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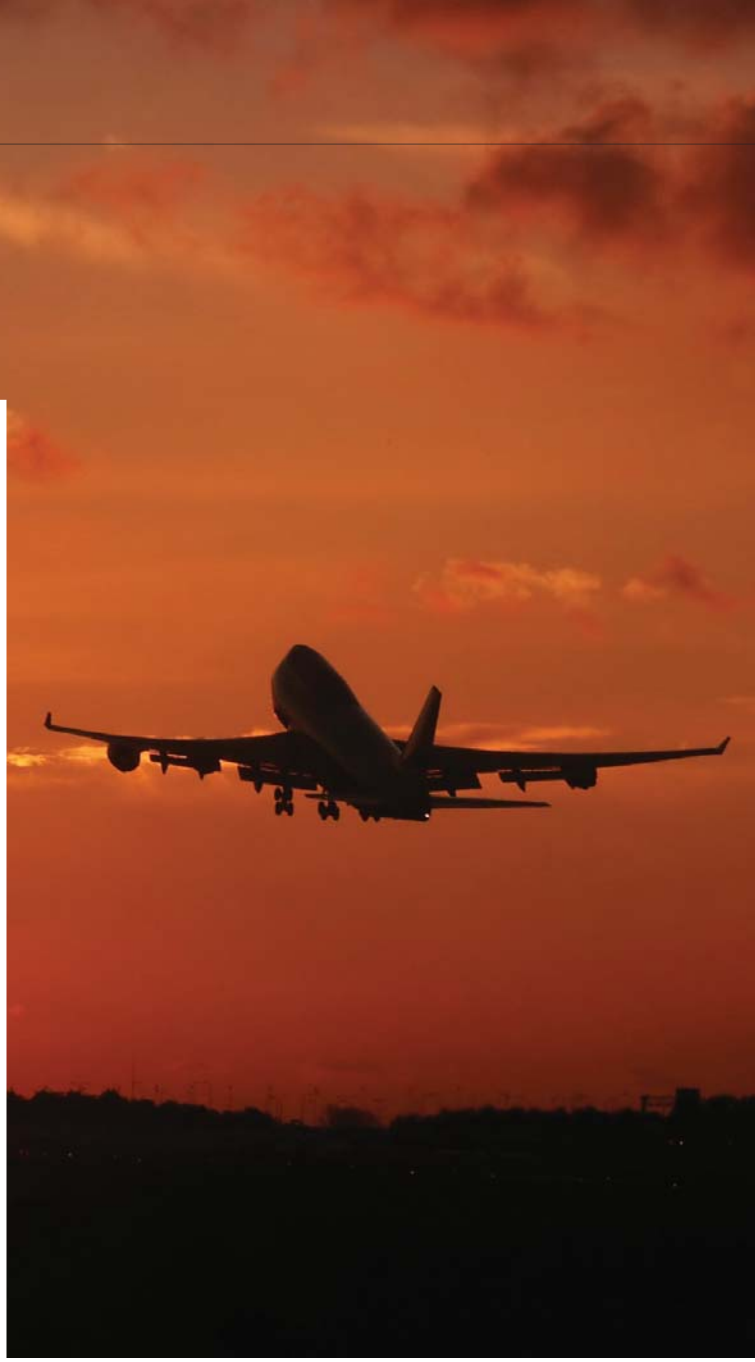


Defending the data:

The SMS perspective on the appropriateness and role of safety reporting data in legal proceedings

Aviation safety has been a headline issue in recent weeks and months, particularly as the legal ramifications of the collision between a Legacy 600 private jet and a Boeing 737 over Brazil have brought renewed focus onto the delicate balance between the needs of aviation safety reporting systems on the one hand, and the requirements of local judiciaries on the other.

Captain Daniel Maurino, ICAO's leading expert in the field of Safety Management Systems and a true pioneer of the application of this safety approach to aviation, reviews current policies surrounding safety data and discusses the SMS perspective on the sharing or protecting of various types of safety information in both day-to-day and investigative contexts.

Captain Daniel Maurino is well-known to *Journal* readers as ICAO's foremost expert in the field of Safety Management Systems (SMS). He is also a man now planning to retire this fall, even as aviation safety enters into what he calls "one of the most exciting and promising periods it has ever witnessed".

As he greets me for this interview I can discern in Maurino both a hint of regret and a strong sense of personal satisfaction. His regret, quite clearly, is that he won't be here to participate directly in the more complete endorsement and application of a safety approach that he has defended and worked very hard to get accepted. It's a feeling that many of us share with respect to ongoing goals in the last days and weeks of a career, and, in some, it can be a cause for fear of what life will be without the focus that has guided them for so long.

But in Maurino this regret is clearly tempered by that particular and even enviable satisfaction of the individual who is comfortable in his accomplishments and truly ready to enjoy the more self-directed pursuit of knowledge and fulfillment that of late, it seems, only retirement can afford us.

“I’m retiring from ICAO,” begins Maurino, a broad smile coming across his face, “not from life.”

Maurino first came to work for ICAO in 1989, as a consultant in the then-burgeoning field of human factors research. The lessons learned during the development and maturation of the human factors approach, which involved advancing the industry’s ability to understand and quantify information surrounding how human strengths and fallibilities interface on an ongoing basis with technological and administrative systems, in many ways led directly to his later appreciation for and adoption of the SMS approach. As anyone familiar with Maurino will undoubtedly recall, for him safety is always “all about the data”.

Along with several key ICAO colleagues and with the support of upper management in ICAO’s Air Navigation Bureau (ANB), Maurino has been working hard in the last few years helping to guide a true paradigm shift in how the Organization and its States approach aviation safety. Together with Maurino, these ICAO stakeholders have developed the new Integrated Safety Management Section (ISM) within the ANB, the goal of which is to better organize and effect changes related to aviation safety management in the most efficient and cost-effective manner possible.

As well, Maurino has played a key role in the development and early progress of the Organization’s new Air Navigation Safety Group (ASG), which provides the ICAO Secretariat with strategic vision and direction. The objectives of the ISM Section are to develop, with the support of the ASG, the Internal Safety Management Process (ISMP) and eventually an Integrated Safety System (ISS). In line with these objectives, the ISM Section also supports activities regarding the transition to the next cycle of safety oversight audits based on a continuous monitoring approach.

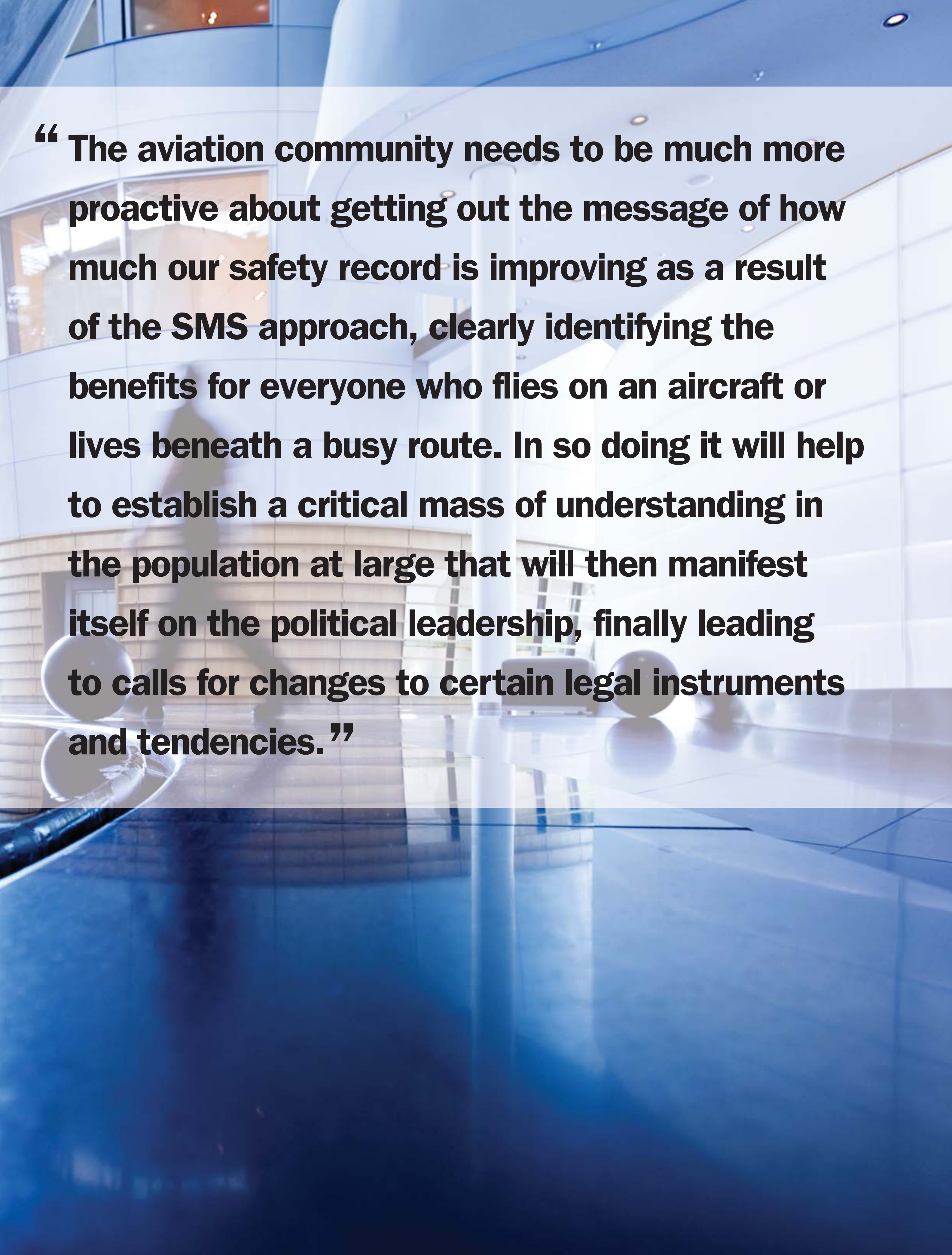
It’s believed that the SMS approach that ICAO has begun to implement under these broad governance tools was originally developed for use on offshore oil platforms. Over time, safety experts from many different industries and sectors, including aviation, began to understand that its principles applied equally to any complex organizational or technological structure.

A properly designed and functioning SMS system gathers reactive, predictive and proactive data from all available operational and technical sources. It then analyzes results based on varying queries and objectives related to improving safety. The challenge for the SMS approach lies in developing the reporting mechanisms and inspiring an organizational environment that makes employees aware of the value of noting and communicating even small incidents or trouble-spots—especially when they may have already become part of a person’s daily routine.

The heart of the SMS approach, therefore, relies on a paradigmatic shift, one that specifically moves the industry away from tendencies to use safety data to assess and assign blame. Instead, under SMS applications safety data is collected and “mined” or collected within a new reporting and punishment paradigm that stresses not individual blame, but rather the aggregate value and importance of “… keeping the data flowing”.

In the aviation context, for example, it has subsequently become understood that the greater goal of keeping airliners safely in the skies is far more important than perpetuating narrow, schoolyard notions of responsibility and blame. The latter only serves to perpetuate an environment where important safety data related to failures and errors remains essentially buried under layers of fear and regret, only to remain ignored, misunderstood and therefore capable of putting still more lives at risk on a recurring basis.

Maurino feels strongly that the aviation community needs to first clearly define what it is seeking to protect, and why. He notes that, until there is a deeper level of understanding of these priorities in society at large, political leaderships will remain reluctant to “buy-in” to the role they will need to play in effecting longer-term changes to current legal frameworks.



