussion and demonstration of performance of supercritical airfoils without leading edge devices by the experts of the manufacturer, we understood why contamination is so critical to those airfoils. A nationwide cold weather operation training campaign was adopted with the help of our Canadian colleagues, and the cold weather operation program was revised and implemented to prevent the same disaster from happening again. All these corrective measures have raised both management's and frontline personnel's concentration on the contamination issues.

Engine IFSD incident investigation—On March 3, 2007, a Boeing 747-200, enroute

(continued on page 30)

International Cooperation Paves Safer Sky Runways *(from page 29)*

from PVG to KIX, experienced No. 2 engine IFSD followed by an audible loud boom and a drop in engine parameters. The aircraft returned to PVG and landed uneventfully. This event is considered to be an incident as per Civil Aircraft Flight Incident of CAAC.

Since we focus on aircraft with a relatively long time of service, this aircraft had experienced three IFSD within 4 months. In order to investigate the cause of this IFSD event, a notification was sent to the state of engine manufacture, and an investigation team was formed with the experts from the engine manufacturer since the state of manufacture appointed a non-travel accredited representative.

In the investigation, we found that one cluster of the fourth stage LPT stator of the engine exhibited displacement and outer shroud forward OD hook fracture, which resulted in the cluster's rubbing against the fourth stage LPT rotor blades and consequently rupturing some of the blades, and the ruptured fly-away blades cut away all the blades/vanes on the fourth, fifth, and sixth stages. Several other fourth stage LPT blades displayed fatigue in the airfoil fracture just above the root platform. Further lab examination revealed that the vane cluster's displacement/fatigue fractures resulted from their sharp radii at the OD forward foot due to improper engine overhaul.

The advantages of the manufacturer's involvement were not only that it knew its product and was able to provide expertise in the investigation, but also that it took immediate actions or gave professional instructions if problems were found.

Though incident investigation seems not as urgent as accident investigation to some extent, we can still promote aviation safety by revealing defects found in the system and making safety recommendations. We also can prevent the accident from happening by investigating the incident since we define an incident as a precursor to an accident in Chinese.

The challenges ahead

Through cooperative efforts, the aviation community has resolved many problems that impair safety, but we still have to face those safety-related challenges. From the investigator's point of view, the biggest challenge now is human-factors-related issues, which account for a large amount of occurrences. That is why we need the whole community to work hard to provide an operational environment that will reduce human-factors-related issues to the greatest extent. In some cases, one nation's competence is not enough to resolve problems confronting us since they are global challenges.

The cockpit meter/feet change-over switch offers a very successful solution to different ATC altitude assignments adopted in different nations to prevent a flight crew's confusion while flying between nations using different altitude assignment systems. In addition, language is another worldwide issue for those pilots whose native tongue is not English, since it is the aviation language. Though we can train pilots and standardize radiotelephony in air-ground communication, we still have some occurrences associated with language difficulty.

Therefore, it is strongly recommended that the international aviation community step up and widen cooperation to take effective measures to improve the operational environment with both software and hardware. We need to not only rationalize the standards, procedures, and policies, but optimize technologies in order to find technical solutions as well. We share information, experience, knowledge, and lessons learned by seminars, conferences, training, and Reachout programs. We can resolve big issues by creating small gadgets or new technologies.

There can be no doubt that safety investigation lays a solid foundation for the safe operation and safe flight of aircraft, along with other safety management activities, and thus plays a significant role in improving aviation safety. As its scope is being widened, international cooperation will play an increasingly active role in promoting investigation efficiency by sharing expertise, experience, and information. As a result, no matter what type of investigation (accident or incident) it is, we will make a huge difference to our aviation safety record if we embrace the globalization trend and strictly follow the international standards in investigation with a cooperative attitude. The whole aviation community will surely benefit from investigation cooperation, which will function as one of the powerful driving forces to move the aviation industry in a favorable direction. ◆