“The aviation community needs to be much more proactive about getting out the message of how much our safety record is improving as a result of the SMS approach, clearly identifying the benefits for everyone who flies on an aircraft or lives beneath a busy route. In so doing it will help to establish a critical mass of understanding in the population at large that will then manifest itself on the political leadership, finally leading to calls for changes to certain legal instruments and tendencies.”

"Legal systems, it must be remembered, are human constructs that have adapted and evolved over time," Maurino remarks. "This evolution takes place to accommodate new levels of knowledge and understanding in society. It is a process, at all times, of give-and-take between individual freedoms and what is understood as 'the greater good'. Though the timeline of this type of progress is painstakingly slow at times, it is specifically this type of cultural shift in the legal paradigm that we must now work towards in order to allow SMS initiatives to flourish."

In assessing the role that aviation safety and communications professionals need to perform with respect to near-term SMS outreach objectives, Maurino begins by pointing out that there still remains confusion even within the industry itself regarding the differing types of safety information and the varying levels of priority and protection that should accrue to each under various circumstances.

"The aviation community needs to be much more proactive about getting out the message of how much our safety record is improving as a result of the SMS approach, clearly identifying the benefits for everyone who flies on an aircraft or lives beneath a busy route. In so doing it will help to establish a critical mass of understanding in the population at large that will then manifest itself on the political leadership, finally leading to calls for changes to certain legal instruments and tendencies."

When asked about recent investigations and some opinions being expressed by aviation stakeholders that pilots and controllers should be protected from the consequences of their performance, he is emphatic that this is the wrong course for the industry to be taking at this time.

"Let's be very clear here. Current actions to protect safety data from accident investigations are generally misguided. These actions unwillingly convey the perception—and perception *is* reality—that we are trying to create a 'special status' for pilots and controllers: one whereby they are above responsibility for their actions. This represents the old human factors approach: 'Do not hold people accountable for unwilling errors', and it makes for a hard sell for less aware audiences.

The industry needs to be much clearer in its message both to the public and to political leaders that we are seeking to specifically, under a well-considered and prioritized regimen, protect only certain types of voluntarily-reported safety data—not accident reports that are in the public domain and not the eventual culpability of individual pilots or controllers. It's by protecting the data that we'll protect people."

Maurino notes that a very clear distinction needs to be drawn between information from flight data recorders and that which can be derived from the voluntary cockpit recordings that pilots and controllers allow to be made specifically for safety purposes.

"No other industry, not even the public sector where employees are paid with public funds, submits its workers and managers to the degree of invasion of privacy and potential for self-incrimination that is represented by the cockpit voice recorder," he explains.

In-house reporting systems, according to Maurino, should all have a special status as regards public access. These internal reviews and reports are produced by all organizations everywhere to help them identify what is broken and what needs to be fixed, and all rely on the privacy of those participating being fully respected. Though information from these types of reports and processes is regularly shared with other agencies on an aggregate basis, in Maurino's view it's very different when you get down to the question of personal privacy and responsibility.

The challenge that remains in this regard is at the legislative level on a State by State basis. A few countries have re-written their laws to protect reporting data, Denmark and Holland come immediately to mind, but in international forums within ICAO certain States still object even to having to accept the inclusion of guidance in this area within ICAO's Annex 13—*Aircraft Accident and Incident Investigation*, never mind agreeing to develop effective legislative remedies.

"Aviation will not be able to effect change to national legal systems by standing at podiums and telling lawyers and judges and justice ministers that they need to change the way they work," he stresses. "This direct and confrontational approach will only serve to get peoples' backs up and entrench current systems."

Despite these impasses, Maurino is positive and excited about the aviation safety challenges that remain as he prepares for his departure from the field. He notes that methods for improving safety reporting are still in an early stage of development and that very few organizations today are collecting the type and amount of data that will become the norm as SMS programmes move forward.

"I believe that there's still a great deal of potential that remains to be explored and exploited within the area of safety management," Maurino concluded. "The idea that you don't wait for something to break before you fix it, that you move away from the purely reactive focus on accident prevention and look more deeply at all the underlying concepts, programmes and minute activities that together create a real safety profile, in many ways we are still simply scratching the surface of what mature SMS systems will be able to achieve." ■

Accident safety data and the media: An investigator’s perspective

The mid-air collision over Brazil in 2006 raised concerns in aviation and judicial circles about the purpose and protection of safety data in the investigative context.

Marcus Costa, Chief of ICAO's Accident Investigation and Prevention (AIG) Section, speaks to the *Journal* concerning the mutually exclusive needs of accident investigators and media outlets when the latter remain willing to offer large sums of money in exchange for investigation reporting data.

ICAO *Journal*: Summarize for our readers the investigation results from the 2006 Brazil mid-air accident and some of the ramifications that have arisen as a result.

The investigation of this collision proved to be very comprehensive and a lot of good concerns arose as a result. From a broader perspective, aviation gained meaningful insights into the overall air traffic system and the manner in which latest-generation aircraft, equipped with Airborne Collision Avoidance Systems (ACAS) and Mode-C transponders, were still able to collide in a controlled airspace. Perhaps the biggest lesson we can extract from this unfortunate accident is that operational personnel need to keep their situational awareness and assertiveness well-honed despite ongoing technological advancements.

Would you characterize the Brazilian process as a "standard" investigation procedure?

This experience proceeded a little differently from other accident and incident investigations in the sense that the Brazilian investigation authority (the Aircraft Accident Prevention and Investigation Centre, CENIPA) does not seek to identify a single cause for accidents. Rather they attempt to identify *all* the possible contributing factors.

This is a philosophical difference, in a sense, but States that conduct their investigative efforts in this manner also generally do so because the use of the word "cause" can have specific legal consequences in some instances. ICAO Annex 13 supports both types of investigative approaches provided they are comprehensive enough to identify all the safety deficiencies that contributed to the accident.

The aviation community is generally quite satisfied with the report summarizing the 2006 mid-air accident, specifically because it was so comprehensive, but it remains of significant concern to all stakeholders that the cockpit voice recorder (CVR) recordings were leaked to the media in the manner that they were.

"We need to constantly hit home that the repercussions of inappropriate or illegal releases of safety investigation records may adversely affect not just something we call 'aviation safety', but more directly the innocent passengers who benefit day-in and day-out from our community's tremendous efforts and otherwise excellent record in this area."

Why is this such an important issue from an investigator's standpoint?

What we classify as "Annex 13 investigations", namely the specific efforts of aviation stakeholders to determine accident/incident contributing factors or causes, are conducted purely to improve aviation safety. During investigations, investigators usually assure those involved that anything they say will be used only toward the prevention of accidents and incidents.

As these procedures have improved over time, and as lessons have been learned regarding how we can improve this type of safety data gathering to better inform stakeholders in the post-accident environment, tools such as the "black box" flight data recorders (FDRs), now very familiar to the public and usually of essential and indisputable value for investigations, began to become standard issue on all commercial aircraft. Similarly, pilots and air traffic control (ATC) professionals also began to permit their conversations to be recorded and for these conversations to be saved to the FDRs—a tremendous invasion of workplace privacy by any standard but one which was agreed to by these parties specifically to assist in achieving safety objectives.

The great concern to investigators, as with all stakeholders who have an interest in the ongoing and effective improvement of aviation safety, is that if some Annex 13 investigation records begin to officially or unofficially find their way into the media on a regular, or even semi-regular basis, the willingness of those involved to have their communications recorded and to share additional and relevant information post-accident will become severely restrained. Ultimately this would place serious limits on all investigations and significantly undermine safety improvement efforts.

How do these Annex 13 requirements correspond to the needs of local legal enquiries when negligence or some other form of civil malfeasance may need to be confirmed?

The general process is that a judicial authority in a pertinent State would begin its own investigation to determine its own results. The Annex stipulates that judicial officials need to weigh the relative merit of releasing some safety investigation records for these purposes versus the adverse effect on aviation safety already discussed here *(for more detail in this regard please see the IFALPA viewpoint and its references to some of the pertinent ICAO Annex 13 Guidance, page 12).* Annex 13 further stipulates that any judicial or administrative proceedings to apportion blame or liability should be separate from any investigation conducted under its provisions.

Was this type of deliberation followed in the case of the Brazilian accident?

From what I understand of the matter no members of the Brazilian investigation board were involved in the media coming into possession of the cockpit voice recordings. This material was illegally leaked and the investigation board concerned only became aware of it when it had already found its way onto the internet.

In your opinion, might Annex 13 need to be amended in some way to help protect the data more rigourously?

I don't think so. The problem in this instance was more than likely external to the investigation stakeholders and also external to the local judiciary.

What's important to remember in this context is that there can be a lot of money involved when large media firms become interested in gaining access to restricted information to help generate their print, web and broadcast news revenues. There was a situation approximately a decade ago, for instance, when an aircraft accident occurred involving a famous rock band. During that investigation someone was approached and offered $250,000 by a media outlet in exchange for the information from the CVR. Fortunately in that instance the individual chose to act out of responsibility rather than greed.

In the end the aviation and legal communities can and do function with very high levels of responsibility and respect for each other, but a single individual in a chain of custody can still be a weak link if other industry sectors are willing to offer bribes of this sort. Our community is no more immune than any other when individuals from the media or elsewhere are willing to sacrifice human life and "the greater good" in exchange for short-term profit.

If "money talks" to this extent, what can aviation do to try and plug this hole?

I am a firm believer that the answer rests with education. The most important thing the aviation community can do is to continually and proactively educate the public that there is an important reason for protecting safety data from inappropriate use. We need to constantly hit home that the repercussions of inappropriate or illegal releases of safety investigation records may adversely affect not just something we call "aviation safety", but more directly the innocent passengers who benefit day-in and day-out from our community's tremendous efforts and otherwise excellent record in this area. ■

IFALPA'S VIEW

The following is an excerpt from IFALPA advisory 09POS03, entitled *The use of accident related safety information*. The omitted sections refer to existing portions of Attachment E to ICAO Annex 13.

The IFALPA Executive Board notes that the provisions of ICAO Annex 13 are not consistently implemented around the world, causing some difficulty during, and subsequent to, the technical investigation. Further, there is a mistaken belief amongst some IFALPA Member Associations that ICAO Annex 13 grants immunity from prosecution for pilots and that IFALPA supports this position. The purpose of this statement is to clarify IFALPA's understanding of the intent and scope of ICAO Annex 13.

IFALPA supports the proposition of Annex 13 that:

3.1 *The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.*

It is important to note that this paragraph only refers to the investigation itself. It does not speak to other administrative or judicial action connected with an accident or incident. The real issue when dealing with such an administrative or judicial action is the use that may be made of the results of the investigation. IFALPA believes that many of the questions in this area may be resolved by application of Annex 13:

5.12 *The State conducting the investigation of an accident or incident shall not make the following records available for purposes other than accident or incident investigation, **unless the appropriate authority for the administration of justice in that State determines that their disclosure outweighs the adverse domestic and international impact such action may have on that or any future investigations:** [emphasis added]*

a) all statements taken from persons by the investigation authorities in the course of their investigation;
b) all communications between persons having been involved in the operation of the aircraft;
c) medical or private information regarding persons involved in the accident or incident;
d) cockpit voice recordings and transcripts from such recordings; and
e) recordings and transcriptions of recordings from air traffic control units; and
f) opinions expressed in the analysis of information, including flight recorder information.

IFALPA does not support the emphasised caveat in 5.12, but while it exists, IFALPA expects the caveat to be interpreted strictly by the applicable court or other authority. The principles of the non-disclosure of records are amplified in Attachment E to Annex 13 which, while not a Standard, contains guidance material to assist States in amending their laws to allow safety programmes generally and compliance with the provisions of the Annex, specifically those in paragraph 5.12.

Ambitious GASP objectives now being realized with advances in Regional and sub-regional cooperative initiatives

Recent AFI-RAN and RASG-PA events meet with unqualified success

In the final months of 2008, ICAO and the Industry Safety Strategy Group (ISSG) partners began to actively implement new programmes and governance structures to help individual States cooperate more effectively with respect to the efficient oversight and management of their civil aviation safety programmes and infrastructure development.

The basis for these initiatives is provided for by the ICAO Global Aviation Safety Plan (GASP), which complements the objectives laid out in the ISSG Global Aviation Safety Roadmap (GASR). Together, the GASP and GASR outline global safety priorities for governments, industry and Regions, as well as providing a well-defined process for identifying gaps between best practices and reducing duplication in efforts to implement action plans.

In this issue, the *Journal* explores recent developments in the ICAO African (AFI) and Americas/Caribbean (SAM and NACC) Regions that reflect the ongoing application of practical measures to address key global safety concerns. Readers may wish to note that ICAO will review the scope and conclusions from last year's AFI-RAN meeting in more detail in the special *AFI Regional Report* magazine slated for distribution in the coming months.

Two of the most important recent developments with respect to the global objectives contained in the ICAO GASP occurred late in 2008. This progress was achieved in the African (AFI) and Americas/Caribbean (NACC/SAM) Regions respectively.

In the AFI Region, GASP/GASR efforts were moved forward with tremendous success at the Africa/Indian Ocean Regional Air Navigation (AFI-RAN) meeting on aviation safety and efficiency, held in Durban, South Africa last November. This event developed a blueprint for creating new Regional cooperation initiatives among various sub-regional bodies that have been operating under the auspices of ICAO's Cooperation Development of Operation Safety and Continuing Airworthiness Programmes (COSCAPs).

The AFI-RAN results built on the efforts of recent workshops and meetings that were held in: Addis Ababa, Ethiopia; Abuja, Nigeria; Maputo, Mozambique; Ouagadougou, Burkina Faso; and Arusha, Uganda; among others. The event helped to highlight how civil aviation responsibilities, especially with respect to effective safety oversight and the implementation of more advanced air navigation infrastructure, can be extremely expensive for many States to assume individually. It's currently estimated, for example, that some 75 percent of AFI States are not capable of assembling the resources required to be able to develop and manage an effective and sustainable civil aviation safety oversight system.

Captain Haile Belai, ICAO's Chief of the AFI Implementation Programme which was established to give effect to ICAO's broader AFI Plan, noted in a recent *Journal* interview that many of these smaller AFI States only experience a few departures on a daily basis, while larger countries—even those with many millions of inhabitants—may similarly only witness 20 or 30 daily departures.

In all of these instances, civil aviation activities are simply not yet at a threshold whereby they can generate the volume of ancillary revenue which is suitable, on a State-by-State basis, to cover the costs of the comprehensive resources that are required for effective safety programmes. In an era when even a single accident investigation can incur costs in the tens of millions of dollars, the need for these types of cooperative Regional programmes becomes very clear, very quickly.

"The establishment of the new AFI and Pan American initiatives is reflective of an increasing trend towards the Regionalization of international civil aviation safety initiatives. States throughout the world are finding that by pooling their aviation expertise and resources they can achieve real safety improvements in a timely and sustainable fashion through international cooperation," remarked Roberto Kobeh González, President of the ICAO Council.

In the Americas and Caribbean, the inaugural meeting of the Regional Aviation Safety Group – Pan America (RASG–PA), held late in 2008 in Costa Rica, brought together stakeholders from States, industry, and global and regional organizations representing a new and truly *hemispheric* level of coordination. The event established RASG-PA as the key forum in the hemisphere to address safety risks in line with the GASR and will serve to ensure harmonization and coordination of safety risk mitigation efforts taken in the North American, Central American, Caribbean and South American regions.

"The event set the stage for collaboration among the stakeholders to reduce aviation safety hazards," began ICAO NACC Regional Director, Loretta Martin. "In the 21st century, access to safe flights should be a basic right of citizens everywhere, but this right can only be effectively extended when all stakeholders work together on the most significant challenges—especially those related to aviation safety. The RASG-PA brought together industry, international and regional organizations, and Civil Aviation Authority (CAA) stakeholders, building on the work reflected in the Roadmap and GASP as well as new safety data that had been presented and assessed in recent workshops."

RASG-PA planning focuses on eliminating the duplication of efforts and reducing human resource and financial expenditures, which are extremely limited in the South/Central American and Caribbean Regions. All participating stakeholders will be looking for alternative funding sources from organiza-

ISSG GLOBAL AVIATION SAFETY ROADMAP: 12 FOCUS AREAS

The ISSG's members include: the International Air Transport Association (IATA); Airbus; Boeing; Airports Council International (ACI); the Civil Air Navigation Services Organization (CANSO); the Flight Safety Foundation (FSF); and the International Federation of Air Line Pilots Associations (IFALPA). ICAO was also an active and essential participant throughout the ISSG's Roadmap development activities.

Focus areas for States:

1. Inconsistent application of international (ICAO) Standards.
2. Inconsistent regulatory oversight.
3. Impediments to the reporting of errors and incidents.
4. Ineffective incident and accident investigation.

For Regions:

5. Inconsistent coordination of Regional programmes.

For Industry:

6. Impediments to reporting and analyzing errors and incidents.
7. Inconsistent application of Safety management Systems (SMS).
8. Inconsistent compliance with regulatory requirements.
9. Inconsistent adoption of industry best practices.
10. Non-alignment of industry safety strategies.
11. Insufficient number of qualified personnel.
12. Gaps in the employment of technology to enhance safety.

“The Regional Aviation Safety Group—Pan America—will focus on eliminating duplicated efforts and reducing human resource and financial expenditures, which are extremely limited in this Region. All participating stakeholders will be looking for alternative funding sources from organizations that have a clear stake in reducing aviation safety risks in the area, thereby reducing the need to rely solely on States for funding initiatives.”

Loretta Martin,
ICAO NACC Regional Director

tions that have a clear stake in reducing aviation safety risks in the area, thereby reducing the need to rely solely on States for funding.

The ISSG Roadmap and ICAO GASP require that all stakeholders follow a logical process to address 12 focus areas attributable to States, Regions, and industry, respectively, so that the Regions will always invest their energy in the most critical areas *(see ISSG sidebar, page 14).* The Roadmap provides metrics through explicit projects that enable managed improvement and channels efforts through existing mechanisms—not new bureaucracies.

Industry participation in the Roadmap is essential and includes airlines, operators, airports, ANSPs, Maintenance and Repair Organizations (MROs) and manufacturers. Martin commented on the usefulness of having the Roadmap's focus areas clearly indentified as the RASG-PA membership joins together to tackle their agenda.

"My own observation has been that, even though there is some degree of overlap under current safety and development regimens, certain gaps nonetheless remain—for instance between air navigation and flight safety activities," continued Martin. "The RASG-PA will help to minimize these and other deficiencies by concentrating on the Roadmap's 12 focus areas."

A number of ICAO Member State officials were elected at the RASG-PA meeting to serve as members on its Executive Steering Committee (ESC).

Lt. Col. Oscar Derby, Director General of the Jamaica Civil Aviation Authority, was elected as the RASG-PA's first Chairman, and other State aviation dignitaries from Brazil, Costa Rica, Chile and the U.S. will serve as Vice-Chairmen of RASG-PA and the ESC.

International organizations, including the International Air Transport Association (IATA), Airports Council International (ACI), the Asociación Latinoamericana de Transporte Aéreo (ALTA), the International Federation of Air Line Pilots' Associations (IFALPA), the International Federation of Air Traffic Controllers' Associations (IFATCA), the Central American Corporation of Navigation Service Providers (COCESNA), as well as the U.S. Federal Aviation Administration (FAA) and manufacturers Airbus and Boeing, will also serve on the RASG-PA ESC to help establish the highest level of coordination and collaboration possible.

Attendees of the ground-breaking Regional Aviation Safety Group – Pan America (RASG-PA) meeting in Costa Rica, November 2008. While addressing the ICAO, State, aviation stakeholder and industry participants, ICAO Council President Roberto Kobeh González noted that:

"The establishment of the new AFI and Pan American initiatives is reflective of an increasing trend towards the regionalization of international civil aviation safety initiatives. States throughout the world are finding that by pooling their aviation expertise resources they can achieve real safety improvements in a timely and sustainable fashion through international cooperation."

"Some of the most significant advances in civil aviation safety have been achieved when government and industry work together to identify potential safety hazards and work together to mitigate risks to an acceptable level," added Kobeh González.

The spirit of his remark was heartily supported by Loretta Martin.

"This group is results oriented," commented Martin. "We will be a forum for expedient, efficient, and cost effective implementation of near-, mid- and long-term Roadmap initiatives for all stakeholders. The RASG-PA will determine roadblocks and identify priorities to achieve GASR implementation with clearly-defined stakeholder action plans."

Representatives from several regional and sub-regional safety groups also attended and shared valuable safety information at the RASG-PA meeting, including the European Aviation Safety Agency (EASA), the Commercial Aviation Safety Team (CAST), the Caribbean Aviation Safety and Security Oversight System (CASSOS), and the Central American Aviation Safety Agency (ACSA).

During RASG-PA/1, participants completed a gap analysis for the implementation of Safety Management Systems (SMS). Members of the Steering Committee used this information to determine the implementation requirements and develop a plan for the roll-out of SMS programmes throughout the Region by building upon the synergies of all the countries and industry stakeholders involved and following-up on the extensive training and workshop activity that has previously been conducted in the Region by both ICAO and ISSG members.

While speaking with ICAO Flight Safety (FLS) Section Chief Mitchell Fox, who also attended the RASG-PA meeting and has been participating in regular teleconference calls with Steering Committee members in the weeks since, his excitement at being involved in this truly "hemispheric" event was clearly in evidence, but it was the subject of SMS that became an early focal point in our discussions.

"The Pan Am application of the more refined SMS implementation framework is currently set for 2010, and this still represents a tremendous challenge for industry and governments," Fox began. "In the most recent call I had with the Steering Committee we got some great news from the representative at Boeing about a company with aviation ties that has developed a very sophisticated system for implementing SMS in their aviation operations. He noted that they're willing to donate this to the RASG-PA free of charge so that it can assist all the relevant stakeholders in taking on and meeting this significant challenge."

Fox went on to comment on the important role that ICAO performs as "a very well-suited network" for getting stakeholders and States connected, communicating and cooperating. In early pre-Roadmap, pre-GASP discussions between the Organization and industry groups, a strong conclusion was reached that their efforts at that time were making inefficient use of limited resources.

This preliminary groundwork paved the way, first for the Roadmap and GASP and now more specific Regional initiatives to take shape— moving beyond the setting of priorities and getting started on the actual implementation of distinct plans of action.

"When you put forward a structured approach that makes sense to both government and industry, and you provide a logical process to reveal the gaps in various global safety initiatives, it in effect makes it much simpler for States and stakeholders to cooperate with a degree of effectiveness that was once a fairly distant goal on our horizons," Fox remarked.