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Curt Lewis & Associates, LLC
DCI/Branch AIRCO
Defence Science and Technology Organization (DSTO)
Delta Air Lines, Inc.
Directorate of Aircraft Accident Investigations—Namibia
Directorate of Flight Safety (Canadian Forces)
Directorate of Flying Safety—ADF
Dutch Airline Pilots Association
Dutch Transport Safety Board
EL AL Israel Airlines
Embraer-Empresa Brasileira de Aeronautica S.A.
Embry-Riddle Aeronautical University
Emirates Airline
Era Aviation, Inc.
European Aviation Safety Agency
EVA Airways Corporation
Exponent, Inc.
Federal Aviation Administration
Finnair Oyj
Flight Attendant Training Institute at Melville College
Flight Safety Foundation
Flight Safety Foundation—Taiwan
Flightscape, Inc.
Galaxy Scientific Corporation
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Japan Airlines Domestic Co., LTD
Japanese Aviation Insurance Pool
Jeppesen
JetBlue Airways
Jones Day
KLM Royal Dutch Airlines
Korea Air Force Safety Ctr.
Korea Aviation & Railway Accident Investigation Board
Kreindler & Kreindler, LLP
L-3 Communications Aviation Recorders
Learjet, Inc.
Lockheed Martin Corporation
Lufthansa German Airlines
MyTravel Airways
National Aerospace Laboratory, NLR
National Air Traffic Controllers Assn.
National Business Aviation Association
National Transportation Safety Board
NAV Canada
Nigerian Ministry of Aviation and Accident Investigation Bureau
Parker Aerospace
Phoenix International, Inc.
Pratt & Whitney
Qantas Airways Limited
Qatar Airways
Qwila Air (Pty), Ltd.
Raytheon Company
Republic of Singapore Air Force
Rolls-Royce, PLC
Royal Netherlands Air Force
Royal New Zealand Air Force
RTI Group, LLC
Sandia National Laboratories
SAS Braathens
Saudi Arabian Airlines
SICOFAA/SPS
Sikorsky Aircraft Corporation
Skyservice Airlines, Ltd.
Singapore Airlines, Ltd.
SNECMA Moteurs
South African Airways
South African Civil Aviation Authority
Southern California Safety Institute
Southwest Airlines Company
Southwest Airlines Pilots' Association
Star Navigation Systems Group, Ltd.
State of Israel
Transport Canada
Transportation Safety Board of Canada
U.K. Civil Aviation Authority
UND Aerospace
University of NSW Aviation
University of Southern California
Volvo Aero Corporation
WestJet ◆

Raytheon, a Company of Innovation

(Who's Who is a brief profile of, and prepared by, the represented ISASI corporate member organization to enable a more thorough understanding of the organization's role and functions.—Editor)

The Raytheon of today is the result of 80 years of continuous innovation… including the impressive legacies of the businesses Raytheon has joined with over the years, like Beechcraft, E-Systems, Texas Instruments Defense Systems and Electronics business, and Hughes Aircraft's Defense Electronics business. All businesses brought complementary skills and expertise, which have combined to make Raytheon a global leader in defense, government and commercial electronics, and business and special-mission aircraft.

As a world-class supplier of space and airborne products, safety and mission assurance are always at the forefront. Raytheon provides state-of-the-art electronics, mission systems integration, and other capabilities in the areas of sensing; effects; command, control, communications and intelligence systems; and a broad range of mission support services. The company branded and trademarked the term "No Doubt," pledging to customers that Raytheon products will work as advertised, are safe, and are supportable. Raytheon is stepping out to lead the industry in mission assurance and to make assurance a key market differentiator.

Raytheon Company was founded in Cambridge, Mass., as the American Appliance Company in 1922, a pivotal time in American history. The first decade of modernism, the 1920s saw the advent of automobiles, radios, and refrigerators. The electrical industry was extending power lines across the United States, and telephones were linking every hamlet and home. In the aftermath of World War I, the nation was in flux, disillusioned at the end of a bitter war that brought no real peace or economic security and energized by the prospects of modern technological advances. Emerging from the depths of a severe post-war depression that wiped out jobs and forged a widening chasm between the privileged and the poor was a breed of entrepreneurs with a driving ambition to succeed and willingness to gamble on it.

Against this backdrop the founders of Raytheon became business partners. Two former college roommates, Laurence K. Marshall and Vannevar Bush, formed the

Raytheon

company with Charles G. Smith, a young scientist who had developed the prototype for a home refrigerator that used artificial coolants. Marshall, an engineer, businessman, and trained physicist, and Bush, a scientist and professor of electrical engineering at the Massachusetts Institute of Technology, along with several other financial backers, dreamed of prosperity and a potential market for their newly developed refrigerator.

However, as is the case with so many other entrepreneurs, the product that launched the company was a bust and never left the laboratory. Facing failure, it was Marshall and Bush who suggested revisiting an earlier idea young Smith had experimented with: a new kind of gaseous tube that would allow radios for the first time to be plugged into a wall socket and operate on electricity rather than batteries. The tube would overcome the need for two expensive, short-lived A and B batteries, the greatest shortcoming to widespread radio use at the time. By devising a way to replace the B battery with a tube, the small company beat out the army of researchers and engineers of RCA, Westinghouse, and other corporate giants to produce a device that forced the entire radio industry into a new direction and made radios affordable and accessible to every household. Perfected and introduced to the public in 1925, the tube, known technically as a gaseous rectifier and marketed under the brand name Raytheon, brought in more than $1 million in sales by the end of 1926 and positioned the company as a major contributor to the fast-growing radio tube market for nearly two decades.

In the more than 80 years since, the company has become known for many more major technological advancements that have changed the course of American culture and world history. Among these innovations are the first commercial microwave ovens, miniature tubes for hearing aids, the Fathometer depth sounder, the mass production of magnetron tubes, early shipboard radar, the first successful missile guidance system, a space communications system, mobile radio telephones, the first combat-proven air defense missile system and terminal doppler weather radar. ◆

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