"In my opinion, the success that this initiative will lead to is precisely why people choose to work in international aviation to begin with." ■

Putting jatropha to the test

Air New Zealand employs a new second generation biofuel in recent flight test as commercial aviation looks to improve environmental performance and abate future exposure to jet fuel price volatility.

The world's first commercial aviation test flight powered by jatropha, a sustainable second generation biofuel, was successfully completed by Air New Zealand at the end of 2008.

Air New Zealand's Boeing 747-400, powered by Rolls-Royce RB211 engines, takes off from Auckland international Airport last December. One of the four engines was run on a 50/50 mix of second-generation jatropha biofuel and Jet A1.

More than a dozen key performance tests were undertaken in the two hour Air NZ test flight which took-off on December 30th from Auckland International Airport. A biofuel blend of 50:50 jatropha and Jet A1 fuel was used to power one of the Air New Zealand Boeing 747-400's Rolls-Royce RB211 engines.

After the successful completion of their flight, Pilot in Command Captain Keith Pattie and Air New Zealand Chief Pilot Captain David Morgan stepped off the aircraft back at Auckland International Airport and informed invited guests about the outcomes of the flight.

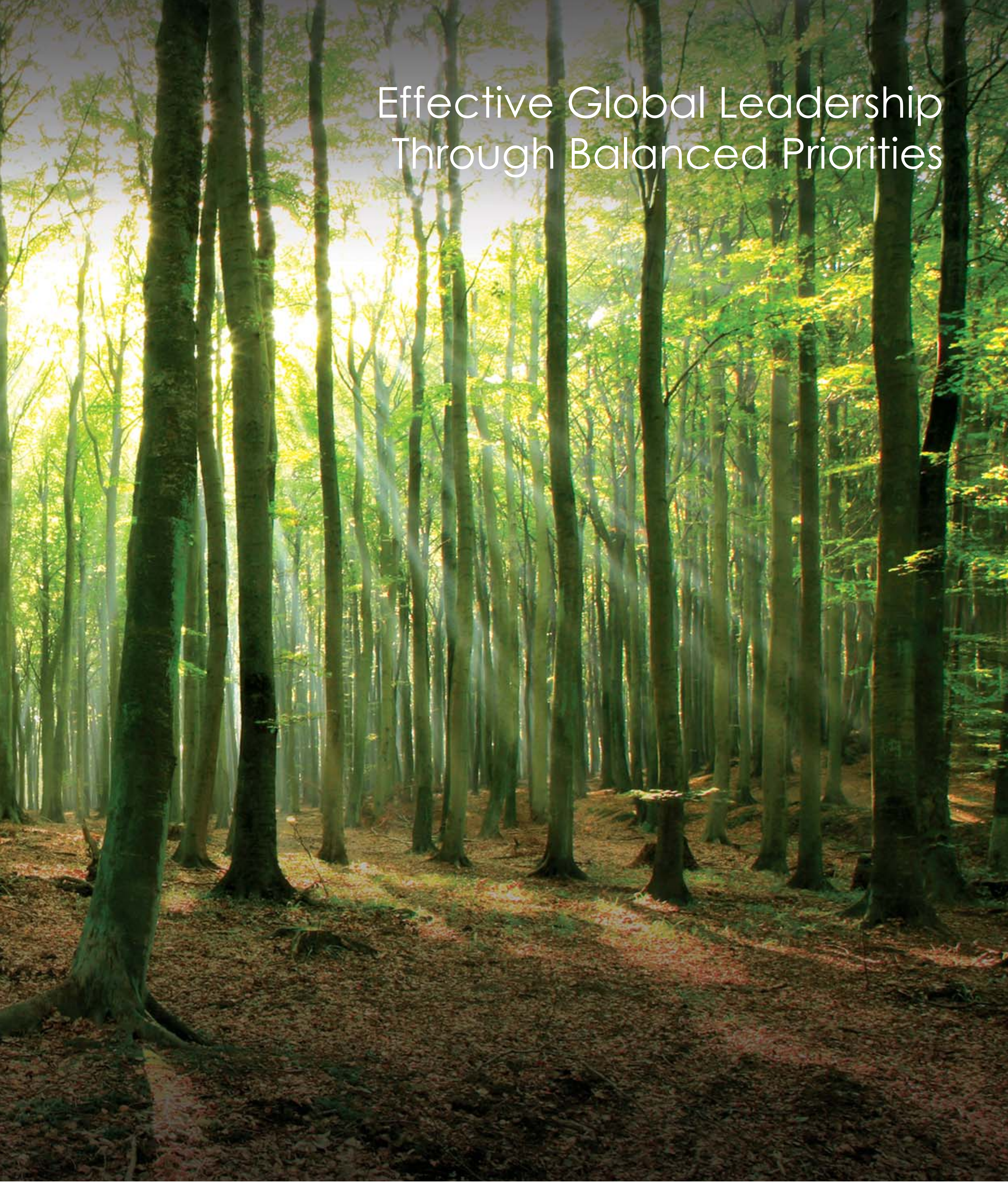
"We undertook a range of tests, both on the tarmac and in-flight, with the jatropha biofuel performing well through both the fuel system and engine—just as laboratory tests indicated it would," commented Captain Morgan. "To complete our testing programme our engineers will, over the next few days, be thoroughly assessing the engine and fuel systems looking for any changes as a result of the use of biofuel. Together with our partners on this project we will then review all the results as part of our drive to have jatropha certified as an aviation fuel."

According to test leader Air New Zealand, the aim of the biofuel flight was to expand the aviation industry's knowledge of a second generation sustainable biofuel and to determine its suitability for use in air travel. The purpose of the flight was to confirm that the fuel—which has been produced to a specification equal to that of normal jet fuel—meets or exceeds this specification.

The flight had an extensive test flight schedule which was developed in association with Boeing and Rolls-Royce. Engine parameters for the biofuel engine were compared to the other three, standard-fuel engines in both high and low power tests.

The flight included a full thrust take off, varying climb power settings, engine acceleration tests, and shut downs and relights in-flight and on the apron. More details are available in the QuickFacts section immediately following this article.

Tests are now ongoing by all involved partners to confirm the fuel's energy levels, specific gravity, economic value and fuel use per mile flown. The *ICAO Journal* will seek to follow-up on these results as they become available later in 2009.


Effective Global Leadership
Through Balanced Priorities

QuickFacts: The Air New Zealand biofuel test

Date and location
Auckland, New Zealand, December 30, 2008.

Which aircraft and engine types were involved in the test?
An Air New Zealand Boeing 747-400 powered by Rolls-Royce RB211 engines.

Who were the partners in the test flight?
The test flight is a joint initiative between Air New Zealand, Boeing, Rolls-Royce and UOP, a Honeywell company, in commercial aviation's drive for more sustainable air travel for future generations.

Representatives from Air New Zealand and its test partners on the biofuel flight. From left to right: Jennifer Holmgren, UOP; Billy Glover, Boeing; Chris Lewis, Rolls-Royce; Air New Zealand CEO Rob Fyfe; Air New Zealand's pilots (Chief Pilot, Captain David Morgan and Captain Keith Pattie).

What was the source fuel for the test flight?
The fuel that Air New Zealand employed was a 50/50 mix of jatropha and Jet A1.

What is jatropha and where was the jatropha sourced from?
Jatropha is a plant that grows to approximately three metres high and produces seeds that contain inedible lipid oil that is used to produce fuel. Each seed produces between 30 and 40 percent of its mass in oil and jatropha can be grown in a range of difficult conditions, including arid and otherwise non-arable areas, leaving prime areas available for food crops.

The jatropha oil Air New Zealand sourced and refined for its test flight came from South Eastern Africa (Malawi, Mozambique and Tanzania) and India. It was sourced from seeds grown on environmentally sustainable farms.

How can potential end-users be sure their jatropha is sourced from environmentally sustainable farms?
In this case the test flight partners engaged Terasol Energy, a leader in sustainable jatropha development projects, to independently source and certify that the jatropha-based fuel for the flight met all of the most current sustainability criteria.

What criteria did Air NZ and its partners set for these tests to meet?
The partners were non-negotiable about the three criteria their environmentally sustainable fuel needed to meet for the test flight programme. These were social, technical and commercial.

Firstly, the fuel source needed to be environmentally sustainable and not in competition with existing food resources. Secondly, the fuel had to be able to function as a drop-in replacement for traditional jet fuel and technically be at least as good as the Jet A1 product used today. Finally, it had to be cost competitive with existing fuel supplies and be readily available.

The criteria for sourcing the jatropha oil required that the land was neither forest land nor virgin grassland within the previous two decades. The quality of the soil and climate needed to be such that the land would not be suitable for the vast majority of food crops. Furthermore, the farms had to be rain-fed and not mechanically irrigated.

Who refined the fuel?
Once received from Terasol Energy, the jatropha oil was refined through a collaborative effort between Air New Zealand, Boeing and leading refining technology developer UOP, utilising UOP technology to produce jet fuel from renewable sources that can serve as a direct replacement to traditional petroleum-based fuel.

Who certified the fuel as acceptable for use in the test flight?
The fuel was tested over several days by both Rolls-Royce and scientists at the independent research company Intertek at its Sunbury Technology Centre in the United Kingdom.

The biofuel used in the Air New Zealand test were refined from jatropha oil. Jatropha is a plant that grows to approximately three metres high and produces seeds that contain inedible lipid oil that is used to produce fuel. Each seed produces between 30 and 40 percent of its mass in oil and jatropha can be grown in a range of difficult conditions, including arid and otherwise non-arable areas, leaving prime areas available for food crops.

Has any life cycle analysis been conducted on jatropha?

Jatropha can be grown on marginal lands and, as such, the issues around land use change-related life cycle emissions can be mitigated.

The Sustainable Aviation Fuel Users Group *(see page 22),* launched in September 2008, has chartered a peer reviewed, independent life cycle and socio-economic sustainability research report, which is expected to be completed in September 2009.

If jatropha takes off as a commercial fuel for either aviation or the motor industry, are you concerned that it may displace food crops, and in turn see their prices further increase?

If Air New Zealand decides to meet its sustainable second generation biofuel needs from jatropha, any crops would have to be certified as coming from land that had not previously been used for competing food crops.

Do jatropha plants need fertilizer?

Jatropha plants need much less fertilizer than traditional crops currently used for biofuels. For example, Jatropha uses 1/20 of the fertilizer needed for corn.

Why did Air New Zealand conduct this biofuel flight?

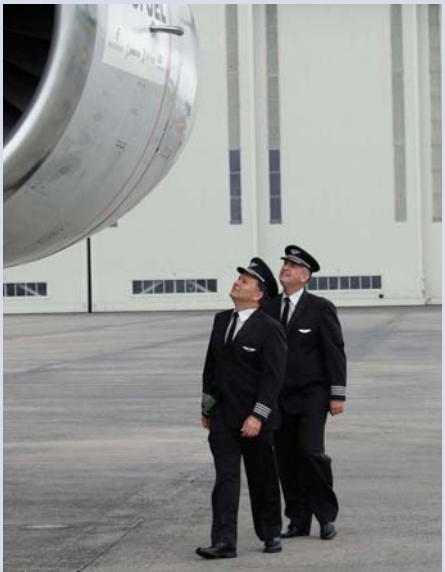
Air New Zealand wants to take a leadership role in developing more sustainable air travel for future generations. This test is just one part of the scientific research and development process that is required. We were fortunate to be able to perform it with partners sharing the same vision such as Boeing, Rolls Royce and UOP.

Why did the airline only run one engine on the biofuel blend?

Only one engine needs to be utilised to achieve the scientific outcomes of the test flight. Furthermore, under aviation regulations the Boeing 747 is only certified to be able to run one engine on a second generation sustainable biofuel for this test flight.

Who was onboard the flight?

The aircraft had four pilots on the flight deck and was flown by Air New Zealand's Boeing 747 Fleet Manager Captain Keith Pattie. There were two engineers on board the flight as observers and no other passengers.



Test flight Pilot in Command Captain Keith Pattie (left) and the project's Chief Pilot Captain David Morgan inspect the biofuel engine prior to take-off.

Where did the aircraft fly to?

The test flight was conducted over the wider Hauraki Gulf area of New Zealand's North Island. During the flight Captain Pattie and his crew undertook a number of fuel tests confirming and measuring the performance of the engine and fuel systems at various altitudes and under a variety of operating conditions.

What were the specifics of the biofuel test flight?

The test flight began with a full powered take off. The throttles were advanced slowly as per normal operating procedure to establish three-quarter power and then full power.

Climb:

The aircraft climbed to 25,000 feet. The main fuel pump for engine one (the engine powered by biofuel) was then switched off to test the lubricity* of the fuel and ensure that the fuel's friction would not slow down its flow to the engine.

Cruise:

Once it was cruising at 35,000 feet, the test aircraft's auto-throttle was switched off and the crew manually set all engine controls so that the Engine Pressure Ratios (EPRs) across all four engines could be checked for identical readings.

Deceleration/acceleration:

The crew then controlled the fuel pressure to manage and measure the rate of change of fuel to the engine under these changing operating conditions.

Descent:

The test engine was shut down at 26,000 feet and was re-engaged with a wind-milling restart at 300 knots. A second engine shutdown was performed at 18,000 feet, this time with a starter-assisted relight at 220 knots.

Simulated approach:

When the aircraft was at 11,000 feet the autopilot was programmed to land on a virtual runway "located" at 8,000 feet and undertake a missed approach procedure. This was to test the performance of the fuel under maximum thrust.

Landing:

The flight ended with a normal landing that included the use of reverse thrust upon touchdown. The aircraft was then taxied back to the hardstand where all engines were shut down and a final restart was performed on the biofuel test engine. ■

*The lubricative aspects of a given fuel are not directly provided by what is more commonly referred to as its "viscosity", but rather by other components in it which prevent wear on contacting metal surfaces.

Air New Zealand and the Sustainable Aviation Fuel Users Group

Air New Zealand's recent biofuel test can be seen as part of a larger industry initiative now underway to begin putting the latest biofuel knowledge and research into practical applications. Late last year, Air New Zealand became a founding member of aviation's new Sustainable Aviation Fuel Users Group, along with two of its main biofuel test partners, Boeing and UOP (Honeywell).

With support and advice from world leading environmental organizations, the World Wildlife Fund (WWF) and Natural Resources Defense Council (NRDC), the Sustainable Aviation Fuel Users Group makes commercial aviation the first global transportation sector to voluntarily drive verifiable sustainability practices into its fuel supply chain.

Besides Air New Zealand, other airlines supporting the sustainable fuels initiative include Air France, ANA (All Nippon Airways), Cargolux, Gulf Air, Japan Airlines, KLM, SAS and Virgin Atlantic Airways. Collectively, these carriers account for approximately 15 percent of commercial jet fuel use.

The group's charter is to enable the commercial use of renewable fuel sources that can reduce greenhouse gas emissions while lessening commercial aviation's exposure to oil price volatility and dependence on fossil fuels.

UOP, a leading developer of refining technology, has already developed process technology to convert natural oils and greases to military jet fuel as part of a project funded by the U.S. Defense Advanced Research Projects Agency (DARPA). The process technology produces "green" jet fuel that is a drop-in replacement for

SUSTAINABLE AVIATION FUEL USERS GROUP

Commitment to sustainable options

As aviation leaders, our business is to bring people, cultures, and economies together. We recognize the need for dynamic, new innovation to help reduce aircraft greenhouse gas emissions beyond existing advances, while continuing to increase the socio-economic good that air travel provides to the world.

Whilst we recognize the need to drive further efficiency gains through technological solutions and operational efficiencies, we also have an opportunity to deliver significant environmental and social benefits as we seek to lower the carbon intensity of our fuels overall by supporting the development, certification, and commercial use of lower carbon renewable fuels, derived from environmentally and socially sustainable sources.

Therefore, we, the undersigned air carriers and other aviation industry organizations declare our commitment to advance the development, certification, and commercial use of drop-in sustainable aviation fuels. Collectively, we represent approximately 15 percent of commercial aviation fuel demand, and in assessing the sustainability and commercial use of a bio-derived aviation fuel, the following considerations at a minimum should be addressed by verifiable means:

1. Jet fuel plant sources should be developed in a manner which is non-competitive with food and where biodiversity impacts are minimized; in addition, the cultivation of those plant sources should not jeopardize drinking water supplies.

2. Total lifecycle greenhouse gas emissions from plant growth, harvesting, processing, and endues should be significantly reduced compared to those associated with jet fuels from fossil sources.

3. In developing economies, development projects should include provisions or outcomes that improve socio-economic conditions for small-scale farmers who rely on agriculture to feed them and their families, and that do not require the involuntary displacement of local populations.

4. High conservation value areas and native eco-systems should not be cleared and converted for jet fuel plant source development.

These criteria should be consistent with, and complementary to emerging internationally-recognized standards such as those being developed by the Roundtable on Sustainable Biofuels.

traditional kerosene-based jet fuel and meets all the critical performance specifications for flight. This technology is also viable for use in the production of jet fuel for commercial jets.

“We welcome the aviation sector’s will to reduce their greenhouse gas emissions, and appreciate their efforts to ensure the sustainability of their biofuels sourcing,” said Jean-Philippe Denruyter, WWF Global Bioenergy Coordinator and Steering Board Member of the Roundtable on Sustainable Biofuels. “By teaming up with the Roundtable on Sustainable Biofuels, the aviation sector can build on an existing, solid, multi-stakeholder process that will reinforce this initiative.”

All group members subscribe to a sustainability pledge *(below)* stipulating that any sustainable biofuel must perform as well as, or better than, kerosene-based fuel, but with a smaller carbon lifecycle. The user’s group has pledged to consider only renewable fuel sources that minimize biodiversity impacts: fuels that require minimal land, water and energy to produce, and that don’t compete with food or fresh water resources. In addition, cultivation and harvest of plant stocks must provide socioeconomic value to the local communities.

“The use of second-generation feedstocks is the only way that biofuels will successfully make an impact on the growing demand for transportation fuels without taxing valuable food, land and water resources,” said Jennifer Holmgren, general manager for UOP’s Renewable Energy & Chemicals unit. “We are proud to be a part of this team and are committed to commercializing biofuels technologies that use second generation resources to produce the highest quality fuel compatible with today’s infrastructure and aircraft technology.”

The group has announced two initial sustainability research projects. Assistant Professor Rob Bailis of Yale University’s School of Forestry & Environmental Studies, through funding provided by Boeing, will conduct the first peer-reviewed, comprehensive sustainability assessment of jatropha curcas, to include lifecycle CO2 emissions and the socioeconomic impacts to farmers in developing nations. Similarly, NRDC will conduct a comprehensive assessment of algae to ensure it meets the group’s stringent sustainability criteria.

Both species may potentially become part of a portfolio of biomass based renewable fuel solutions that, through advanced fuel processing methodologies developed by energy sector leaders such as UOP, can help aviation diversify its fuel supply.

“This taskforce comes at just the right time to help airlines cut costs and decrease their greenhouse gas emissions,” said Liz Barratt-Brown, NRDC senior attorney. “If done right, sustainable biofuels could lower the airlines’ carbon footprint at a time when all industries need to be moving away from fuels with high levels of global warming pollution.” ■

SAFUG member pledge

We agree to work with leading organizations and individuals in the biofuels arena, not limited to the aviation industry, to develop a world-leading fact base on sustainable aviation fuels, which will:

1. Provide a body of peer-reviewed research and best practices, including fuel lifecycle emissions assessments, which will support the practical application of common sustainability criteria to the development, certification, and commercial use of sustainable aviation fuels.

2. We will work in conjunction with the *Version Zero* report of the Roundtable on Sustainable Biofuels as a basis for sustainability research and certification efforts. The Working Group will identify and research feedstock-specific sustainability indicators and criteria to contribute to the Roundtable.

3. Support the development of government policies which promote the development, certification, and commercial use of sustainable, lower carbon aviation fuels.

We are committed to working in partnership where appropriate with governments, other industries and representatives of civil society on credible and feasible actions in response to global climate change concerns and other socio-economic challenges.

We strongly encourage other aviation industry participants to join us in working together to help accelerate the development, certification, and commercial use of environmentally and socially sustainable aviation fuel.

Reflections of an ICAO Search and Rescue Officer

Some truths, experiences and lessons learned

by Brian Day, former Search and Rescue Technical Officer

Brian Day served the ICAO Secretariat for seven years as Technical Officer (SAR) in the Air Traffic Management Section of the Air Navigation Bureau from July 2000. It was a period of dramatic world events in which the aviation industry would play a key role. Brian, as an emergency response specialist, was called upon to give ICAO's support to a number of ventures. This article summarizes those field experiences while emphasizing some important aspects of ICAO's mandate and priorities. Brian Day continues to be retained by ICAO as a SAR specialist and consults widely in the public and private sectors.

Most *Journal* readers will be familiar with the essential role of ICAO in serving the aviation industry by drafting a framework of safety and technical standards. The global uniformity of procedures that results is one of the principal reasons for the extraordinary success of international civil aviation over the past fifty years. That operations continue so seamlessly and safely, day and night in their thousands upon thousands, is testimony to the foresight and perseverance of the delegates from 54 nations who attended the first civil aviation conference in Chicago from November 1st to December 7th, 1944. Their work made effective the peaceful application of the frenzied aviation developments of the war years. It built upon the network of air routes and military airfields that had served in the fields of conflict and converted the airplane from an instrument of war into a powerful means of pursuing peace and prosperity.

What perhaps is less well known is the emphasis that was given to humanitarian ideals at the opening session of the Chicago Conference. President Roosevelt spoke explicitly of "a new chapter in the fundamental law of the air" and of "a great attempt to build enduring institutions of peace". Mr. Roosevelt foresaw that the attainment of such a lofty goal could be seriously prejudiced "by petty considerations" and weakened "by groundless fears". Thus, he exhorted that "in full recognition of their sovereignty and judicial equality" all nations should work together "so that the air may be used by humanity, to serve humanity".

The spirit of humanity, then, is at the very core of the ICAO mandate.

The freedoms and opportunities of air travel have changed our world, no doubt. Those freedoms have been both wonderfully used and, on occasions, terribly abused. Over the last decade, the aviation industry has boosted commerce, trade, and particularly tourism to unprecedented levels at a remarkable rate. Economies have boomed, international relationships have prospered and the building blocks of peace have been greatly reinforced. On the other hand, on more than one loathsome occasion but particularly one, the fears and prejudices of a few fanatics prompted the awful misappropriation of civil aircraft as weapons of mindless devastation. None who strive for safety in aviation will ever forget the sight of passenger-carrying aircraft being directed to the destruction of innocent civilians.

In striking contrast to the 9/11 scenario, from time to time in this same period, civil aircraft have played an auspicious role in relieving the suffering of people deprived and at risk because of war. On four of these occasions in which ICAO played a cooperative part, I, as the ICAO Search and Rescue specialist, was privileged to participate.

Iraq

When the American-led coalition invaded Iraq, the strife of war quickly spread, both in its type and extent. The lives of innocent people, in alarming numbers and in widespread locations, became disrupted and threatened. They urgently needed support.

Soon after the commencement of hostilities, the United Nations World Food Program began relief flights into Baghdad, Mosul and Basra from Amman, Jordan. Because these humanitarian flights were operating in a high-risk environment with only limited air traffic control and no civil search and rescue services, the United Nations Joint Logistics Committee (UNJLC) requested assistance from ICAO. There was a critical need for the development of an emergency response plan that would ensure some lifesaving action in the event of a relief flight encountering an emergency in Iraqi airspace. This organisational responsibility was to become my personal adventure. It began when I flew from Amman to Baghdad on August 18th in the company of Paul Steiner, an air transport expert with the UNJLC.

After visiting the control tower to familiarize ourselves with airspace arrangements and Baghdad's improvised air navigation services, we were equipped with helmets, flak jackets and radios and dispatched in a convoy on the hazardous drive to the city. When only two or so minutes short of the hotel where the United Nations mission had made its headquarters, our radios sprang to life with panicked cries of a bomb blast. A violent explosion had shattered a substantial part of the U.N. building and decimated the wall surrounding the compound. This was just the place where we were to have been given a security briefing and be accommodated for the night. The chaos that followed was grim. Statistics of the overall Iraq war are awful and those of that day in August are, tragically, almost insignificant now. Still, 22 people were killed, amongst them the brave Sergio Di Mello, the U.N. Special Representative. Over 100 were injured, some of them grievously. It was an unprecedented attack on United Nations staff deployed in the field of conflict. That led, soon thereafter, to the recall of most staff and chaotic interruption to all U.N. services and processes in the country.

"The search and rescue service is a key component of the greater safety management process that extends across the whole range of air navigation operations. SAR provides a safety net of last resort. SAR is the system that activates when all other defences are down. SAR saves lives at the end of the line."

ICAO's work, however, continued, and within a few days a civil aviation emergency response plan had been completed and a letter of agreement produced for cooperation between the Coalition Provisional Authority, the World Food Program and the civil aircraft operators in-country. This letter of agreement was subsequently taken by these various agencies and put to use in developing support services for future humanitarian activities in other strife-torn localities.

Sudan

Unhappily, a need developed for a similar emergency response plan soon afterwards in the Sudan, where the United Nations was called upon to conduct a massive airborne operation in support of those suffering in Darfur. When, in 2004, I travelled to Khartoum with a colleague to evaluate its SAR system, a peace deal between the warring factions was due to be finalized by the end of the year. The rebel Sudan Peoples' Liberation Movement (SPLM) intended to take up a formal role in the government of Sudan as well as assume a major share of responsibilities in the troubled south of the country. Sudan's civil war, which pitted the northern-based Islamist government against the mainly Christian south, had already claimed the lives of more than two million people, mostly through hunger and disease.

As a means of bringing relief supplies to the terribly deprived people in Darfur, U.N. agencies had deployed a sizable fleet of aircraft to Sudan. Over the coming few months, it was planned to increase the number of participating aircraft to no less than 90. Managing such an operation of airborne relief is a major undertaking; the logistical considerations are enormous and the prospect of coping with any emergency is daunting. The hazards of the Darfur operation were further exaggerated by its remoteness and the lack of in-country support. In these circumstances, the chances of relief flights encountering danger and distress were real.

Once again, there was an urgent and critical need for an emergency response plan to be developed that took full account of the many U.N. aircraft that had begun using Sudanese airspace. The flights were so numerous as to significantly upset the balance of operations and services in the region. While this unusual proliferation of U.N. aircraft constituted a valuable resource for the conduct of any SAR operations that might arise during their presence, the U.N. fleet itself, operating in an adverse environment, was exposed to high risk. Both aspects of the fleet's presence needed careful assessment and response plans. The procedures used as a template for the Darfur plan were those developed in cooperation with the Coalition Forces during the mission to Iraq the previous year.

There will, no doubt, be many similar situations in which the U.N. will be called upon to mount airborne relief operations, some, presumably, in intrinsically dangerous environments. The expertise of ICAO is invaluable in these situations. Its abilities extend through airspace management, air traffic control, flight operations, aeronautical information, accident investigation and many other related services that need to be harnessed in an emergency. Further, as the United Nations aviation executing agency, ICAO has a unique credibility and degree of acceptance that is essential to the promotion of cooperation and harmony in the rapid development of contingency plans.

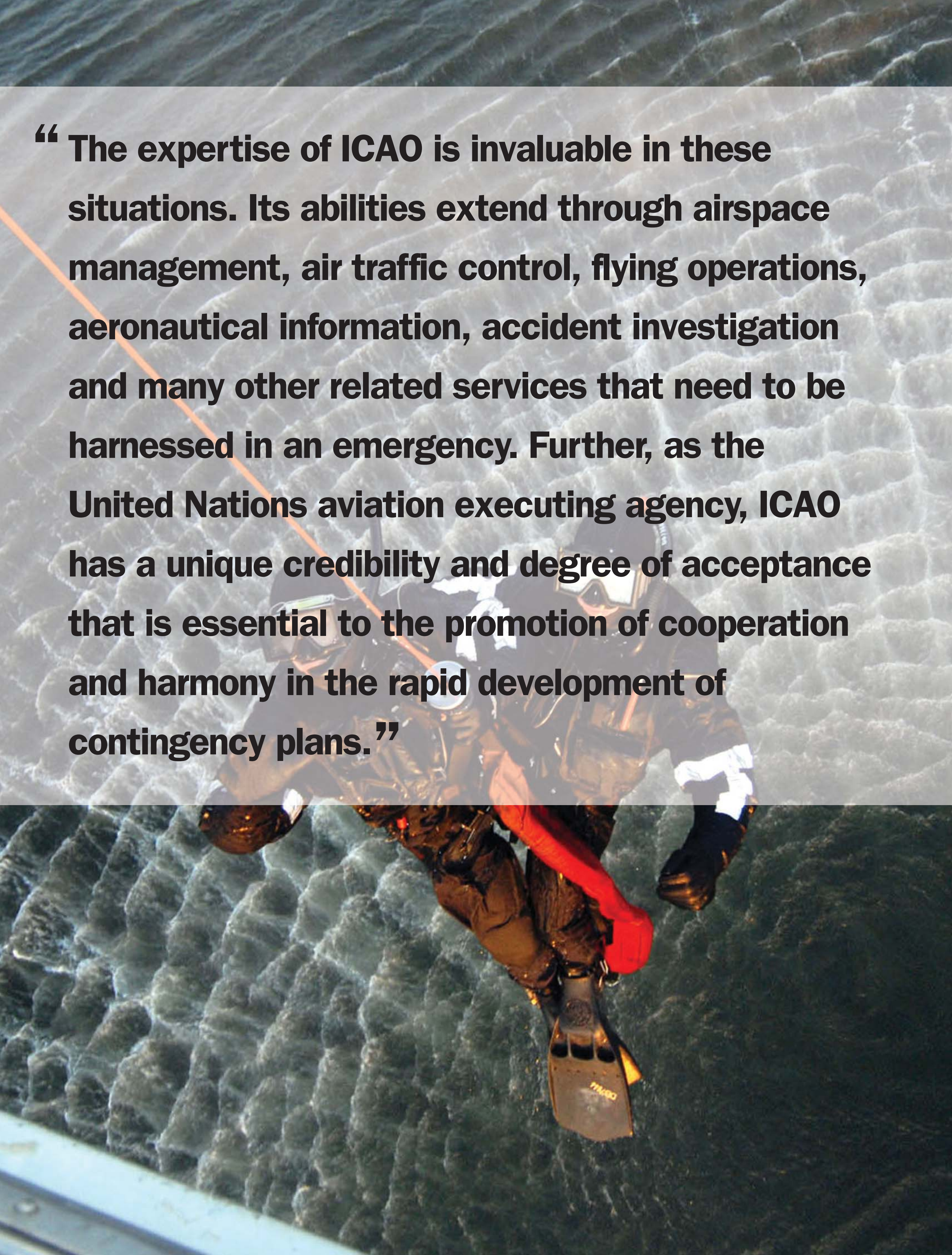
Kosovo

In 2005, the United Nations Interim Administration Mission in Kosovo (UNMIK) expressed concern that existing plans and resources were insufficient to the task of providing a SAR service to civil aircraft operating within Kosovo airspace.

While Serbia's sovereignty had been widely recognized by the international community, in practice, Serbian governance in the province had been virtually non-existent. Instead, the province had been governed by UNMIK with the help of the local provisional institutions of self-government (PISGs), and security had been provided by the NATO-led Kosovo Force (KFOR).

While ICAO had no role to play in the final determination of Kosovo's political status, it continued to serve as a source of expertise for the promotion of safety and regularity in the conduct of its civil air operations. As in the cases of Iraq and Sudan, the operations in Kosovo had been disadvantaged by only minimal support services. Arrangements had been made for the provision of air traffic control by Icelandic authorities and temporary regulation of operations had been addressed through the establishment of a Civil Aviation Regulatory Office (CARO) within UNMIK. SAR services, however, had been left as a responsibility of an amalgam of loosely connected agencies untrained in specialist aviation emergency response.

In being assigned to the UNMIK CARO in September 2005, I was briefed to make Kosovo agencies more aware of the



"The expertise of ICAO is invaluable in these situations. Its abilities extend through airspace management, air traffic control, flying operations, aeronautical information, accident investigation and many other related services that need to be harnessed in an emergency. Further, as the United Nations aviation executing agency, ICAO has a unique credibility and degree of acceptance that is essential to the promotion of cooperation and harmony in the rapid development of contingency plans."

benefits of civil aviation SAR as a subset of emergency response services. In doing this, I was to discuss with them, particularly, effective command and control structures and systems of regulation to ensure prompt and effective life-saving response. Kosovo, as much as any service provider in my experience, had, as a legacy of the Balkans war, inherited a number of agencies whose functions and responsibilities overlapped in a blurred confusion of roles.

Chief amongst the documents that ICAO prepared for Kosovo was a Kosovo SAR Plan that detailed the respective SAR roles of all participating agencies, terms of reference for a Kosovo SAR Coordinating Committee and an extensively revised agreement between UNMIK and KFOR to serve as an updated, more pertinent basis of operational cooperation. These documents now serve as a firm foundation for SAR services provided from a newly commissioned rescue coordination centre (RCC) at Pristina Airport with a complement of specially trained SAR staff.

Lebanon

The 34-day military conflict between Hezbollah's paramilitary forces and the Israeli military started on July 12th, 2006 and continued until a United Nations-brokered ceasefire went into effect on August 14th of that year.

Beirut's Rafic Hariri International Airport was identified as strategically important and became an early target of airstrikes. Crippling bomb damage was sustained by the airport's runways and normal civil aviation operations were severely curtailed.

An air and naval blockade was also imposed and social and economic activities within Lebanon were severely disrupted until the embargo was lifted on September 8th.

The conflict displaced almost a million Lebanese and up to half a million Israelis, although most were ultimately able to return to their homes. Throughout the conflict an urgent and critical need arose for enormous humanitarian aid to be extended to those in need in the most expeditious manner possible. The only feasible way in which that could be done was by air. Once again, the World Food Programme (WFP) and the United Nations Humanitarian Air Services (UNHAS) were called into action and ICAO was asked to assist. Accordingly, I was despatched to Larnaca, Cyprus, where WFP and UNHAS had set up a coordination centre for the movement of relief supplies.

Typically, and within a short time, huge resources were marshalled into the effort and the challenge quickly became one of timely and effective distribution. In this regard, the role of ICAO became readily apparent in facilitating safe and regular air delivery. For anything to be achieved it was vital that all parties cooperate; that, in turn, required a credible coordinator of aviation operations. For this, ICAO was ideally suited.

While maintaining strict oversight of operations in and out of Lebanese airspace, authorities sanctioned a corridor for the operation of civil aircraft engaged in the conduct of relief operations. This narrow route required careful protection by a number of regional States including Cyprus, Greece, Lebanon, Israel and Jordan. The movement of aircraft required impromptu arrangements for airways clearances, radio communications, identification procedure, traffic flow management and, not least, an emergency response plan that would effectively care for aircraft in distress.

Some lessons learned

It has been well said that modern man is more inclined to produce than to protect. We are driven by material gain and are loath to allocate resources for insubstantial purposes; better, we believe, that we support the manufacture of goods and build on the dollar-quantified bottom line.

In the aviation industry, despite the oft-repeated mantra that safety comes first, the reality is that safety needs to compete with other priorities. Safety, to be sure, is an imperative but it is inevitably limited by the availability and the allocation of financial resources. To put it into proper perspective, the business of airlines, evidently, is not safety; it is transport. In providing transport, they seek to do so safely.

ICAO has been directed by its Member States to promote safety management systems that both recognise the commercial realities of the aviation industry and ensure the optimal application of safety measures. Safety systems are developed to constantly highlight hazards and improve the mitigation of risk. The SAR service is a key component of the greater safety management process that extends across the whole range of air navigation operations. SAR provides a safety net of last resort. SAR is the system that activates when all other defences are down. SAR saves lives at the end of the line.

Preventive SAR requires airborne carriage of life-saving equipment and specifies a certain conduct of operations that reduces exposure to hazards, thus it is pre-emptive. Operational SAR, when an accident has occurred, launches rescue units into the teeth of the storm that brought the aircraft down.

In all, SAR is a vital operational and humanitarian service that should never be marginalized in the mistaken belief that it is an anachronistic leftover of more dangerous times. Just as its need has been recognised in the extreme circumstances of Iraq, Darfur, Kosovo and Lebanon when danger presented itself in clear and present form, so should SAR be understood as a service of constant operational relevance, humanitarian need and economic necessity. Safety pays; so does the saving of life.

But it's not just the lives that are saved that tell the story; the availability of a SAR service implies a moral value that is put on life without regard to race, gender, location or any other discriminator. Without it, civilisation would scarcely be civilised at all.

Some truths elaborated

The extraordinary experiences that I had as ICAO's SAR specialist, some of which I have recounted here, stand out as lessons from the real world. Quite the same lessons became apparent from a comprehensive project in which 34 African State SAR systems were evaluated over the last five years; so, too, from ICAO's cooperative SAR endeavours throughout the world with the International Maritime Organization, and in our countless SAR missions to developing States under the auspices of ICAO's Technical Co-operation Bureau. The lesson, simply, is that while aeronautical technology has never been more effective, systems more redundant and operations safer, SAR must always be given the support it needs for itself, to be the support that the industry requires.

Concerned that a misperception of risk could compromise proper attribution of resources to SAR, the United States National Transportation Safety Board (NTSB) undertook a study "to dispel a public perception that most air carrier accidents are not survivable". The study also sought "to identify things that can be done to increase survivability in the accidents that do occur". This study of 568 air accidents over the 18 year period from 1983–2000 found that 2,280 of the 51,207 total occupants died, giving a survival rate of 95 percent. This, to many in the industry, is a surprisingly high rate of survival.

For serious accidents, including those classified as non-survivable, the survival rate was, of course, markedly lower. Of the 2,739 occupants involved in the serious accidents that were studied, 1,524 survived, for a rate of 55 percent. This still, perhaps, may be a surprising high rate to many. In serious accidents classified as survivable, some 76 percent of those on board lived through the experience.

Conclusion

Whether judged on operational, economic or humanitarian grounds, SAR is a service that requires more than a rushed response when crises occur. It is not just war, drought, famine and catastrophe that require contingency planning. SAR is, in a sense, a contingency plan in its own right that needs to be properly conceptualised, developed and provided for as a matter of course.

Perhaps, in terms of principle, I have learnt little new in having that lesson reinforced throughout my ICAO experience. In more fully appreciating its depth of truth, however—the need for SAR at all of the social, political and financial levels of society—I leave ICAO with a markedly more profound sense of understanding.

Further, in having been repeatedly reminded of how essential it is to the world's collective conscience that we provide for those in distress, in the aviation industry as in every other facet of community, I leave this fine organization in the hope that high on its agenda, and in the agenda of the 190 Member States that it seeks to serve, a place will always be found, a prominent one, for the great charge of SAR: "that others may live".

There could surely be no more apt application of President Roosevelt's memorable call in 1944 *"that the air may be used by humanity, to serve humanity"*. ■

ICAO Council appoints new Secretary General

France's Raymond Benjamin to succeed Taïeb Chérif effective August 1st, 2009

The Council of the International Civil Aviation Organization has appointed Raymond Benjamin of France as the new Secretary General of the Organization for a three-year term, beginning August 1st, 2009. He will succeed Taïeb Chérif of Algeria, who has occupied the position since 2003.

Benjamin's 33-year career in civil aviation began in 1976 with the French Civil Aviation Administration. After a year with the Human Resources Division, he was given the responsibility for negotiating bilateral air transport agreements on behalf of the Administration.

Following his career at ICAO, Benjamin became Executive Secretary of ECAC from 1994 to 2007, where he was responsible for policy advice and strategies in the areas of safety, security, and the environment. He was also responsible for integrating newer Member States into the European regulatory system and fostering relations with other regional organizations and ICAO.

Benjamin is currently Special Adviser to the Joint Aviation Authorities Training Organization (JAA/TO) and to the European Aviation Security Training Institute (EASTI). ■

In 1982, Benjamin joined the European Civil Aviation Conference (ECAC) as an Air Transport Officer. A year later, he was appointed Deputy Secretary, a position he held for six years. In 1989, he came to ICAO as Chief of the Aviation Security Branch, where he advised on security policy matters and was involved in the development of a worldwide airport assessment and technical assistance programme for States. He also participated in the establishment of a network of aviation security training schools and standardized training packages (STPs). In addition, he served as Secretary of the ICAO Aviation Security Panel and the ICAO Group of Experts for the Detection of Plastic Explosives.

Raymond Benjamin of France (second from right) after his appointed as Secretary General of ICAO. Benjamin is currently Special Adviser to the Joint Aviation Authorities Training Organization (JAA/TO) and to the European Aviation Security Training Institute (EASTI). In attendance are (from left to right): Lionel Alain Dupuis, Representative of Canada on the ICAO Council; ICAO Secretary General Taïeb Chérif; Viviane Benjamin, spouse of Raymond Benjamin; ICAO Council President Roberto Kobeh González; and (far right) Jean-Christophe Chouvet, Representative of France on the ICAO Council.

PAST ICAO SECRETARIES GENERAL

1997-2003: Renato Cláudio Costa Pereira	(Brazil)	**1964-1970:** Bernardus Tieleman Twigt	(Netherlands)
1991-1997: Philippe Rochat	(Switzerland)	**1959-1964:** Ronald MacAlister Macdonnell	(Canada)
1988-1991: Shivinder Singh	Sidhu (India)	**1952-1959:** Carl Ljungberg	(Sweden)
1976-1988: Yves Lambert	(France)	**1944-1951:** Albert Roper	(France)
1970-1976: Assad Kotaite	(Lebanon)		

Brian Colamosca is presented with the ICAO ANC Laurel Award for his outstanding contribution to the work of the Commission in the field of Reduced Vertical Separation Minimum (RVSM). From left-to-right: A Korsakov, member of the ANC; Roberto Kobeh González, President of the ICAO Council; Omari Nundu, Award presenter and President of the ANC; Brian Colamosca, Recipient of the ANC Laurel Award; Taïeb Chérif, ICAO Secretary General; Donald Bliss, former Representative of the United States of America.

Spotlight on Brian Colamosca: Latest recipient of the ANC Laurel Award

The Fifth ICAO Air Navigation Commission (ANC) Laurel Award was conferred last September on ICAO's Brian Colamosca, in recognition of his outstanding contribution to the work of the Commission in the field of Reduced Vertical Separation Minimum (RVSM).

The ICAO Air Navigation Commission (ANC) Laurel Award, in the form of a gold statuette, is bestowed on an individual or group who has made an outstanding contribution to the work of the Commission in furthering the safety, regularity and efficiency of international civil aviation. The 2008 Laurel Award was presented by Omari Nundu, President of the Air Navigation Commission of ICAO, during a special ceremony at the Organization's Headquarters.

In conferring the award, Nundu recognized Colamosca's overall contribution to the safety, regularity and efficiency of international civil aviation through his efforts in the global arena, in particular through RVSM implementation in the North Atlantic and Pacific Regions. Colamosca participated actively in ICAO's Separation and Airspace Safety Panel (SASP) and its forerunner, the Review of the General Concept of Separation Panel (RGCSP).

Colamosca's efforts impacted directly on RVSM implementation in the United States and internationally in Australia, Canada, Mexico, the Caribbean, the Middle East, the North Atlantic, the Pacific, South America, the South China Sea, and the Southeast Asia to Europe routes.

"It is a great honour to be recognized for the RVSM work," expressed Colamosca upon accepting the prestigious award. "The successful implementation of RVSM was truly a collegial, cooperative, and global effort."

Earlier in his career, as a member of the RGCSP, Colamosca was pivotal in developing the RVSM global system performance specifications and the accompanying altimetry system performance specifications. He was also instrumental in drafting the first edition of ICAO's guidance material for RVSM, the *Manual on Implementation of a 300 m (1,000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive* (ICAO Doc 9574).

More recently, Colamosca led FAA efforts to mentor specialists from the Air Traffic Management Bureau of the General Administration of Civil Aviation of China in various aspects of safety analysis in the lead up to the 2007 implementation of RVSM in Chinese airspace. ■

Focus on the flight deck

With the advent of the jet-age and digital advances to instruments and procedures, present-day airliners can ironically be easier to fly than the far less complex machines that criss-crossed the skies during the first half of the 20th century.

In this *Journal* feature, Levent Bergkotte traces an entertaining history of flight deck advancements and highlights their implications for flight crews specifically and aviation safety in general.

Over the past century, aviation has come a very long way. From the unstable, unreliable biplanes of the early 20th century to today's gigantic airliners carrying hundreds of passengers halfway across the globe, the progress of aviation has been continuous. One of the areas where most of this progress has been made is on the flight deck of aircraft, also referred to as the cockpit.

The very first aircraft had virtually no cockpit at all. They featured a small area for the pilot to sit and manipulate the few controls to keep their aerial vehicle as stable as possible during its sometimes precarious flight. As the speeds aircraft could travel at picked up, pilots needed more and more protection from the elements. Over the following two decades, aviators were still seated in open spaces—even in the first passenger aircraft.

During the 1920's, aircraft manufacturers started to incorporate closed flight decks into the front section of the aircraft, greatly improving pilot comfort and safety. Although located in the same position as flight decks today, the steering cabins of the early airliners were extremely basic. They contained only the bare necessities for controlling the aircraft and its engine or engines and little, if any, navigational instrumentation.

As aircraft started to fly longer stretches, the importance of better navigation aids increased—leading to the advent of the autopilot. This handy device greatly improved both accuracy and safety, especially since aircraft didn't yet have pressurized cabins and weren't able to fly high enough to avoid bad weather. The most modern aircraft of this era were generally employed to explore the world just as ocean going adventurers had during preceding centuries.

Eventually, air services began to be established on a more and more worldwide basis and, gradually, it became possible to circumnavigate the globe by airplane. Of course the low speeds of these aircraft compared to today's airliners, combined with their limited range, made these voyages very long and exhausting for the flight crews.

The introduction of jet aircraft after World War II revolutionized the way aircraft flight decks were designed and equipped. Flight times were virtually slashed in half and, with these tremendous improvements to aircraft speed, it became even more important to improve the navigational systems of the aircraft to ensure that flights could be operated as safely as possible.

It became apparent over time that any deviations to a flight path at these new and higher speeds could endanger the safety of the flight; for example by it flying too far from suitable en-route alternate airports during a transatlantic crossing. Another safety factor was the fuel burn. With early jets, the first generation engines were not only very loud and emission-prone, but they were also very thirsty. In order for pilots to learn to fly jet-powered aircraft in the safest way possible, a whole new set of skills needed to be introduced to flight training related to the relationships between fuel consumption, navigation and flight speed.

An aircraft's navigational capabilities during this period were, together with the plane's overall quality and endurance characteristics, the most important considerations for conducting a safe long-range flight. These skills and qualities have improved dramatically in the second half of the 20th century.

Where early airliners still navigated by means of homing in on land-based navigation aids—such as beacons—and were quite limited in doing so, the modern airliners of today can navigate to any given point on the globe. Indeed, the only limiting factor affecting modern-day airliners is their range and capability to land at a given destination. The advance of inertial navigation systems meant that an aircraft could pinpoint its location at any given point during a flight, and that the pilots were no longer dependent on distance and bearing readings from fixed navigation beacons along the route.

With engines and aircraft systems becoming systematically more reliable over time, air travel became safer than ever before. Engine improvements also meant that aircraft became less noisy, less polluting and also much more fuel efficient.

Changes were also implemented over time to the number of crew members needed to operate an airliner in a safe manner. The very first airplanes, including the first passenger airliners, were flown by a single pilot who also functioned as a flight engineer, navigator and radio operator all at the same time. As aircraft and their cockpits became more complex, the number of crew needed to operate them also increased. With the development of larger, propeller-powered aircraft during World War II, the multi-tasking pilot found the early cockpits gave way to a flight crew consisting of four or five people with specific duties and responsibilities.

"Having vital information displayed on the head up display, including the flight path to follow for an instrument approach, means that landings can now be performed in much poorer visibility conditions than was previously possible. This development greatly reduces the need for go-arounds and diversions, thus increasing safety and decreasing operating costs for both airlines and airports."

The introduction of jet airliners later signalled the start of automation in the flight deck. The cockpit crew was now reduced to three individuals consisting of two pilots and a flight engineer. The reduction of the number of crew members in the flight deck didn't mean that aircraft were now less complex—if anything their advanced systems made them far more complex than ever before.

Rather the integration of new electronic systems and sensors, as well as more ergonomic designs, now meant that fewer crew members were capable of ensuring an even greater level of aggregate flight safety.

As time went on, the advent of less complicated systems and smaller airliners meant that pilots could now also begin to take over the tasks of the flight engineer, leading to the two-person cockpit.

As the position of the flight engineer seemed to be becoming more and more obsolete, there were discussions in the industry about the impact of this development. The main issue was not the loss of jobs, as many flight engineers went on to either flying aircraft themselves or successfully applying their expertise in other sectors. Rather, the debate was mainly focused on the flight safety aspects of this development. In a three-crew cockpit, in the event of an emergency, the pilots would often be able to concentrate on flying the aircraft while the flight engineer was trying to solve the problem at hand. With a two-crew cockpit this was no longer a possibility.

Despite these concerns, the general consensus was and is that modern airliners can be operated safely by two pilots. For operators, the introduction of two-crew cockpits also meant a vast reduction of expenses, although this advantage has now been negated by the need for an extra crew member —a relief pilot, and sometimes two— who are required during the ultra long range flights some airliners are capable of operating.

“ In the end, a modern airliner capable of carrying up to 850 passengers, or a yet-to-be-developed aircraft that may transport over a thousand travellers, could very well be flown by a single pilot, just like the very first aircraft that took to the skies. The main difference is that while the lonely aviation pioneer steered his aerial vehicle sitting in an open cockpit with minimal comfort, the modern flight deck manager is surrounded by the latest state-of-the-art technology in what has now become a type of ‘flying office’. ”

After the introduction and improvement of inertial navigation systems, the next big step was the implementation of Flight Management Systems as the use of computers on the flight deck had become more standardized. The Flight Management System (FMS) acts like a third brain in the cockpit to assist the pilots and lighten their work load dramatically. The FMS does everything from keeping an eye on all aircraft systems, checking their status, and warning the crew of any problems, to navigating the aircraft along the programmed flight path coupled with the autopilot.

The possibilities and capabilities of FMS systems have improved dramatically over a relative short period of time, and even more features are being added on a constant basis. FMS combined with another important tool, the Global Positioning System (GPS), makes navigation more safe and secure than ever before. Initially developed by and for the military, GPS is now widely used in commercial aviation. It has been continuously upgraded since its introduction, constantly improving its capabilities and precision.

Another great advance in aviation safety in general and flight deck automation in particular is the implementation of traffic collision avoidance systems (TCAS) and ground proximity warning systems (GPWS),

which now form an essential part of an airliner's safety equipment. Both the TCAS and GPWS, combined with other advanced navigation and autopilot aids, have greatly increased the safety of the passengers and crew by reducing the number of incidents related to collisions with other aircraft or the terrain.

One of the latest developments to be implemented in commercial aviation (and like the GPS system initially used by military forces) is the Head Up Display or HUD. The HUD's main advantage is its capability of displaying the most vital information on a transparent screen right in front of the pilots' eyes, which is particularly useful during the approach to a runway. Using this system, the pilot doesn't have to take his or her eyes off the wind screen at any moment during the approach phase, which means that situational awareness is greatly improved.

As well, having vital information displayed on the HUD, including the flight path to follow for an instrument approach, means that landings can now be performed in much poorer visibility conditions than was previously possible. This development greatly reduces the need for go-arounds and diversions, thus increasing safety and decreasing operating costs for both airlines and airports.

In comparing the flight deck of an early jet airliner with those found in the latest generation of aircraft, we find that countless dials and knobs have now been replaced by state-of-the-art digital displays. Where cockpits used to be 100% mechanical, they are now very close to being fully digitized. The need for back-up systems will ensure that flight decks will likely never become fully computerized, but one could just imagine the look on a 1950s pilot's face if he were to see the flight deck of an airliner rolling out of the factory today.

For today's pilots, good training is more essential than ever before. Of particular importance is the need for pilots to be trained in "collaborating" with their computerized environment. For example, while aircraft navigation systems are now more advanced than ever, and reliability is extremely high, pilots still need to stay aware of their geographical location. Situational awareness used to be second nature to early pioneers navigating their aircraft by means of landmarks or the stars, but when cruising at 39,000 feet over the Atlantic on autopilot this responsibility can require a significant degree of professional vigilance.

As automation in the flight deck continues to increase and improve, the inevitable question is: will pilots keep their jobs? The job of a pilot is now, more than ever, more of a computer systems manager than an aviator. Flying with standard instrument procedures, the autopilot is switched on shortly after take-off, only to be switched off again shortly before touch-down. In some cases it can be called upon to complete a fully-automated landing in weather conditions with minimal or no visibility whatsoever, remaining on until the moment an aircraft completes its roll-out after landing.

Providing all systems are functioning properly, the autopilot/FMS combination can often fly an aircraft in a much more precise and stable way than a human being ever could. The key point here is that, in order for computers to fly an aircraft safely, they must be fully operative. No matter how advanced a computer may be, it is still a machine and thus prone to malfunction. In his or her capacity as a flight manager, the pilot is also there to take over from the computers if necessary. The general consensus for now is that a pilot should at all times have the option to override the computer and overrule its decisions.

It is a fact that automation in the flight deck of modern airliners has contributed to diminished workloads for the flight crew. It is important to remember that many, if not the vast majority of the (automated) safety systems in aircraft were developed and implemented following serious incidents and accidents. It is ironic perhaps that present-day airliners appear to be easier to fly than the less complex machines that criss-crossed the skies during the first half of the 20th century, and it is not unimaginable that further automation will negate the need for a second pilot in the cockpit altogether.

In the end, a modern airliner capable of carrying up to 850 passengers, or a yet-to-be-developed aircraft that may transport over a thousand travellers, could very well be flown by a single pilot, just like the very first aircraft that took to the skies. The main difference is that while the lonely aviation pioneer steered his aerial vehicle sitting in an open cockpit with minimal comfort, the modern flight deck manager is surrounded by the latest state-of-the-art technology in what has now become a type of "flying office". ■

2009 ICAO CALENDAR OF EVENTS

Meeting	Site	Duration
Global ATM (Air Traffic Management) Forum on Civil/Military Cooperation	ICAO Headquarters, Montreal	19 – 21 October 2009
Fifth Symposium on ICAO MRTDs, Biometrics and Security Standards	ICAO Headquarters, Montreal	21 – 23 September 2009
ICAO-World Bank — Routes Development Forum Maximizing Civil Aviation's Contribution to Global Development Aviation Development: Focus on Asia/Pacific	Beijing, China	14 – 15 September 2009
ICAO CAR/SAM Workshop on Data Collection, Forecasting and Analysis	Mexico City, Mexico	29 June – 3 July 2009
Seventh MEVA II REDDIG Coordination Meeting (MR/7)	Mexico City, Mexico	10 – 11 June 2009
Search and Rescue (SAR) Meeting for the North American, Caribbean and South American Regions (SAR/NAM/CAR/SAM)	Puntarenas, Costa Rica	18 – 22 May 2009
Workshop on the Development of National Performance Framework for Air Navigation Systems	Mexico City, Mexico	4 – 8 May 2009
Diplomatic Conference — Compensation for Damage Caused by Aircraft to Third Parties arising from Acts of Unlawful Interference or from General Risks (DCCD)	ICAO Headquarters, Montréal	20 April – 2 May 2009
ICAO Regional Seminar on MRTDs, Biometrics and Security Standards	Abuja, Nigeria	6 – 8 April 2009
ICAO Legal Seminar	Incheon, Republic of Korea	30 March – 2 April 2009
ICAO Legal Seminar	Paris, France	25 – 26 March 2009
Workshop on Airport and Air Navigation Services Economics	Bangkok, Thailand	25 – 27 February 2009
ICAO Legal Seminar	Cairo, Egypt	18 – 19 February 2009
Workshop, Aviation and Alternative Fuels	ICAO Headquarters, Montréal	10 – 12 February 2009